

# Impact of on-track competition on public finances – the case of the Czech Republic

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## Abstract

The European Commission presumes that competition in the passenger railway market will motivate railway operators to become more customer-led companies. Competition forces should lead to an improvement in the quality of services provided and thereby increase demand for rail transport and cut budget burdens.

This paper aims to assess the budgetary impacts and development of public spending efficiency in the context of on-track competition in the Czech Republic. The paper illustrates what impact the increase of the number of passengers (including passengers entitled to state-imposed discounts on commercial lines) had on public funds, and public spending efficiency as measured by the ratio of public expenditures to rail transport performance.

The general results indicate that the situation regarding the budgetary impact is more complex than the original ideas considered. While both the length of subsidised railway lines and the number of subsidised train-kilometres have decreased, the fiscal burden has not dropped but increased as a final consequence. It turns out that an introduction of competition need not result in a reduction in budget entitlements nor an increase in the efficiency of public resources spent. The efficiency of public resources remained unaffected despite the introduction of on-track competition on the main routes.

## Keywords

On-track competition; railway operations; public budget contributions; public spending efficiency; compensation; Czech Republic

## 1. Introduction

Railways have been a significant burden on finances for a long time. Decreasing labour productivity, the rigidities of state monopolies, and a decline in both freight and passenger demand have led to growing fiscal demands and declining rail industry efficiency. These long-term fiscal, social, and competitive pressures have resulted in gradual reforms that have been institutionalised in the form of the European railway packages aiming at revitalising the rail sector. An introduction of competition is one of the proposed measures. Railway liberalisation may lead to benefits for railway passengers and public finances (Pietrantonio and Pelkmans, 2004; European Commission, 2008; Beria et al., 2012). As Nash et al. (2011) summarised, economic theory forecast that an increase in competition may lead to improved services, lower costs, and, simultaneously, growth in transport performance and a fall in subsidies paid.

The European railway industry receives substantial amounts of public funding, for both financing investments into infrastructure and subsidising non-profitable operations and supporting the restructuring of railway organisations (van de Velde et al., 2012). The rationale for providing public support to railways is to provide services beyond those a commercial railway would offer (ECMT, 2005).

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Governments face a number of choices in determining the level of public support they should provide for railways (Di Foggia and Arrigo, 2016), but generally the main objectives of the policies adopted at the EU level may reduce budgetary expenditures (Pietrantonio and Pelkmans, 2004) and ensure better value for money (ECMT, 2005).

Despite the significance of the public spending issue, public expenditures on railways are largely unexplored in Europe (Di Foggia and Arrigo, 2016). Analyses of the budgetary implications of introducing on-track competition are not common at all. When on-track competition is introduced, it is assumed that the removal of subsidies and provision of railway operations at commercial risk will have a positive budgetary impact. This simple assumption is complicated by the fact that cherry-picking may take place when on-track competition is introduced, and, together with state-imposed compensation for commercial operating companies, there is a much more complicated view of the impact of on-track competition on budget spending and its effectiveness.

The aim of this paper is to assess budgetary impacts and the development of public spending efficiency in the context of on-track competition in the Czech Republic. Impacts on public budgets are focused exclusively on two categories of expenditures for railway operations – subsidies for provable losses and compensation for state-imposed discounts – and we abstract away from the revenue side. In dealing with the aim of the paper, we use a *public spending efficiency* indicator that is measured by the ratio of public expenditures to rail transport performance.

Within the aim of the paper, we will focus on two main questions:

- What was the impact of an increase in the number of passengers caused by on-track competition, including passengers entitled to state-imposed discounts, on public funds?
- How has the on-track competition introduced into the long-distance railway operation segment affected public spending efficiency?

This paper is structured as follows. In Section 2, we review the relevant literature on both on-track competition effects and budgetary issues concerning passenger railway operations. Next, in Section 3, we present a methodological approach that represents the basis for answering the question of the budgetary impacts of introducing on-track competition. In Section 4, we focus on the organisation and characteristics of long-distance passenger transport in the Czech Republic and selected aspects of its funding. Section 5 provides an overview of long-distance passenger railway performance and a budgetary impact assessment based on the established indicators. And finally, Section 6 summarises the obtained results, discusses conclusions, and identifies potential directions for further research.

## 2. Literature review

In connection with reforms of the European railway market, the introduction of competition to passenger rail transport, and pressures to solve the issue of public funding of railways, there are a variety of studies, both theoretical and empirical, that can be considered.

For a long time, it was true that there was very little experience with on-track competition. The smaller extent of on-track competition on rails was, among other factors, given by the risk of cherry-picking practices (e.g., in Great Britain), which may be applied by potential competitors entering only the most lucrative markets. This practice may lead to: a) an increase in debt for or subsidies to the incumbent, or b) a cut in unprofitable services (Beria et al., 2012). The situation has changed significantly with the development of this kind of competition in passenger railway transport in a few European countries in recent years. What, therefore, are the impacts of introducing on-track competition into passenger rail transport? As Crozet (2016) stated, there is not an easy answer to this question. Simultaneously, so far there have been only limited studies on the impacts of competition showing a mixed picture as to possible effects (UNECE, 2017).

The initial literature assessing the impacts of on-track competition was built on simulation models. Preston et al. (1999) answered the question of the desirability of on-track competition in the British passenger rail industry. They were the first to use a PRAISE simulation model to assess the desirability of more or less competition on the Ipswich–London route. Then, Johnson and Nash (2012) presented the results of simulating the effects of introducing on-track competition to a long-distance international rail passenger route coexisting with strong domestic high-speed services. They pondered the effects, including benefits to customers (specifically, fares and services), the profitability of the incumbent, and the revenues of the entrant, also using a PRAISE model. A similar paper by Mancuso (2014) offered a simulation based on the discrete choice model with limited data on the Milan–Rome route, with their analysis taking into account the market shares of both incumbents and newcomers, consumer surplus, and environmental costs. In addition, Álvarez-SanJaime et al. (2016) developed an ex-ante analysis of the introduction of on-track competition in Spain based on a simulation and identified the socio-economic conditions under which a newcomer's entry would be viable. Finally, Broman and Eliasson (2017) focused on market dynamics in an on-track competitive market and studied duopoly behaviour through simulations. Their conclusions predicated total welfare and the conditions necessary to achieve a total welfare surplus.

The first real effects of on-track competition were dealt with in Nash et al. (2011), but there had only been marginal entries into niche markets, especially in Sweden and Germany, at the time. Alexandersson and Hultén (2009) analysed the deregulation process in Sweden in view of the problem of how to dismantle the incumbent's remaining profitable services and how to reorganise the sector into a unified market structure.

Some studies have addressed directly and in detail the question of the impact on prices and the pricing policy pursued by both incumbents and newcomers in terms of on-track competition. Bergantino et al. (2015) was one such work that empirically explored the development of prices (in both intra-modal and inter-modal competition) and the effects on capacity in Italy. The Italian case is the most elaborate example that deals with price effects. The study by Beria et al. (2016) confirms this statement because it is a very detailed study on price reactions by the incumbent after a new entry and generally the price strategies of the two operators. Regarding the Swedish case, Vigren (2017) investigated what effects the on-track entry had on market prices using ticket price data from the operators' websites. A study by Cascetta and Coppola (2014) had a wider focus, concentrating on price effects and also supply and demand. Their analysis was based on legal regulations; the operators' business plans, timetables, and prices; and surveys and interviews. In addition to exploring past data, they forecasted the mentioned indicators.

Other studies have addressed effects influencing the supply side. Fröidh and Nelldal (2015) analysed the effects of market opening on the supply of long-distance services in Sweden. Their aim was to answer the question of the extent to which the new services competed with the incumbent's services and how this affected the incumbent's supply. Related to the supply side, the issue of sector concentration has appeared and been studied (e.g. in the comparative UNECE, 2017). Demand-side effects have been monitored independently as well. The Italian case is discussed in Beria and Grimaldi (2016), who following their previous work applied a cost-benefit analysis and extrapolated to reach conclusions on customer benefits. In addition, Fröidh and Byström (2015) examined customer preferences in Swedish passenger transport. Their research was grounded in a stated choice study together with a multinomial logit model and they investigated how preferences differed among different categories of customers. The feasibility of on-track competition in Great Britain was addressed in CMA (2016), which opened this question aiming at evidence for the potential passenger benefits and efficiency gains for train operators.

As regards the examination of competition in the Czech case, a paper by Tomeš et al. (2014) was the first comprehensive survey of competition on the Czech rail passenger market. This paper focused on both the long-distance and regional railway passenger markets and their organisation. Subsequently,

Tomeš et al. (2016) analysed the market impacts of on-track competition in the Czech Republic between 2011 and 2014 focusing on market categories – price, product, and marketing strategy.

An interesting picture has been suggested in comparative studies, even if it is very complicated to generalise any national experience. Bergantino (2015) studied market changes in the EU and derived factors determining the penetration rate of newcomers and their form (whether they are subsidiaries of existing national operators, owned by other operators, or private without any experience in the transport sector). Next, she focused on a review of the evidence within the EU concentrating on the form of input, the quality of rolling stock, and services. In addition, Perennes (2017) evaluated the potential consequences of on-track competition at the European level based on the consequences of on-track competition in the seven forerunner countries. The output of this paper was a summary of the standard profiles and financial strategies of new entrants. A comparison in the wider context of Central European countries was provided by Tomeš and Jandová (2018). They compared the impacts of on-track entries on the development of a particular national railway market while covering entry barriers, business models, market developments, and regulatory challenges.

The academic literature on industry-efficiency effects in the case of railways is scarce (Casullo, 2016), and in the case of on-track competition completely marginal, despite its importance. It is important to keep in mind that there are different levels of efficiency. Jensen and Stelling (2007) focused on the development of Swedish railways and explored whether and how deregulation has affected *cost efficiency* with an analysis based on a longitudinal econometric approach. Another study dealing with the issue of efficiency was conducted by Driessen et al. (2006), who explored the link between the form of competition and *productive efficiency* in the railway industry using data envelopment analysis in order to construct productive efficiency scores. A very inspiring paper was Desmaris (2014) who focused on the Swiss reform of railway passenger market and also answered the question what results for public finances have been obtained, measured by *public fund use efficiency*. In addition, Casullo (2016) attempted to measure the *operational efficiency* impact of on-track passenger operations measured in terms of operating expenses per train-kilometre (train-km) using a difference-in-difference estimator for the study group of Austria, the Czech Republic, and Italy compared to a group of similar rail networks.

In CMA (2016), the question of the way in which on-rail competition may threaten government funds was also marginally processed in the context of the expansion of on-track competition on the British passenger railway market. The study claimed that greater on-rail competition could result in an increase in the level of government subsidies required.<sup>2</sup> On the other hand, it is necessary to bear in mind the very special nature of the British railway sector, which is organised on the franchise principle, which is very different from the Czech case.

If we now look at literature dealing with public expenditures on rail services, two groups of studies appear. One group is descriptive studies with the aim of conducting a large international comparison, possibly finding a trend and its determinants, and the other is studies evaluating the impact of state aid on the railway industry or efficiency.

The large number of descriptive studies is due to the complexity of the possibilities of exploring the issue and the lack of relevant data. The NERA (2004) study is usually considered one of the first, most important, and most detailed studies on public funding of European railways. This study reflected the EU obligation from the 1996 White Paper<sup>3</sup> to report on the progress made by EU countries in regularly decreasing the debt and improving the finances of the railway sector. Obviously, their conclusions were based on the period when the railway reforms had just begun and when almost all of the countries in the EU had passenger services funded by contract and very few services operating outside of the

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<sup>2</sup>An expansion of on-track competition may reduce franchised operators' revenues, which requires an increase in governmental funding or lowers governmental revenues from franchises (CMA, 2016).

<sup>3</sup>Meaning the 1996 White Paper: A Strategy for Revitalising the Community's Railways.

framework of public service obligations (PSOs). The study pointed out the significance of large hidden support for railways that had been persisting (NERA, 2004). Afterwards, Schäfer and Götz (2018) updated and expanded the NERA (2004) database on public contributions to railways and identified two main models for public funding in connection with the amount of access charges and operating contributions paid.

The issue of how to estimate the actual value of subsidies that go to the transport sector was dealt with in a European Environment Agency (2007) report as well, with summarised data on the size, structure, and distribution of transport subsidies in Europe. Later, a paper by Beria et al. (2012) within research into railway regulation and liberalisation in four EU countries (Italy, France, Germany, and Spain) focused marginally on PSO funding. In terms of scope and focus on estimating subsidies directly and exclusively to European railway operators, there have been more significant studies (e.g. Arrigo and Di Foggia, 2013; Di Foggia and Arrigo, 2016). This research supplemented the significant lack of information and enabled a comparison of government spending on railways in three large EU countries (Italy, France, and Great Britain; see Di Foggia and Arrigo, 2016).

Evaluation studies have generally considered ambiguous effects on efficiency from state support aiming at railways. As Pietrantonio and Pelkmans (2004) stated, state aid can induce an improvement in efficiency, but when the intensity of state aid is too high, it could lower productive efficiency. Studies evaluating the appropriateness of public support for railways have been carried out for a few EU countries – e.g. Hungary (Táncos and Besseneyi, 2005), Great Britain (McNulty, 2011), and Italy (Arrigo and Di Foggia, 2014).

A study by Táncos and Besseneyi (2005) evaluated the efficiency of government contributions in the railway sector in Hungary using a benchmarking method (with German railways as the benchmark). Another study based on a benchmarking method was McNulty (2011), which focused on general factors determining the cost of railways in Great Britain and set recommendations for how to improve efficiency and value for money for rail in Great Britain. This study used a benchmarking method when comparing British rail with French, Netherlands, Swedish, and Switzerland railways. A paper by Arrigo and Di Foggia (2014) devoted to the assessment of public support for railways in the case of Italy was methodologically based on a benchmarking method. They focused on summarising the total amount of public subsidies paid to the railway sector over the last quarter of a century in five major European countries (Italy, Great Britain, Germany, France, and Sweden). Their main objective was to evaluate the appropriateness of public support paid in Italy compared to that in the other selected European countries.

A multi-country comparative study was performed by van de Velde et al. (2012), who also investigated the question of value for money for state budgets in a sample of five countries (France, Germany, Great Britain, the Netherlands, and Switzerland), where funding included all state contributions to the railway system (operating subsidies, investment grants, pensions, and health insurance costs and net of dividends to the state). It was a very rough assessment based on generalised data for both passenger and freight transport. The authors concluded that there was no clear overall trend visible in the development of state funding and that a more detailed analysis was needed.

As can be seen from the above, i) studies on on-track competition have not dealt with the question of the budget effects of on-track competition on the passenger railway market, and ii) research on public spending in the railway sector has not taken into account systematically and in detail the presumption of on-track competition. Thus, the goal of this paper is to fill in the gap and answer the following question: What have been the budgetary impacts of introducing on-track competition in the Czech Republic?

### 3. Methodology

Considering the aim of the paper, we had to choose an adequate measure to calculate the effect. Together with Di Foggia and Arrigo (2016), who claimed that data on EU railway funding suffer from some limitations, we encountered some limitations in data availability that hindered a direct calculation of the impacts of introducing on-track competition to the long-distance passenger market in the Czech Republic. These limitations included: i) missing data for some years as a result of missing notifications from EU countries, and ii) the fact that the published data do not disaggregate kinds of support (Di Foggia and Arrigo, 2016). These constraints were a major barrier for selecting an appropriate indicator to calculate the impacts on public resources and the efficiency of their use.

A calculation which included performance indicators in passenger-kilometres for separate long-distance rail transport categories (non-commercial in PSO contracts vs. commercial in on-track competition) would be the most illustrative and would most accurately describe the indicators for the market situation. Unfortunately, the incumbent operating company does not provide this data for each detailed category of transport services (regional PSOs, long-distance PSOs, and commercial transport) and for individual routes not at all. The unavailability of suitable data is largely due to fierce competition that makes detailed data more sensitive and makes operating companies protect the data as a trade secret. In addition, the incumbent has been facing an investigation by the European Commission regarding abuse of its dominant position and the availability of data is therefore even more limited.<sup>4</sup> In addition, there is no way to estimate or derive performance in passenger-kilometres for individual routes reliably (especially not retrospectively).

For this reason, we used performance measured in train-km to calculate the efficiency of public funds spent. This indicator is considered sufficient because it is a widely used measure of efficiency. Casullo (2016) claimed, for example, that operating expenses per train-km is a critical indicator for rail efficiency because it measures the level of financial inputs required per train. It is clear that the higher this indicator is for a given railway, the more that railway must invest for each train-km, and, simultaneously, a higher number compared to a peer group is indicative of relative inefficiency (Casullo, 2016). In our case, we measured the efficiency of spent budgetary funds, which in the case of PSO services shows at the same time the amount of provable loss per kilometre, but the principle remains the same.<sup>5</sup>

In our calculations, we relied less on aggregated data from “global” EU sources (EU railway reports), and instead most of the data used originated in national sources (e.g. the annual reports of individual operators, the Ministry of Transport, and the infrastructure manager SŽDC). Data on compensation for state-imposed discounts are publicly available from the Ministry of Transport website and in the annual reports of individual operating companies. The amount of compensation for provable losses for the provision of long-distance rail transport under a PSO for the incumbent is available from the incumbent’s annual reports. We recalculated the data at constant prices for 2010 based on year-on-year CPI inflation to capture real trends.

The performance of private operators on long-distance routes was recalculated from the infrastructure manager’s annual reports. The number of ordered train-km for the incumbent under a PSO can be traced back in annexes to the 10-year framework contract from 2010 between the Ministry of Transport and the incumbent (Ministry of Transport, 2010).<sup>6</sup>

The number of ordered train-km is given for each one-year timetable, which begins in December every year. We recalculated it for calendar years in order to carry out an accurate comparison with other data. The market share measured in the incumbent’s train-km for open access was calculated from the

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<sup>4</sup>For more information on the investigation, see European Commission (2016a).

<sup>5</sup>The calculation of provable loss in the Czech Republic is addressed at Ministry of Transport (2010).

<sup>6</sup>This contract forms the basis for an annually concluded agreement on ordered services.

timetables, but in a simplified manner. First, we assumed that all trains run daily, which is not always the case, and this simplification therefore led to overestimation. Second, the distance from Prague to Ostrava was always included in our calculation, but some trains continued to Bohumín or the border with Poland or Slovakia (leading to an underestimation of the indicator). Overall, it can be assumed that the incumbent's market share was slightly underestimated on the basis of the control calculation according to the same method that was applied to private operators. However, all of these simplifications distort the incumbent's performance for open access only very slightly and do not affect the overall conclusions.

In order to determine the impact of the introduction of competition on the state budget, we built on the development of public payments for long-distance domestic railway transport services. We took into account two types of public payments from the state budget to calculate expenditures: i) a state subsidy for a proven operating loss from long-distance transport services under a PSO, and ii) compensation for state-imposed discounts for commercial services, which is not a traditional subsidy but a budget expense related to the introduction of competition that is able to display the dynamics of the market after the introduction of competition and, at the same time, may become a notable budget item after a competition-led demand increase.

In addition to describing the current state, we were interested in the efficiency of public funds spent depending on performance, which we measured in train-km. We methodologically built on the calculation of the efficiency of the use of budgetary resources by Desmaris (2014) who measured public fund use efficiency by CHF paid by the Swiss government for each train-km. Our concept of efficiency is not efficiency in terms of operational efficiency, which is usually monitored at the company level. The "public spending efficiency" we are monitoring is intended to be the monitoring of the efficiency of the public funds invested and the benefits they gain measured by train-km (due to lack of a more accurate pass-km indicator).

The first indicator was the development of state subsidies per train-km for domestic long-distance passenger rail transport provided by the incumbent under a PSO. The indicator shows the unit loss for long-distance services under a PSO and, at the same time, the efficiency of the public funds spent in this transport category.

$$Efficiency_{PSO} = \frac{\text{public subsidies for long-distance trains} \in PSO}{\text{train-km ordered}} \quad (1)$$

Another indicator of the efficiency of the use of public budgets is the efficiency of budget funds on routes with on-track competition – Efficiency<sub>COMP</sub>. This indicator measures the costs on state-imposed discounts with travelled train-km for on-track competition.

This compensation is the only public funds that an operator under open access obtains. This indicator illustrates the cost of discount policy, and it also shows, with some constraints, the effectiveness of the use of budgetary resources. It also illustrates the dynamics of the development of passenger interest and is a side effect of changes in market demand. It can be expected that a fall in prices that may arise from competition and an increase in the number of passengers eligible for a discount would have a negative effect on the state budget. As demand grows, this indicator will grow. In view of the fact that discounts are calculated from full prices, any potential market consolidation or price increase may lead to an increase in budget entitlements and an increase in this indicator.<sup>7</sup>

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<sup>7</sup> Changes in discount policy interfere with the year-to-year comparability of the data. In the case of the Czech Republic, there was a change in discount policy in September 2018, i.e. outside of the analysed period.

$$Efficiency_{COMP} = \frac{\text{compensation for state-ordered discounts}}{\text{train-km of commercial trains}} \quad (2)$$

In order to calculate the overall impact from the introduction of competition to passenger long-distance railway transport on the spent budgetary resources, the two effects need to be combined. The total impact was measured by the sum of both types of public spending on total train-km in long-distance services. The formula for overall efficiency is as follows:

$$Efficiency_{tot} = \frac{\text{Subsidies for long-distance trains } \in \text{ PSO} + \text{compensation for state-ordered discounts}}{\text{total train-km of long-distance trains}} \quad (3)$$

This indicator shows what the budget costs per 1 train-km of long-distance passenger transport in the Czech Republic are.

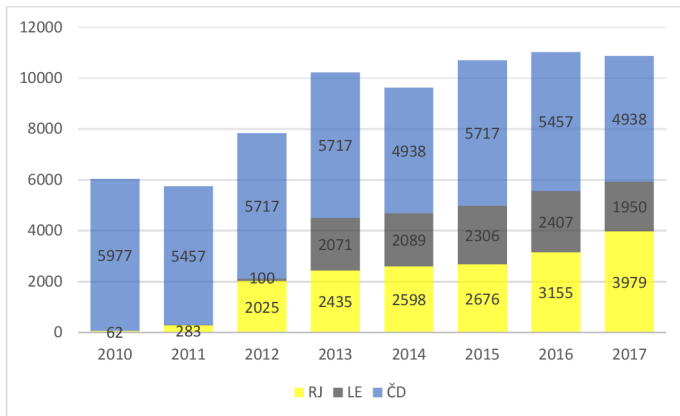
#### 4. The Czech case – market organisation and funding

It is generally considered that long-distance passenger services have some potential for intra-modal competition depending on the scale and density of the market (Pietrantonio and Pelkmans, 2004). At the same time, country conditions for newcomer access to the national networks should be consistent with EU rules, which means guaranteeing access to every licensed operator (Beria, 2010). This has been fully adopted into Czech legislation in Act No. 266/1994 Coll., on Rail Systems. Any licensed operator may, after obtaining a license, operate rail passenger transport services financed solely by revenues from fares, i.e. commercially.

The history of railway liberalisation in the Czech Republic was described in more detail in Tomeš et al. (2014), and we will therefore be very brief. As noted above, the milestone for the railway liberalisation process was 1994 when the act enabling a change in the railway system and ensuring *de jure* the introduction of competition into the railway market came into force. Long-distance railway passenger transport services were not affected by competition until 2011, which means that all services were provided by the incumbent, the state-owned operations company České dráhy (Czech Railways, ČD), and ordered as PSOs with the only exception being the highest category of ČD trains – the SuperCity (SC) Pendolino trains deployed on the busiest Prague–Ostrava line since 2005. In 2011, the market structure changed when the first private operator, RegioJet (RJ), launched on the Prague–Ostrava line, followed by another private newcomer, LEO Express (LE), the following year. In subsequent years, the market was further opened and international routes to Poland, Slovakia, and Austria were added. The evolution of operating performance with on-track competition is captured in Figure 1.

Figure 1: Performance of individual operators with on-track competition (train-km in thousands)





Source: own calculations, data based on the infrastructure manager's annual reports and timetables

Nowadays, a combination of ordered and subsidised non-commercial services (under PSOs) and services provided on a purely commercial basis (in on-track competition) makes up the long-distance rail passenger transport market in the Czech Republic (see Table 1).

Table 1: Long-distance railway services

	<i>The scope of services*</i>	<i>Routes</i>	<i>Operating losses covered</i>	<i>Compensation for discounted tariffs</i>
<i>Commercial</i>	Minority	Prague–Ostrava & a few other trains**	No	Yes
<i>Non-commercial under a PSO</i>	Majority	Rest of the long-distance market	Yes	No***

Source: own elaboration

Note: \* for details, see Table 3; \*\* see Figure 2; \*\*\* they are taken into account in the PSO contract.

The non-commercial services are motivated particularly by social and ecological factors. Simultaneously, in this case, revenues from fares are lower than operating costs, which generates the need to pay for operating losses from this non-commercial public transport. The Ministry of Transport orders most of the long-distance rail transport services as PSOs and then has an obligation to pay any provable loss to an operator. The maximum level for such compensation is set by the Ministry of Transport as agreed with the Ministry of Finance (§ 4, Act No. 194/2010, Coll.). The Ministry of Transport currently chooses operators by direct awarding of services to the state-owned ČD.<sup>8</sup>

In addition to the obligation to cover operating losses, there is another duty – for losses caused by state-imposed fare discounts for defined groups of passengers. It arises from Regulation No.

<sup>8</sup>With a few exceptions and a governmental plan for future competitive tendering for the long-distance segment.

1370/2007 on public passenger transport services by rail and by road.<sup>9</sup> Following this regulation, the Czech government adopted Resolution No. 452 of 7 June 2010 dealing with this kind of compensation. All state-imposed fare discounts are offset by the Ministry of Transport in the case of services performed outside of public service contracts, i.e. commercial services. The state-imposed discounts include discounts for children, students, and disabled people and their attendants (from 2012 until September 2018).<sup>10</sup>

Table 2: State imposed discount in Czech Republic in 2011-2017 (%)

<i>Traveller category</i>	<i>Children up to 6 years</i>	<i>Children 6–15 years</i>	<i>Students 6–15 years</i>	<i>Students 15–26 years</i>	<i>Disabled people (holders of ZTP or ZTP/P card)</i>	<i>Guide of ZTP/P cardholder</i>	<i>Parental visits to institutions</i>
<i>Discount</i>	100%	50%	62.50%	25%	75%	100%	75%

Source: Resolution No. 452 of 7 June 2010

In connection with the above noted, a question arises: How important are commercial services in the long-distance railway segment? As can be seen in Table 3, the share of commercial services measured in train-km has been growing and now accounts for around 25% of total performance in the long-distance passenger railway sector.

Table 3: Shares of service categories (%)

	2011	2012	2013	2014	2015	2016	2017
<i>Commercial</i>	14.10	19.32	24.02	22.96	24.83	25.78	25.10
<i>Non-commercial under a PSO</i>	85.90	80.68	75.98	77.04	75.17	74.22	74.90

Source: own calculations, data based on the infrastructure manager's annual reports and timetables

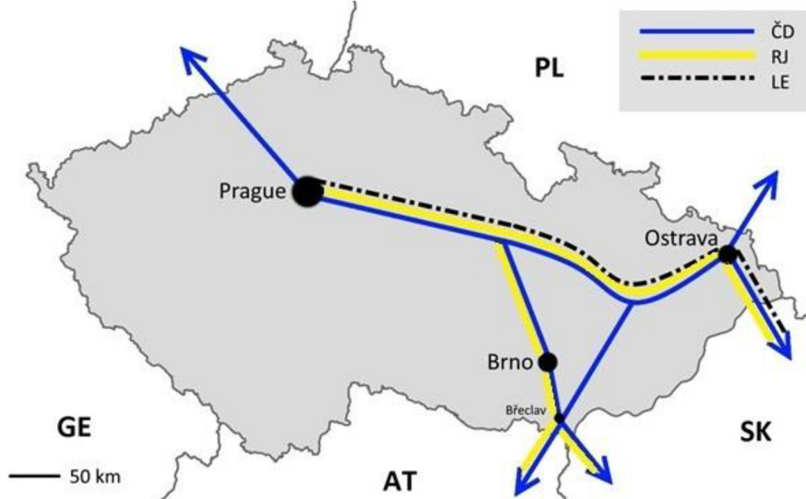
None of the monitored private operators provides PSO services in long-distance passenger rail. The above changes in the share of PSOs in the total performance of long-distance transport are therefore due to the increasing number of ČD connections that go beyond PSOs, and partly due to the changing number of ordered PSO services.

Lines with at least some commercial services are displayed in Figure 2. In addition to the well-known Prague–Ostrava open access line and the Prague–Brno line launched by the private operator RJ in 2016, there are some commercial services provided by the incumbent ČD on the Ostrava–Břeclav line.

<sup>9</sup>In addition to the compensation obligation, this regulation brought greater transparency particularly in the methods and levels of compensation in the case of direct awarding and reduced uncertainty for both the ordering authority and the service provider over legal obligations (Steer Davies Gleave, 2016).

<sup>10</sup>Until the end of 2011, the discount was also imposed for elderly citizens and officials.

Figure 2: Commercial lines in the Czech Republic (as of January 2019)



Source: own elaboration

The long-distance segment of non-commercial trains comprises the various train quality categories of fast (R), express (Ex), InterCity (IC), and EuroCity (EC) trains. Both IC and EC trains were fully subsidised during 2007–2010, while only the highest quality SC Pendolino trains were excluded. The milestone in 2007 was connected with the separation of passenger and freight transport. While passenger transport operated at a loss, freight transport was profitable and cross-financing was taking place, which motivated the incumbent ČD to address the funding and pushed politicians to receive subsidies for higher quality IC and EC trains that were commercial until 2007 as well (Lysoněk, 2007).

In 2010, however, there was another change in the subsidising railway system. Orders from the Ministry of Transport and subsequently subsidies for IC and EC services were limited based on the prerequisite that these high-quality services had to be able to be profitable (Petrák, 2011). All IC and EC trains were to be operated commercially, but only seven pairs of IC/EC trains were taken out of PSO contracts in the first step in December 2010 (ČT24, 2011). The exception concerned EC trains bound by international agreements from Prague to Germany, Austria, and Slovakia (via Vsetín; Petrák, 2011). Simultaneously, the category of most of the trains that operated on the Praha–Ostrava line changed from EC trains to subsidised Ex trains with the new 2010/2011 timetable (ČT24, 2011). Other agreements between the incumbent ČD and the Ministry of Transport led to subsequent growth in the number of commercial connections.

## 5. Assessment of budgetary impacts

Concerning the impact of the introduction of competition in long-distance passenger transport on performance measured in train-km, the introduction of on-track competition definitely reduced PSO performance by about 3 million train-km. The performance of the commercial services increased more, but the development was more variable than in case of PSOs. Generally, the overall impact balance

was clearly positive, especially since 2013, but the year-on-year development of total performance in long-distance rail transport is characterised by both increases and decreases.

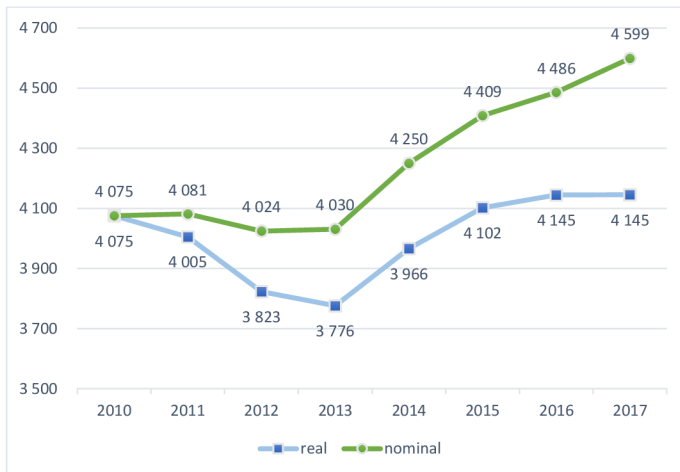
Table 4: Performance of long-distance passenger transport (train-km in thousands)

	2011	2012	2013	2014	2015	2016	2017
<i>Non-commercial under a PSO</i>	35 051	32 749	32 339	32 295	32 394	31 725	32 431
<i>Commercial</i>	5 753	7 842	10 222	9 625	10 700	11 020	10 867
<i>Total</i>	40 804	40 591	42 561	41 920	43 094	42 745	43 298

Source: own calculation, data based on the infrastructure manager’s annual reports and timetables

The assessment of impacts brought some surprising findings. While our expectations suggested that the introduction of competition to the rail would bring about savings for public funds, our findings bring an ambiguous result (see Figure 3).

Figure 3: State compensation for provable losses for long-distance services under PSOs for ČD (CZK in millions)



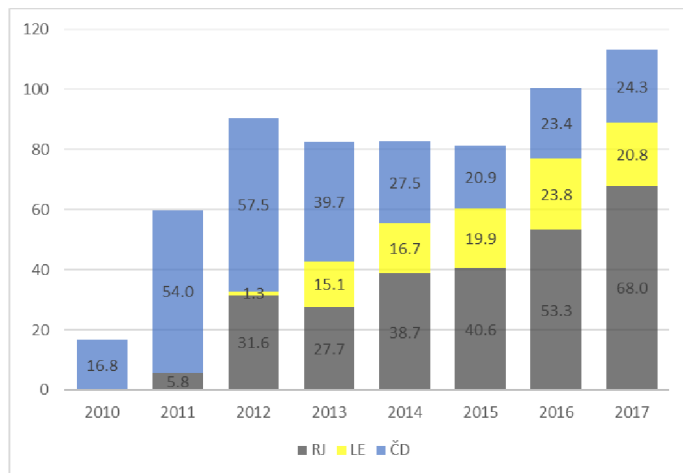
Source: nominal data: ČD annual report, real data: own calculation

Basically, state subsidies for long-distance PSO services were at a standstill in nominal terms up until 2013 and then began to grow quite dynamically. If we recalculate expenditures to fixed prices from 2010, there is a decline in budget subsidies in the first years, but the post-2013 breakthrough is also evident here, and from 2015 onwards, the real subsidies are higher than the 2010 level. Since 2015, there has been an apparent stabilisation in public expenditures on long-distance PSO services (in constant prices).<sup>11</sup>

<sup>11</sup> For comparison, the development of total government expenditures can be find e.g. at <https://tradingeconomics.com/czech-republic/government-spending>.

Another follow-up indicator is the budgetary impact of operators (and trains) operating at commercial risk. Here, we monitor the development of compensation for state-imposed discounts (Figure 4).

Figure 4: Compensation for state-imposed discounts (CZK in millions, 2010 prices)



Source: own calculation, data based on Němec and Petrák (2018)

The introduction of on-track competition has led to a noticeable increase in traffic, especially on the Prague–Ostrava route, where there is no reasonable alternative in road transport due to the lack of a direct highway connection. The growth in passenger demand was also reflected in compensation for state-imposed discounts, and the dynamics of the market are evident from the development of this compensation. A significant increase between 2010 and 2011 was caused by a change in the system of discount compensation, which began to be reimbursed by the Ministry of Transport during 2010. Since 2012, we can see obvious effects from the newcomers, with on the one hand the share of the incumbent ČD noticeably decreasing, and on the other hand, the total volume of compensation dramatically increasing (it almost doubled between 2011 and 2017).

Table 5: Shares of long-distance passenger transport performance and public payments (in %)

Share in performance in train-km	2011	2012	2013	2014	2015	2016	2017
ČD	94.87	72.91	55.93	51.30	53.43	49.53	45.44
RJ	4.92	25.82	23.82	27.00	25.01	28.63	36.61
LE	0.21	1.27	20.25	21.7	21.56	21.84	17.95
Share in discount compensation							
ČD	90.27	63.62	48.14	33.14	25.69	23.31	21.49
RJ	9.73	34.99	33.55	46.74	49.91	53.05	60.11
LE	0.00	1.39	18.31	20.12	24.40	23.64	18.40

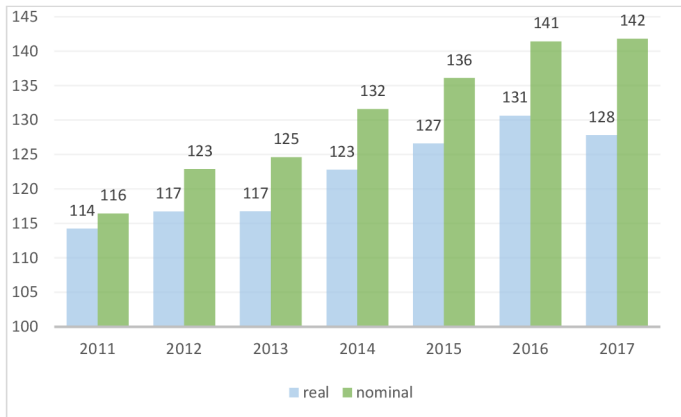
Source: own calculation, data based on the Ministry of Transport, the infrastructure manager's annual reports and timetables

annual reports and timetables

When we focus on the market shares of individual operators, we can conclude that the increase in the number of passengers entitled to a discount is higher than would correspond to the market shares per kilometre in the case of the newcomers. This is particularly noticeable for RJ, which may have been caused by the generally higher occupancy rate of RJ trains, the higher popularity of RJ among discount passengers, or (theoretically) unauthorised travel with discounted RJ passenger tickets.

Regarding the development of the efficiency of public spending on PSO long-distance services ( $\text{Efficiency}_{\text{PSO}}$ ), it is not possible to forecast the impact of extraction of some PSO routes in advance. The introduction of on-track competition may have had both a positive and a negative effect on the efficiency of spent budget payments. If services on some tracks were more unprofitable (budget-demanding) than average, the indicator may be reduced because the exclusion of such services significantly reduces the amount of public subsidies. In the case where relatively slightly unprofitable services are excluded, the indicators may increase as relatively more loss-making services remain. The difficulty of obtaining data on the profitability of individual railway lines in the Czech Republic complicates the estimate, but when the fact that all cases are main routes connecting the largest cities within the Czech Republic is taken into account, it may be assumed that these lines were relatively slightly unprofitable (at least) compared to other subsidised long-distance lines. If this is proved, then  $\text{Efficiency}_{\text{PSO}}$  should grow. These considerations were largely confirmed by the figures and  $\text{Efficiency}_{\text{PSO}}$  in the monitored period increased annually in nominal terms and most years in real terms.

Figure 5: Compensation for provable losses for long-distance PSOs (CZK per train-km)



Source: own calculation, data based on the Ministry of Transport (2010)

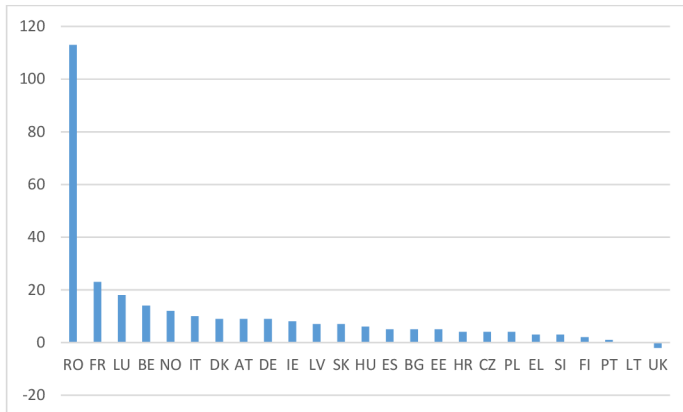
As shown above in Figure 5, three distinct periods can be seen in the development of  $\text{Efficiency}_{\text{PSO}}$ . First, the period of 2011–2013 is characterised by stable development, which means that the primary effect of the introduction of competition did not imply a change in the efficiency of budget subsidies (Figure 5) and the decrease in the number of services (Table 4) under PSOs was accompanied by a percentage decrease in budget subsidies (especially if we focus on the figures in constant prices – see Figure 3). Second, the period of 2013–2016 is distinctive in a gradual increase in the indicator, in both constant and current prices. This development is consistent with increasing subsidies to compensate for provable losses, when the loss of PSO services increased with a more-or-less constant (in 2016,

even decreasing) extent of ordered PSO services and the effectiveness of budget subsidies declined. The year 2017 could suggest some signals of stabilisation.

The growing real spending per train-km in PSO long-distance services after the introduction of on-track competition can be interpreted as indirect evidence of cherry-picking. It can be reasonably assumed that newcomers enter a market that is commercially lucrative. Losses for the incumbent due to the loss of revenues from the busiest routes then leads to an increase in overall losses and thus to an increase in the compensation required. A second, purely hypothetical, justification may be a decline in interest in long-distance PSO services, which would increase their likelihood of leading to losses. Any increase in traffic recorded in recent years in the Czech Republic would be caused by growth in demand on commercial lines (and possibly in regional transport). Another potential explanation would be that the increase in rail costs would be higher than overall inflation. The last, again hypothetical, justification could be the government's attempt to compensate the incumbent for losses caused by the introduction of on-track competition. There is no way how to confirm or disprove any of these hypotheses. The exact verification is unfortunately prevented by the unavailability of detailed data, internal documents and recordings of meetings.

An international comparison is also worth attention. Long-distance PSO payments in Czech Republic oscillated nominally between EUR 4.73 and EUR 5.38 per train-km throughout the monitored period, and these values are below the EU average (see Figure 6).<sup>12</sup>

Figure 6: PSO compensation (EUR per train-km, 2014)



Source: European Commission (2016b)

As the development of  $Efficiency_{PSO}$  has already shown, on-track competition had a rather negative impact on public PSO expenditures. On the other hand, the introduction of on-track competition increased the performance of long-distance rail transport and led to savings in public funds paid via PSO contracts given that only compensation for state-imposed rebates is paid to operators providing commercial services.

<sup>12</sup>If we also include regional transport in the calculation, the value would even be about half a euro lower.

Table 6: Discount compensation of on-track competition (CZK per train-km)

	2011	2012	2013	2014	2015	2016	2017
<i>Efficiency<sub>COMP</sub> (real prices)</i>	1.71	2.76	2.55	2.57	2.51	3.18	3.54

Source: own calculation, data based on the infrastructure manager's annual reports, the Ministry of Transport, and timetables

As Table 6 shows, compensation for state-imposed discounts showed relatively dynamic growth over the monitored period, more than doubling in constant prices, yet remaining less than 1/50th of the compensation for losses for PSOs in 2017. It means, budget cost of running the PSO service is 50 times more expensive than the service under the on-track competition. The budget demands of open access service (per train-km) were significantly lower and reached values equivalent to EUR 0.1, with the peak in 2017. When we combine the two indicators, we can see the overall impact from the on-track competition on the budget spending (see Table 7).

Table 7: Total efficiency of budget expenditures on long-distance services (CZK per train-km, 2010 prices)

	2011	2012	2013	2014	2015	2016	2017
<i>Efficiency<sub>TOT</sub> (real prices)</i>	100	96	91	97	97	99	98

Source: own calculation

The total efficiency of budget expenditures for long-distance passenger rail transport stagnated for most of the monitored period. The exception was 2013, which is characterised by the lowest PSO subsidies and simultaneously performance at a level close to the maximum within the monitored period. Generally, the introduction of on-track competition did not have a significant impact on the efficiency of budgetary spending. The positive impact generated by the increased transport performance and on-track competition savings was offset by growth in spending on the remaining PSO long-distance services. The budget cost per km of long-distance service remained close to 100 CZK per train-km over the entire monitored period, and numbers close to this value are also typical for regional transport in the Czech Republic.

## 6. Discussion and conclusions

The introduction of competition on long-distance railways had various goals. A reduction in prices for passengers, an increase in quality, and an increase in the availability of services were expected. These effects have actually come to pass and have been documented to different degrees, in both the Czech Republic and other European countries. Assumptions from the introduction of on-track competition are usually identical in the issue of competition-led productive and commercial efficiency. The question of whether greater operational efficiency would lead to greater public spending efficiency over the entire passenger transport sector had been neglected by most authors, or addressed only regarding competition for the market. Our approach is different in the respect that we focused on the impacts on the entire segment of long-distance rail passenger transport, regardless of the category of transport services (whether commercial or non-commercial).

There are two effects related to the development of the overall impact of the introduction of on-track competition on budget expenditures and their effectiveness. The first effect is the increase in public



spending for long-distance trains that remained under PSOs and the deepening loss per train-kilometre after 2013. The second effect is the increase in performance of commercial, on-track competition, services and minimal, although slightly increasing, compensation for state-imposed discounts compared to PSO payments. By combining these effects together, we conclude that the introduction of on-track competition has not changed overall public spending efficiency in the long-distance passenger rail transport segment, since budgetary expenditures for long-distance PSO services have increased and their efficiency has fallen, but, in contrast, the efficiency of public spending on commercial services has improved due to generally low budgetary cost of discount compensation and simultaneous increase in transport performance. Consequently, the two effects have been offset and budget spending has remained virtually unchanged.

Next, we claim that the introduction of on-track competition has not changed public spending efficiency per train-km in the long-distance rail transport sector. The question of conclusions based on an analysis of performance in passenger-kilometres still remains open. In view of the increasing demand for rail transport services, we may assume that the subsidy per passenger-kilometre would gradually decrease over time, but we have only weak evidence that relies on performance in all transport service categories and across the entire network. There are no publicly available data for more detailed calculations.

The data show that the introduction of on-track competition causes an increase in demand for rail transport. This positive effect, however, increased budget demands on the state as a result of compensation for state-imposed rebates, even if only to a relatively small extent during the monitored period. This effect was only a few percents of the PSO subsidies, but it needs to be taken into account.

Using a difference-in-difference estimator, Casullo (2016) concluded that on-track competition has brought major efficiency improvements across the rail systems affected, which corresponds to our finding about the public spending efficiency impacts on long-distance passenger railway services. It seems that the impacts of on-track competition are in qualitative indicators and price competition rather than in efficiency indicators.

Simultaneously, there is evidence of cherry-picking practices performed in the Czech on-track competition segment. This problem has been solved, for example, in Great Britain, where open access is constrained to services that are not currently available for fear of cherry-picking of existing services (NERA, 2004). In contrast, the on-track competition was introduced on the most lucrative routes in the Czech Republic, and it is most likely that one of the explanations for the increase in budget expenditures with unchanged efficiency is cherry-picking by the newcomers.

Many new questions have arisen, one of the most important of which is the question of what is behind the rise in budget spending – whether the increase in public subsidies is the result of real, provable increases in operating costs under PSOs, the result of a decline in revenue from PSO service fares, and/or a hidden effort to compensate the incumbent ČD for a loss of revenues from the most lucrative routes. However, it is almost impossible to answer this question without access to detailed operational data.

Future research providing comparisons of impacts across a group of more countries with different approaches to implementing on-track competition would be worthwhile in order to obtain a more detailed view of the issue and more accurate conclusions. These comparisons would then either support our findings, and show their relatively general validity, or prove that our conclusions are country-specific, which is not an unusual matter in the case of railways.

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