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**BACHELOR THESIS**

**Efficiency of Public Procurement in Transport  
Infrastructure**

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## Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

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Prague, May 14, 2014

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Dalibor Pátek

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## Abstract

The aim of this paper is to evaluate impact of European Union membership and selected institutions on efficiency of public procurement in road and railroad infrastructure. We asses both output efficiency (growth of road and railroad network in relation to investments) and purposefulness of funds expended (by experience reported by its business users).

We also focus on distribution of funds between maintenance expenditures and investments and influence of accession to European Union on this ratio and try to determine efficient level of maintenance expenditures per kilometer of network.

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## Abstrakt

Cílem této práce je zhodnotit vliv členství v Evropské unii a vybraných institucí na efektivitu veřejných zakázek v silniční a železniční infrastruktuře. Zhodnotíme jak výstupovou efektivitu (růst silniční a železniční sítě vzhledem k investicím) a účelnost vynaložených prostředků (dle hodnocení uvedeného podnikateli). Také se zaměříme na rozdělení prostředků mezi údržbu a investice and vliv vstupu do Evropské unie na tento a pokusíme se určit optimální úroveň výdajů na údržbu na kilometr.

<b>Klasifikace</b>	F12, F21, F23, H25, H71, H87
<b>Klíčová slova</b>	veřejné, zakázky, dopravní, infrastruktura, Evropská, unie, instituce, údržba, investice
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# Acronyms

<b>CEECs</b>	Central and Eastern European countries
<b>CPB</b>	Central purchasing body
<b>EU</b>	European Union
<b>EBRD</b>	European Bank for Reconstruction and Development
<b>GCI</b>	Global Competitiveness Report
<b>IRF</b>	International Road Federation
<b>ITF</b>	International Transport Forum
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PP</b>	Public Procurement
<b>RA</b>	Road Administration
<b>RS</b>	Review System
<b>SAI</b>	Supreme Audit Institution
<b>WB</b>	World Bank
<b>WBD</b>	World Bank Databank
<b>WECs</b>	Western European countries
<b>WEF</b>	World Economic Forum

# Bachelor Thesis Proposal

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**Proposed topic** Efficiency of Public Procurement in Transport Infrastructure

## Motivation

According to European Commission study (2012) infrastructure is one of three most problematic sectors with respect to public procurement and the biggest sector in terms of volume of money spend. Also a lot of studies showed its importance for performance of private sector and the whole economy.

Three quarters of the value of procurement advertised in accordance with EU rules is for construction work and services, therefore there should be an impact of EU rules on large projects in transport infrastructure.

Besides output efficiency, purposefulness (social benefits) of public projects is also important. Only if they comply with both output efficiency and usefulness, they are economically rational.

## Hypotheses

- 1) Accession to European Union caused increase of investments and decrease of maintenance expenses in transport infrastructure in Central European and Eastern European countries
- 2) Application of European law on public procurement increase output efficiency (with a slight delay), mainly in new member countries
- 3) Investments in transport infrastructure do not result in better transport infrastructure if they are not accompanied with adequate maintenance expenditures.
- 4) In former Western bloc countries public procurement is awarded more purposefully

## Core bibliography

Erridge, A., Fee, R., McIlroy, J. (2001): Best practice procurement: public and private sector perspectives

Kelman, S. (1990): Procurement and public management: the fear of discretion and quality of government performance

Nemec, J., Ochrana, F., Pavel, J., Šagát, V. (2010): Kontrola ve veřejné správě

Marek, D. (2007): Příprava a řízení projektů strukturálních fondů Evropské unie  
Novela zákona o veřejných zakázkách č. 55/2012 Sb.  
Ochrana, F. (2003): Veřejná volba a řízení veřejných výdajů  
Zákon č. 137/2006 Sb. o veřejných zakázkách

# 1 Introduction

In recent years public finances in most of the European countries are struck by debt crisis. Politicians and economists are looking for savings in each possible area. Public procurement (accounts for 12.8% of GDP or 29% of total general government expenditure on average across OECD members) certainly offers scope for savings (OECD 2013b). The biggest sector by volume of funds is infrastructure. The danger of austerity policy if applied in the field of infrastructure and particularly transport infrastructure is that it could hamper economic growth with the possibility of losses outweighing savings (Égert 2009). Infrastructure has often been seen as enhancing competition, increasing productivity and attracting business activity by lowering transport and production costs and facilitating market access. Some of these effects cancel out on the aggregate level, given that infrastructure has to be paid for (Égert 2009). There are a plenty of papers with focus on evaluation of infrastructure impact on economic growth (Achauer 1989, Esfahani 2003). Works in this field typically revealed widely varying evidence.

Berndt & Hansson (1991) for example tried to measure contribution of public infrastructure capital on private sector output in Sweden. They tried to compute amount of public infrastructure capital that would rationalize the cost saving incurred by private business. The drawback mentioned in work of Berndt & Hansson is that it is quite hard to assess value of public infrastructure capital (also the effects of infrastructure on output on the aggregate level may still differ from the effects of total capital because of externalities). If there is an optimal amount of infrastructure, there must be also optimal level of expenditures on infrastructure. And this level is likely to vary with efficiency of public procurement and institutions involved. Thus public procurement efficiency is one of determinants of how much funds should be allocated into infrastructure. This could be a reason why works based on comparison of expenditures on infrastructure and benefits differ in their conclusions.

The objective of this thesis is to assess output efficiency and purposefulness (usage of resources in compliance with public interest – creating extensive and efficient transport network) of the use of expenditures in transport infrastructure as it is emphasised to have a vital role in economic and social development (OECD 2013). We focus on road and railroad network as data for road and railroad infrastructure are the most comprehensive while data on sea port and airport spending are less detailed

in coverage and definition. With increasingly limited resources in recent years it is essential to ensure that an amount of resources will be used most effectively in connection with good governance. We evaluate the impact of European Union membership and selected institutions on development of roads and railroad network. We also address problem of balance between investment and maintenance expenditures as there might be a tendency to underestimate funding of maintenance because of subventions from European Funds on investment and fact that routine road maintenance projects are not eligible for EU funding within the EU (Sigurbjörnsdóttir 2010). Composition of expenditures on transport infrastructure seems to be significantly affected in recent years in new member states of European Union.

The thesis is structured as follows: in Chapter 2 it gives brief summary of theory behind efficiency in public procurement, description of selected institutions involved in procurement process, European Union regulations concerning procurement in transport infrastructure and other factors influencing public procurement which are not included in our data. Chapter 3 describes data sources and needed requisite rectification of them. In Chapter we 4 focus on impact of institutions and EU membership on enlargement of roads and railroad network (output efficiency) while objective of Chapter 5 is to assess purposefulness using quality ratings from Global Competitiveness report and influence of distribution of funds between investments and maintenance expenditures. Chapter 6 summarizes our findings.

## 2 Public Procurement and Institutions

### 2.1 Efficiency in Public Procurement

The first step in the public procurement process should be to identify requirements. All procurement requirements begin with the perception of a need. The need to connect two settlements could create a requirement to build a railroad, a road or other type of transportation system. The need (public interest) is the subject of public choice and is defined as intersection between the interests of individuals. Public choice itself is carried on the political market where it is influenced by public, politicians and also various interest groups (Ochrana 2003). Once the requirement is clearly stated the supplier selection procedure of supplier follows. The quality of supplier selection procedure determines outcomes (value for money).

Monitoring of public expenditures have two basic forms - control of expenditures and monitoring of results and performance. Control of public expenditures consists of financial, accounting and legal control. It is designed to control if use of resources is in accordance with the intention and if expenditure processes are in compliance with legal standards and regulations. Monitoring of results and performance is also called "performance audit". It monitors efficiency and purposefulness of resources spent through checking selected indicators of performance and focus on both qualitative and quantitative measures. Quantitative aspect includes costs of inputs and cost efficiency (cost per unit of output). Qualitative aspect consists of quality of concrete public good and is measured by satisfaction of majority of citizens (Ochrana 2003).

There are two basic types of measures in performance audit. Direct measures are measured at the input and output, indirect measures in the form of shadow prices. The basis of efficiency measurement is monitoring productivity of output realized from inputs. One of the simplest indicators measured at output is indicator of cost efficiency. The cost per unit of output is usually a good indicator, but there is often a problem of comparability of output and calculation of costs. The cost efficiency indicator puts more emphasis on inputs. We can use this indicator only if the outputs are at least approximately homogeneous (Ochrana 2003).

An important indicator of performance is purposefulness. Purposefulness measures level of fulfillment of objectives (needs). After realization we ex post determine how

much measures taken fulfills previously identified needs. Purposefulness is a higher criterion in performance audit, because some processes could be effective in terms of output, but this output may not lead to fulfilment of objectives. One way to assess purposefulness is vetting by the demand – evaluation of quality of public goods provided by users (citizens) (Ochrana 2003).

## 2.2 Institutions Involved in Public Procurement Process

**Supreme Audit Institutions (or Autonomous Audit Institutions, SAI)** have important tasks in procurement, both on ex ante and ex post basis. They evaluate weaknesses and strengths in execution of public procurement operations at the level of contracting authorities. Their audits aims to find out extent of compliance with laws and regulations as well as the performance related to objectives and targets. In some countries these competencies are split between two bodies. One promotes economic efficiency and the other compliance with laws (Santiso 2005).

While SAIs do not have a direct impact on fiscal performance (budget deficits, volatility or out-turns), they influence fiscal governance and institutional quality, in particular corruption control, bureaucratic efficiency and budget transparency. The paradox of independence is that while AAAs ought to be sufficiently autonomous to act independently as oversight agencies, they must also develop effective functional relations with the institutions of accountability, the legislature, the judiciary and civil society (Santiso 2005). According to Olken (2005) SAI auditing has significant positive impact on reducing resources misuse in infrastructure projects.

Of course, there are differences in level off independence (for example type of appointment procedure of SAI members), but it is beyond the scope of this paper to evaluate such a differences.

**Central Purchasing Bodies (CPB)** are established to exercise procurement jointly for some group of contracting authorities.

EC Directive 2004/18/EC (Public Sector Directive, PSD) includes specific provisions on central purchasing bodies which make it explicitly possible for member states to enact or maintain provisions in respect of central purchasing bodies in their national procurement legislation. CPB is defined in PS as a contracting authority acquiring supplies or services intended for one or more contracting authorities ou awarding public contracts for works, supplies or services intended for one or more contracting authorities or concluding framework agreements for works, supplies or services intended for one or more contracting authorities. It is not mandatory to establish CPB, but an option given to member states (Sigma 2011).

One of the main features of CPB is that it is by definition fully responsible for execution of procurement. Other bodies than CPB can act as agents for contracting authorities, but in that case contracting authorities bear responsibility (OGC 2008).

One rationale behind establishing CPB might be to maintain the same standards across contracts. Also fragmented procurement system means smaller contracting authorities and small contracting authorities often don't have specialized procurement bodies (Sigma 2011). 38 per cent of OECD governments have taken steps in recent years to centralise their procurement function (OECD 2013b).

In case of transport infrastructure, Road Administrations and Railroad Administration act as CPB equivalents. Most governments have usually established a separate agency or administration to manage each subsector, such as roads, railway, ports, and airports. The key element to establishing the institutional structure is the need to improve the efficiency of management and financing of transport infrastructure. In most of the countries, the Ministry of Transport remains responsible for the overall transport policy and for putting in place checks and balances for good governance and the management of fiscal risk (Queiroz 2010).

Railroad infrastructure is unanimously managed by single body in all countries in Europe. The only exception in past 20 years was privatization of railroad infrastructure in United Kingdom between 1994 and 2003. It ended by deterioration of infrastructure and nationalization of railways. Road networks in some countries are traditionally managed through roads departments embedded within several layers of administrative bureaucracy inside a large Ministry of Transport. These arrangements date back to the time when roads accounted for a small proportion of the Ministry's total spending program. However, spending on roads has grown enormously, now typically absorbing 5—10 percent of the government's recurrent budget and 10—20 percent of the development budget. Despite their large asset values and high annual turnover (particularly with maintenance fully funded), roads in some countries are still administered like a small government department. In larger countries Road Administration tend to be more decentralized while smaller countries such as Slovenia and the Slovak Republic are very centralized (Queiroz 2010).

One example of experimental administration system is New Zealand with the distribution of responsibilities by function between several institutions to manage the country's road system. For about a decade, New Zealand had two separate agencies, one to manage roads and the other to provide the funds. As of August 1, 2008, the two agencies were merged (Queiroz 2010). Failure to link policy, planning and budgeting may be the single most important factor contributing to poor budgeting outcomes at the macro, strategic and operational levels (WB 1998).

In Sweden there is particularly integrated approach whereby not only the regional



roads are part of the task of the Road Administration, but issues like public transport are taken into account too. The Swedish Road Administration therefore has a broader task than any of other Road Administrations. Their influence on transport policy development and objectives appears to be larger than in the other countries, which may be partly due to the relatively small central government in Sweden. Swedish Road Administration is thus more than a road network manager, as it also has the overall responsibility for achieving sector policy objectives for transport issues (Spit 2007).

**Review system** should exhibit certain basic features, both in terms of the structure of the review bodies and the procedure they follow. Well-functioning review and remedies procedures are a key factor in ensuring a procurement system that delivers value for money for public contracts. Historically, when a serious malfunction of a public entity's procurement officers was post-factum identified by the audit, legislation allowed the aggrieved contractor to submit a compensation claim to a civil court. There were no enforcement procedures available to address problems while the procurement process was under way. Today, governments are making greater use of corrective measures before public contracts are signed. Policy-makers recognise the benefits this can bring in terms of fair competition and value for money. The modern concept of "remedies" refers to legal measures which can correct the defects or irregularities in a public procurement process while it is still under way. They are to be distinguished from "compensation". Compensation is today viewed more as a remedy of "last resort". Compensations are often viewed as suboptimal, particularly in transition countries, as the amount of compensation tends to be modest, especially compared with the potential value of public contracts. On the other hand review of public procurement and remedial actions can slow down the procurement process and raise the administrative burden. This requires the circumstances in which remedies are available not to be too wide. The challenge is to strike a balance between effective remedies and the efficiencies derived from allowing the public procurement process to proceed promptly to its conclusion (Colman 2012).

There are five basic models for establishing a review (remedies) bodies: a commercial or civil court, an administrative court, an administrative tribunal, a specialized administrative body or a general administrative body. These various models of remedies bodies have their strengths and weaknesses. Courts, whether commercial or administrative, should in principle be the most independent from the administration of government, and inspire the greatest confidence in private sector parties that an objective decision will be reached. On the other hand, in many transition countries courts have a reputation of operating slowly and being costly, and of not being independent. An administrative review body is typically a dedicated and

nominally independent administrative body. It is integrated into the national executive administration, but independent from the contracting entity. Local legal advisers were requested by EBRD as a part of public procurement assessment to assess “the extent to which the remedies bodies in the EBRD region had genuine procedural safeguards in place to ensure fair treatment of the parties, including the right to a public hearing; to be heard within a reasonable time; legislative safeguards of the remedies body’s independence; the right to be present at the proceedings, and to respond to the arguments of the other party; and the right to a reasoned decision”. Most countries with administrative review bodies were reported to have public procurements review procedures lacking in the above guarantees. While in these countries it is possible to appeal a review decision to a court, such courts do not have the power to apply remedial action in order to stop or undo the irregular procurement process (Colman 2012). In four European countries (Czech republic, Spain, Lithuania and Slovenia) it is furthermore obligatory to seek a review by the awarding body. In case of Czech Republic and Lithuania, there are appeals lodged against over 49% of the first-instance decisions (EC 2012).

## 2.3 European Union and Regulations

Aim of EU regulations is to increase competition and propose transparent open procedures ensuring fair conditions of competition for suppliers. In 2008, OECD countries recognised that efforts to improve value for money in public procurement need to go hand in hand with policy measures to enhance transparency, accountability, and integrity (OECD 2013b). Core provisions of the EU procurement legislation are consolidated in EC Directives 2004/18 and 2004/17 and their approval brought significant changes to the public procurement system in EU countries. EC Directive 2004/18 provides the rules for so called “classical sector” covering most of contracting authorities – Ministries, Central Government, municipal bodies and also State and municipal enterprises. Directive 2004/17 concerns “utilities sector”, covering contracting authorities operating in field like water treatment, energy or management of port and airport facilities (Bianchi 2010).

To be able to access to European Union states must align their legislation with EU rules. EU membership also brought opening up of public procurement within the single market which increases cross-border competition for suppliers and thus efficiency. Beside of membership itself, even status of candidate country means there is a significant compliance of state with EU requirements (Gwiazda 2002). The other factor influencing quality and development of transport network is promoting of transnational projects. Establishment of multimodal trans-European transport network

(TEN-T) has constituted a key element in the relaunched Lisbon Strategy. The European Union is supporting the TEN-T implementation by several financial instruments - the TEN-T programme, the Cohesion Fund, the European Regional Development Fund and European Investment Bank's loans and credit guarantees. Grants, in particular under the TEN-T budget line and the Cohesion and European Development Funds, play a major role in both project preparation and implementation phases. Grants are allocated to studies (from feasibility studies to comprehensive technical or environmental studies and costly geological explorations), helping to overcome early stage project difficulties, and to the works phase. Traffic between Member States is expected to double by 2020 therefore there is a need for well-performing trans-European network (Planco Consulting 2003).

## 2.4 Other Factors in Transport Infrastructure Procurement

**Infrastructure planning** is one of the most important activity in the field of transport infrastructure procurement. It is based on prognosis of transport requirements which takes into account estimate of probable development of society, science and technic in next years (or decades).

There are not enough data to compare systems across countries and time (and also the mere existence of plan does not imply its proper use), but we expect countries with well recognized systems of planning to do well. These include France, Germany, Finland, Sweden, Netherlands and Great Britain (OECD 2005) and, in case of railroads, Switzerland also has good planning strategy (Kräuchi 2004).

Other countries which developed system of planning recently are Ireland (2006), Spain and Portugal (both 2000).

On contrary Czech Republic did not possess strategy for development of transport infrastructure until June 2013. The creation of the strategy was in fact forced by European Commission because existence of “comprehensive national transport plan” is a necessary requirement for use of EU funds in the period 2014-2020 (OPD 2013). Thanks to this requirement we can expect development of transport plans in all EU member countries that still do not have it till the end of 2013.

However planning at the level of member states is not enough. Bougheas et al. (2003) showed that in a two-country model of trade where each country's social planner behaves strategically the equilibrium levels of infrastructure are not optimal from a global perspective. This could be solved by European integration process. Decrease of dependency on oil import, transfer of road transport to other types of transport and

completion of TEN-T network are among pillars of present European Transport Policy.

**Public Private Partnership (PPP)** “is a ‘procurement process’ to provide services or deliver assets through joint public and private cooperation” (Queiroz 2010). Its aim is to elicit the private sector to contribute to reducing the overall cost of delivering infrastructure services through increased efficiency and better management of some risks (such as construction). In successful PPP projects, the private sector’s higher cost of financing and the need for a return on its investments are offset by the benefits provided by private participation (Queiroz 2010).

Recent data indicate that expansion of private participation in transport infrastructure has slowed down with the current global economic crisis. Countries with the widespread use of PPP in transport infrastructure are France, Italy, Spain, Netherlands, Denmark and outside Europe USA, New Zealand, Mexico and India. There is also some progress in Slovakia, Russia, Latvia and Romania recently. It is a paradox that some countries which are successful in PPP projects does not have specific PPP law (United Kingdom) or central PPP unit (Spain), while Czech republic has enacted both a PPP framework law and established a central PPP unit but yet has not been able to realize a significant number of PPP projects (Queiroz 2010).

## 3 Data

### 3.1 Investments and Maintenance Expenditures

Data about investment and maintenance are provided by International Transport Forum (ITF), an intergovernmental organization under OECD. Member countries report them in current prices. In order to get them comparable across time, data have been converted to 2005 constant prices (where available, a cost index for land construction is used, otherwise a manufacturing cost index or a GDP deflator is used). We furthermore extended our time series using data from Investment in Transport Infrastructure 1985-1995 report (prices were also recalculated to constant 2005).

It should be noted that renewals are sometimes classified as capital investment and sometimes as maintenance hence the split in expenditure reported is only approximate (OECD 2010).

**Investments** are defined as new construction, extensions, reconstruction, renewal and major repair. Investments reported covers all sources of financing.

**Maintenance expenditures** are defined as the costs incurred to keep the network in good condition and good working order. Only expenditures financed by public administrations are included in the figures.

### 3.2 Railway and Road network

The extent of rail and road network is obtained from local authorities, if possible (Ministry of Transport, Statistical Office, Road administration body or Rail administration body). In case we were unable to acquire data from this type of sources we used World Bank Databank (WBD) and Eurostat. Data were checked with sample from International Road Federation statistics and UNECE (United Nations Economic Commission for Europe) Statistical Database. Some data from international databases had to be excluded, because they did not look credible (according to WBD USA railway network grew by 50 percent between 2004 and 2005, Eurostat data about Greece regularly changed during writing of this thesis). In general Eurostat and WBD proved to be unreliable source of transport network extent. The definition of what counts as “road” and “rail” from WBD follows:

**Road network** includes "all roads in a given area". It covers motorways, highways, main or national roads, secondary or regional roads, and all other roads in a country.

**Railway network** consists of railway route available for train service, irrespective of the number of parallel tracks. It includes railway routes that are open for public passenger and freight services and excludes dedicated private resource railways.

For our analysis we include only paved roads from total network.

### 3.3 Institutions

We put significant effort to acquire data about the presence of institutions mentioned in Chapter 2.2 across European countries.

The list of definitions of institutions we use in our analysis follows:

By **Supreme audit institution** we understand independent functional institution assessing performance with respect to objectives and targets and purposeful and advisable use of funds. All institutions recognized as SAI in our data are members of International Organization of Supreme Audit Institutions.

**Road Administration (RA)** is a single organization charged with maintenance, repair, construction and modernization of railroad or (core) road network usually on behalf of Ministry of Transportation and local governments, but it is not the requirement. We report separate data for road and railroad operators.

European Union requires separation of the natural monopoly of infrastructure management from the competitive operations through Directive 91/440 (only country which did not apply the Directive is Ireland), but in some non-European countries (India) transportation itself and infrastructure is operated by the same institution. We do not distinguish this in our data.

We distinguish between two basic types of **Review bodies** – judicial bodies and administrative bodies. Local practitioners reported particular problems with the perceived impartiality of administrative review in many countries of operations. There was also an evidence of direct hierarchy interference in the review process from the

government administration. On the other hand, in many transition countries courts have a reputation of operating slowly (Colman 2012).

Date of formation of SAIs and RAs was acquired directly from websites of these institutions or from Acts defining these institutions.

### 3.4 Quality of Transport Infrastructure

To assess quality of transport infrastructure we use “Quality of railroad infrastructure” and “Quality of roads” ratings from Global Competitiveness Report (GCR). GCR is an annual report published by World Economic Forum. Quality assessment are obtained from annual Executive Opinion Survey administered in each country by Partner institutes. Survey questions asked for responses on a scale of 1 to 7, where an answer of 1 corresponds to “extremely underdeveloped” and an answer of 7 corresponds to “extensive and efficient by international standards”. For each Survey question, individual responses are aggregated at country level in order to produce country scores. It assesses the competitiveness landscape of 144 economies, providing insight into the drivers of their productivity and prosperity. The list of respondents includes both leaders of both large and small firms. In 2011 15000 executives responded in The Executive Opinion Survey, which makes it the largest poll of its kind (GCR 2011). Data about railroad quality are available from 1996 to 2011, availability across countries varies (there are 30 countries with complete time series). There is however a gap in quality of roads index as it was not reported in GCR from 2001 to 2005.

On the next page there is the table with summary of our data sources and list of countries included in the research.

**Table 3.1: Data sources**

Data	Unit	Source
<b>EU status</b>	non-member, candidate, member	Gwiazda (2002), Nello (2012)
<b>Institutions</b>	EU PP, RA, RS, SAI	Bianchi (2010), OECD (2011), author's survey
<b>Investments</b>	mil. of Euros (cons 2005)	ITF
<b>Maintenace exp.</b>	mil. of Euros (cons 2005)	ITF
<b>Quality assessment</b>	scale 1-7	WEF Global Competitiveness Report
<b>Railway Network</b>	km of lines	Eurostat, WBD
<b>Road Network</b>	km of paved roads	Statistical Offices, Road Administrations, WBD, Eurostat, IRF

*Source:* author

**Table 3.2: List of countries**

Country		
<b>Albania</b>	<b>Hungary</b>	<b>Poland</b>
<b>Australia</b>	<b>Iceland</b>	<b>Portugal</b>
<b>Austria</b>	<b>India</b>	<b>Romania</b>
<b>Azerbaijan</b>	<b>Ireland</b>	<b>Russia</b>
<b>Belgium</b>	<b>Italy</b>	<b>Serbia</b>
<b>Bulgaria</b>	<b>Japan</b>	<b>Slovakia</b>
<b>Canada</b>	<b>Korea</b>	<b>Slovenia</b>
<b>Croatia</b>	<b>Latvia</b>	<b>Spain</b>
<b>Czech republic</b>	<b>Lithuania</b>	<b>Sweden</b>
<b>Denmark</b>	<b>Luxembourg</b>	<b>Switzerland</b>
<b>Estonia</b>	<b>Mexico</b>	<b>Turkey</b>
<b>Finland</b>	<b>Moldova</b>	<b>United Kingdom</b>
<b>France</b>	<b>Montenegro</b>	<b>United States</b>
<b>Macedonia, FYR</b>	<b>Netherlands</b>	
<b>Georgia</b>	<b>New Zealand</b>	
<b>Greece*</b>	<b>Norwaz</b>	

\* removed from models due to inconstencies in data

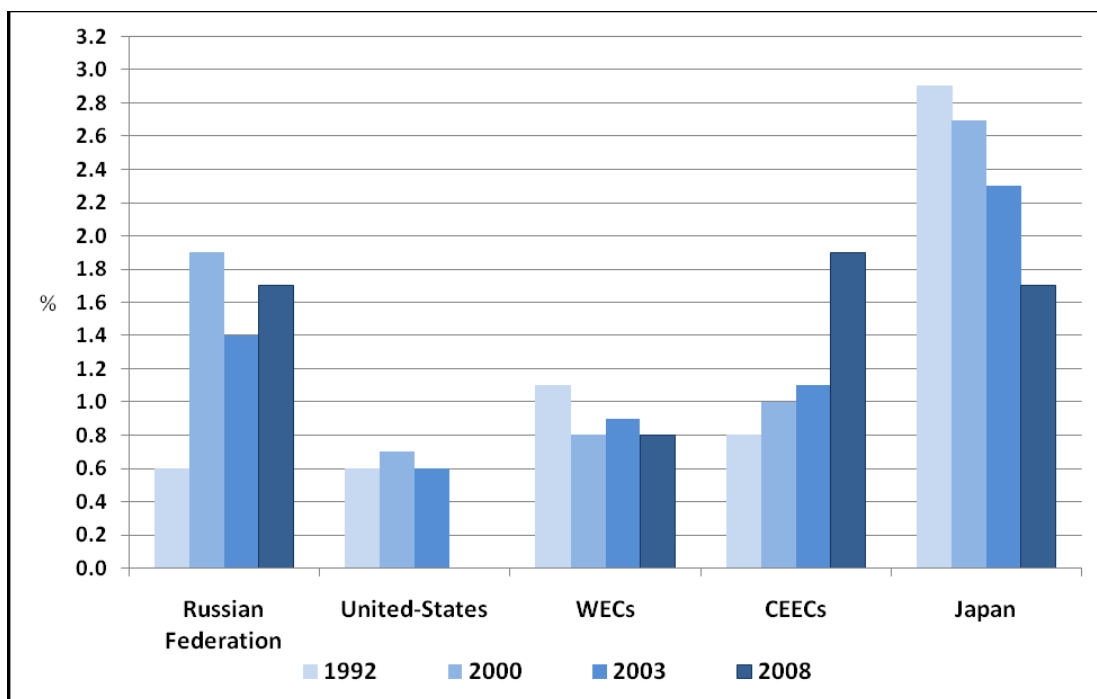
*Source:* author



## 4 Development of Transport Infrastructure and Institutions

### 4.1 EU Membership and Investment in Transport Infrastructure

In Central and Eastern European countries share of investment in inland transport infrastructure, of which level remained stable around 1% of GDP until 2002, has rose sharply in past ten years, jumping to 1,9% of GDP in 2008 (see Figure 4.1) and to 2,0% in 2009 – the highest ever value reported by these countries. In 2010 the share fell to 1,7%, likely affected by the economic crisis.

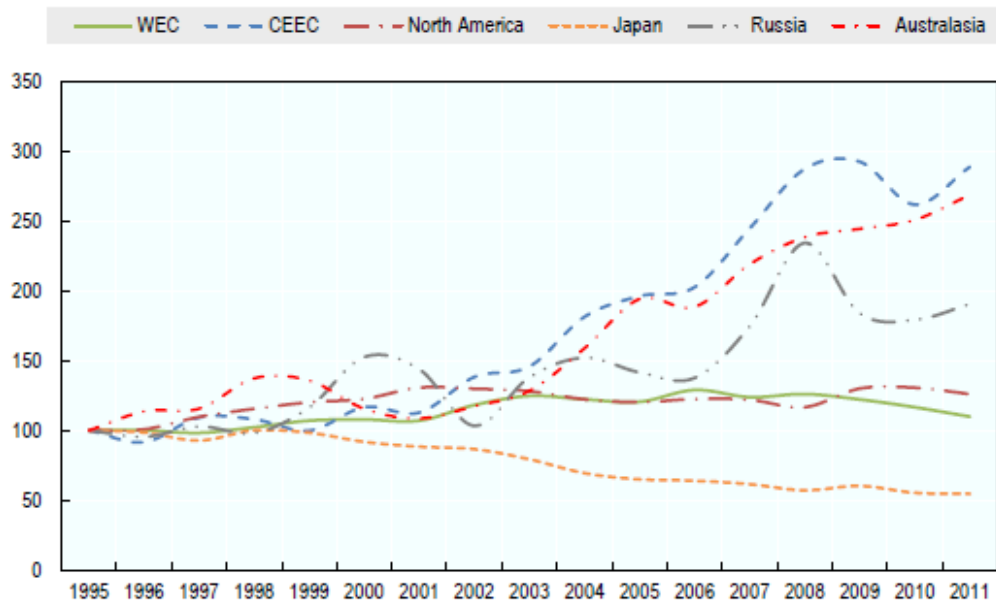


**Figure 4.1: Investment in inland transport infrastructure as a percentage of GDP, current prices**

*Source:* International Transport Forum at OECD, Investment in Transport Infrastructure

As well as share of GDP, the volume of infrastructure investment has accelerated strongly in Central and Eastern European countries, notably since 2003. Besides other effects like better economic condition of Russia and efforts to compensate for earlier underinvestment, it is likely that this is also due to accession process and accession itself of part of the CEECs to EU (OECD 2010). This growth turned negative after

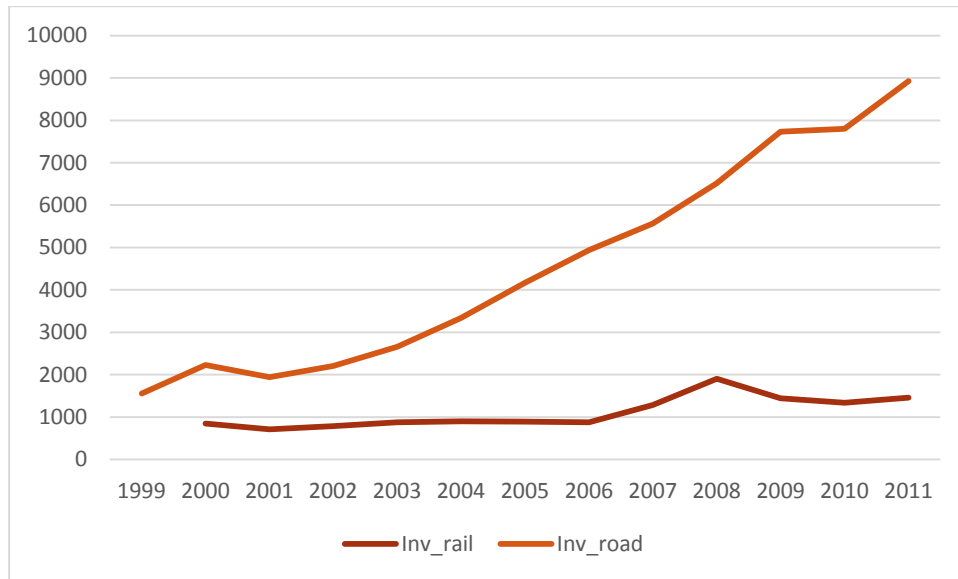
reaching a maximum in 2009 and declined 11% in real terms. In 2011 investments grew again by 10% (OECD 2013). On contrary volume of investments in WECs declined, in 2008 it was nearly 2% lower than in 2003 (see Figure 4.2)(OECD 2013).



**Figure 4.2: Volume of investment in inland transport infrastructure by region 1995-2010, constant 2005 prices**

*Source:* International Transport Forum at OECD, Spending on Transport Infrastructure 1995-2011

As we can see in the graph (Figure 4.3, only countries with full time series are included) even before accession investment in road infrastructure grew in New Member countries (only countries with complete data are included, the trend in the rest of them is the same according to data available). This is, as mentioned, due to previous underinvestment in road infrastructure compared to WECs. However, growth became steeper after 2004 (while difference between 2003 and 2004 investments was less than 700 milions, difference between 2004 and 2005 rose to more than 900 milions), therefore it looks like there is a positive effect of accession.



**Figure 4.3: Investment expenditures Cz, Ee, Lt, Lv, Pl, Sl, millions of Euro, constant prices**

*Source:* author's computations.

Level of investment in railroads was stable before accession and then begun to grow. This demonstrated tendency to convergence with situation in WECs, where it reflects political commitment to development of railways and share of investment in rail infrastructure was 40% in 2011. The growth was stopped in 2008, probably due to emergence of financial crisis. Railroads are more expensive and less flexible type of transport (this is partly because of lack of modal transport infrastructure). On the other hand they are more environment-friendly type of transportation than roads and transport on them could be better coordinated.

## 4.2 Institutions and their Impact on Output Efficiency

In this section we focus on impact of EU membership and institutions on output efficiency - growth of size of transport network. We define output efficiency as

$$\frac{Size_t - Size_{t-1}}{Inv_5} \quad (4.1)$$

Where numerator represents annual change of extent of network and denominator sum of five year investment. In chapter 2.2 we noted that to be able to measure output efficiency, output must be homogenous. This is of course nonsense in single case of e.g. construction of motorway and regional road. But we could assume that at sufficiently large scale paved road network and railroad network is on average homogenous.

The idea is that both institutions and EU regulations enhance transparency and thus efficiency. EU candidate countries also have to comply with EU directives so we have taken their status into account as well. The promotion of public interest is possible only if the public has wide access to information and transparency supports increased competition. Supreme Audit institution is included as it is supposed to control efficiency. We also evaluate impact of review system, judicial review body is expected to be less impressive, on the other hand could lack experts on procurement and have longer assessment times which could prevent remedial measures. Road and rail administration is supposed to enhance output efficiency because it should improve the efficiency of management of networks.

There is suspicion of fixed effect correlated with explanatory variables (for example average elevation and geological conditions in country). For output efficiency in railroads Breusch and Pagan Lagrangian multiplier test confirms this assumption (can not reject null hypothesis – no random effect) and we use Fixed effects estimator. For road sector there is strong evidence of random effects and we use random effects estimator. We expect institutions to cause percentage difference in efficiency, therefore we run log-level model. In case of Railways, Breush-Pagan test shows signs of heteroscedasticity at 10% significance level, hence we use heteroscedasticity robust estimator. In case of Roads, there are no signs of heteroscedasticity.

**Table 4.1: Output efficiency and institutions**

Log_OE	Roads (RE)	Rails (FE)
<b>Extend of the network</b>	7.67e-07 (5.62e-07)	.0007242 (.0001629)
<b>EU_candidate</b>	.3333903 (.6165255)	-.2554788 (1.420002)
<b>EU_member</b>	-1.146188 (.5924657)	-.5354727 (1.177706)
<b>EU_PP</b>	.1458638 (.0914397)	.2887016 (.1460956)
<b>SAI</b>	-.0264761 (.1467116)	-.3845772 (.2526482)
<b>Review_system</b>	-.2314139 (.7385365)	X
<b>Administration</b>	.2498523 (.1282284)	.5667814 (.0478215)
<b>_cons</b>	-3.176528 (1.070679)	-14.84574 (.111204)
	R-sq = 0.0840 N = 224	R-sq = 0.1026 N = 174

Source: author's computations

Explained variable Log\_OE stands for logarithmic form of Output Efficiency. First explanatory variable stands for network extent (which we include because part of investments is designated to general repairs of existing site), EU\_candidate is dummy variable equal 1 if country is recognized candidate, EU\_member is 1 if country is member state and EU\_PP is dummy variable for application of Directive 2004/18. SAI shows how many years from last five Supreme Audit Institution was working and Administration shows the same for Railways Administration and Roads administration. Review system is equal one if there is a judicial type of review system. Review system was excluded from fixed effect estimation (rails) because it is constant for all countries in our sample.

Both railways and roads model share significant positive effect of central administration. In case of railways, more extensive network brings more output efficiency. This could be caused by economies of scale or higher competition among companies specialized in railways construction in big countries. Also countries with smaller networks could focus more on quality. In case of roads, coefficient is statistically insignificant, road network is generally large therefore competition could be sufficient even for small countries. Coefficients of Extent of Networks seems small, but it is caused by the fact, that network size is typically very large figure.

The adoption of Directive 2004/18 brings rise in efficiency in both road and railroad sector (approximately 14,5% and 29% for every year) and coefficient is statistically significant. We tried to include dummy for first two years after adoption (we expect temporary negative effect) of Directive, coefficient was negative and almost equal to coefficient of EU\_PP but insignificant even at 30% level.

In roads model EU\_membership has strong negative effect and is statistically significant. This might be a sign of requirement of higher quality of roads or a sign of waste – as we proved in previous part investments in road sector rose steeply in new member states after accession. Our model suggests that sharp increase in investment leads to overpricing in countries affected. We try to examine the effect of EU funds in our next model where we try to add dummy for net contributors (Member States which made net contributions to the EU's annual budget for the period from 2000 to 2011). We also try to add dummy variable for Old member states (Member States which accessed EU before 2004) and let interact with EU\_PP to see differences in effect of newly implemented directives between new and old members (as application of directives should pose greater shock on legislation in New Member states).

**Table 4.2: Output efficiency and Old member states (road sector)**

Log_OE	Roads (RE)
<b>Extend of the network</b>	6.95e-07 (5.30e-07)
<b>EU_candidate</b>	-.0485525 (.683283)
<b>EU_member</b>	-1.224358 (.6581476)
<b>EU_donor</b>	.3851106 (.9422676)
<b>EU_PP</b>	-.1558694 (.1681789)
<b>EU_PP_old</b>	.5396287 (.2529298)
<b>SAI</b>	-.0214285 (.1224474)
<b>Review_system</b>	-1.314181 (1.02409)
<b>Administration</b>	.3489782 (.2033718)
<b>_cons</b>	-3.463383 (1.159471)
R-sq = 0.1705 N = 224	

*Source:* author's computations

Donor coefficient is not statistically significant – according to data there is small or no difference between donor and recipient countries in output efficiency. EU\_PP becomes insignificant, while EU\_PP\_old is significant and positive. This suggest that old members dealt with implementation of directives far better, their previous legislation was probably more consistent with new Directives. Application of Directive could cause mess in New Member states in first years after adoption due to less compatible legislation or immature transposition process.

## 5 Quality of Transport Infrastructure

Quality of road and railroad network is not determined solely by extent. Also change in quality may not correspond with change of extent of the network (if this was true, all network planning would be pointless). More does not always mean better.

We assume that objective of transport infrastructure is to serve well economic operators and economy as whole. Then we can use Quality of Roads and Quality of Railroad Network indicators from Global Competitiveness report as a proxy variable for purposefulness of public procurement. It is based on survey among business executives from individual countries and it should be a good measure of how well transport network fulfills needs of economy.

### 5.1 Global Competitiveness Index

We define “purposefulness” in our model as

$$\frac{Quality_t - Quality_{t-1}}{Inv_5 + Maint_5} \quad (5.1)$$

where numerator represents annual change of quality and denominator sum of five year investments and five year maintenance expenditures. As well as in previous chapter we are going to examine impact of institutions and EU, now on „purposefulness“ (change in Quality of Roads and Quality of Railroad Network ratings relative to expenditures). Transparency is necessary but not sufficient condition for efficiency. The other condition is that general public is familiar with principles of public procurement processes – identification of needs and perception of requirements – and is able to understand basic cost and benefits analysis. This brings us to hypothesis that public control of perception of needs should work better in countries with long-functioning procurement system and market economy. Subset of these countries can be defined as old member states. They are represented by dummy variable *EU\_member\_old* and consists of states which entered European Union before 2004. Other variables are the same as in Output efficiency model (Extend of the network, candidate status, member status, net contributors, enactment of Directive 2004/18, Supreme audit institution, (judicial) review system and road or railroad administration).

Breusch and Pagan Lagrangian multiplier test shows there is no sign of random effects, Cook-Weisberg test suggest there is strong heteroskedasticity (with p-value close to zero). Because variables (Administration, Review\_system) are constant for individual countries in our sample we use Pooled OLS estimator with heteroskedasticity robust standart errors. As well as in Output efficiency model, we expect impact in percentage, therefore we use log-level model.

**Table 5.1: Quality and institutions**

Log_Purposefulness	Roads (OLS)	Rails (OLS)
<b>Extend of the network</b>	-6.51e-06 (2.13e-06)	-.0001473 (.0000788)
<b>EU_candidate</b>	2.748368 (1.622663)	1.415439 (1.227558)
<b>EU_member</b>	4.066334 (2.139791)	3.359785 (1.799382)
<b>EU_member_old</b>	-.8371248 (1.609876)	-2.731662 (1.53243)
<b>EU_donor</b>	-.0260025 (2.351052)	.8082195 (1.791298)
<b>EU_PP</b>	-1.455766 (.5734525)	-.5701903 (.3966285)
<b>SAI</b>	-.183628 (.2440387)	.1442148 (.2048385)
<b>Review_system</b>	1.118633 (1.252349)	-0.568405 (.5403638)
<b>Administration</b>	.0369876 (.2110334)	X
<b>_cons</b>	-4.38716 (3.750047)	-6.221759 (2.396301)
	R-sq = 0.5172, N = 57	R-sq = 0.3043, N = 105

*Source:* author's computations

As expected extend of network demeans efficiency (more investments must be allocated to “maintenance” of existing network). EU membership has significant positive effect on purposefulness. This result is in contrast with predictions of Output efficiency model, suggest that usefulness of network is not determined by extent and that both railroad and road network projects in EU member states better meet the needs of economy. However there is a danger of violation of random sample assumption, because availability of data could be correlated with quality of use of resources. In Old Member countries purposefulness is lower in railroad sector compared to New Members, but still higher than outside EU (3.359785 - 2.731662 = 0.628). This might be caused by higher demands of local citizens. It is likely that



there is a difference in perception of quality change between for example French and Hungarian citizen, the French one demands high speed rail while Hungarian might be content with conventional railway. It is supported by fact, that roads does not share statistically significant effect of Old member countries (roads and highways are more or less the same across Europe, there is no equivalent of high speed rail in roads sector). Quality ratings are based on surveys and not on hard data. In case of roads, candidate status also has significant positive effect on purposefulness (statistically significant at 10% level). Whether country is donor or recipient in relation to EU budget looks unimportant, it suggest that money which flows through European budget are used equally purposefully as the ones paid directly from national budgets of EU member states. Coefficient of candidate status is positive and significant for roads, which on contrary suggest that for non-member countries money from EU funds are more purposefully used. In railroad sector this effect is not statistically significant, probably because European funds are used mainly for investment in road infrastructure in candidate countries (Planco Constulting 2003). Enactment of Directive 2004/18 seems to have negative effect.

Remaining institutions coefficients are not statistically significant. This bring us to hypothesis that the very existence of institutions is not enough to improve the functioning of procurement.

Results of models in this section should be watched carefully, because models are based on relatively small data set. Set contains data from 21 (roads) and 20 (rails) countries.

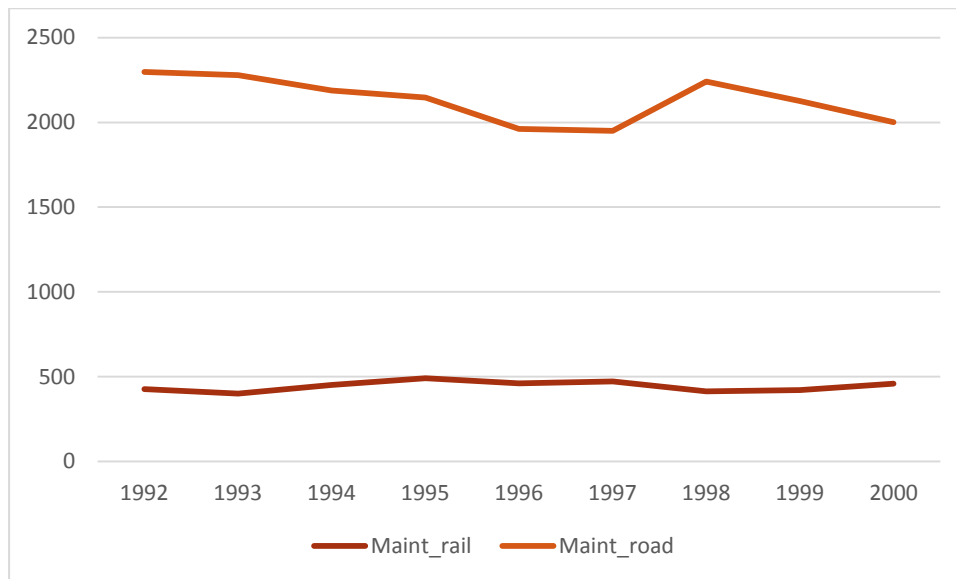
## 5.2 Maintenance expenditures and EU accession

On contrary to investments, there is a fear of drop in CEECs in maintenance expenditures in recent years. This might be caused by crowding out effect of European Union grants, which in general favour investments. Maintenance must be financed solely by national or private funds. In many countries observers have raised concerns about insufficient funding of road assets and the state of existing road infrastructure and its impacts on the competitiveness of the economy. Funding for road maintenance, particularly, may be postponed on the expectation that a lack of maintenance will not result imminent asset failure. (OECD 2013a). We look at the trend in acceding countries after last thress enlargements.

### 5.2.1. 1995 Enlargement

In 1995 Austria, Finland and Sweden joined European Union. All three countries were relatively rich compared to those involved in easterne enlargement, so effect of

accession is expected to be small. There is a slight drop in maintenance expenditures in 1996 and 1997, but same drop is present also in investment data (see Figure 5.1). On average after accession maintenance expenditures decreased in Austria (in road sector, data about railways are not available) and Finland and increased in Sweden.

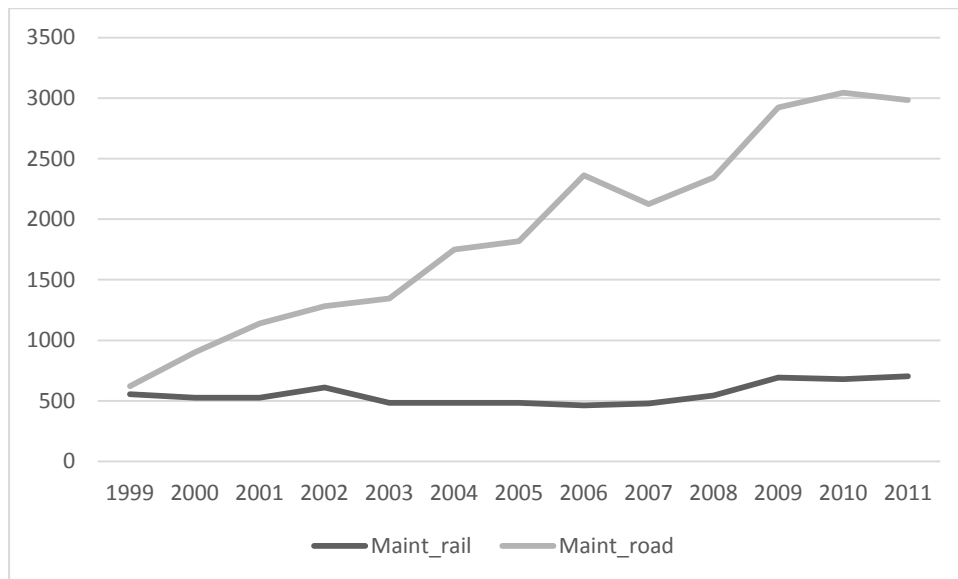


**Figure 5.1: Maintenance expenditures At, Fi, Se, millions of Euro, constant 2005 prices**

*Source:* author's computations.

### 5.2.2. 2004 Enlargement

The 2004 Enlargement was the largest simple enlargement in terms of people and number of countries. Six CEECs and two Mediterranean countries were able to join EU. Data on Mediterranean countries are not available. Data on CEECs show that effect of EU accession on maintenance expenditures is a matter of deal by deal basis. Generally maintenance expenditures in these countries are steady for railroad network and growing for road network. This points to insufficient maintenance expenditures in road sector in previous years. The trend remained the same after EU accession (see Figure 5.2) and in more or less the same for countries not included into graph (because of incomplete data).

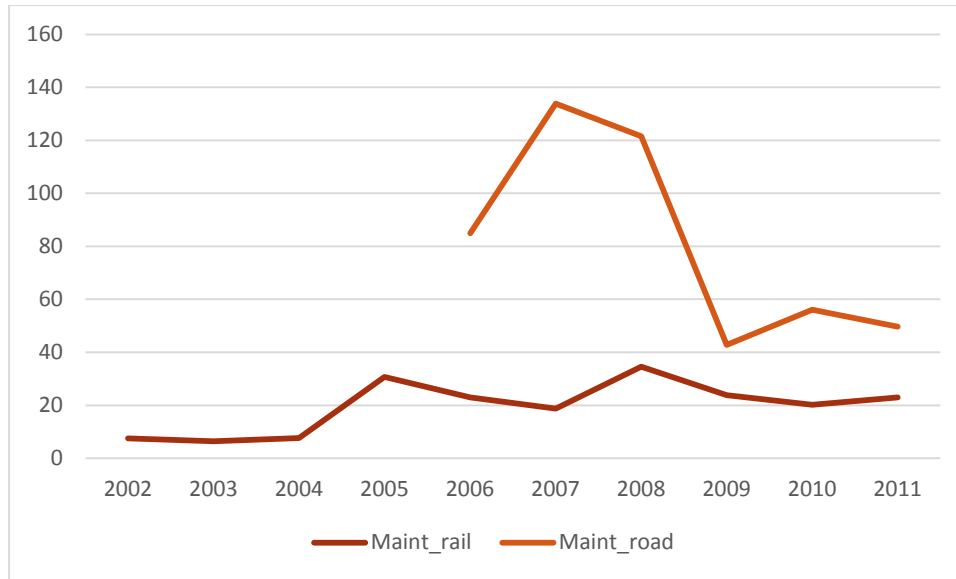


**Figure 5.2: Maintenance expenditures Cz, Pl, Lt, Lv, millions of Euro, constant 2005 prices**

*Source:* author's computations.

### 5.2.3. 2007 Enlargement

Unfortunately there is no data about maintenance expenditures after accession for Romania. In Bulgaria there was a surge in maintenance expenditures on roads in first two years after accession followed by even sharper drop which corresponds with worsening situation of public budget since 2009. Interestingly, in this case there is also increase in investments in 2010 and 2011, therefore situation in Bulgaria is in compliance with our hypothesis.



**Figure 5.3: Maintenance expenditures Bg, millions of Euro, constant 2005 prices**

As we can see in terms of volume whether maintenance expenses grew or declined after accession is a case-by-case matter. However, in CEECs share of maintenance expenditures on total expenditures in road sector has declined, falling from 35% in 2000 to 26% in 2010 (OECD 2013).

### 5.3 Quality and Maintenance Expenditures

In previous section, we analyzed change in maintenance expenses in countries after accession to European Union. We try to compute approximate optimal level of expenditures on maintenance. Like in case of calculating efficiency, we use Fixed effects estimator, because there is strong suspicion of fixed effect correlated with explanatory variables (for example weather conditions in country).

The equation we try to estimate is

$$\begin{aligned}
 & Quality_t - Quality_{t-1} \\
 & = Maintenance3_{km} + LowMaintenance3_{km} \\
 & + HighMaintenance3_{km} + Inv5 + Quality_{t-1}
 \end{aligned} \tag{5.2}$$

Where *Maintenance3km* stands for average of maintenance expenditures per km in past three years. There are two dummies interacting with *Maintenance3km*. One for low values and the second one for high one. The first one is based on assumption that certain minimal amount of money is needed for efficient maintenance and the second on assumption that after achieving sufficient funding further rise of expenditures has

small or no effect. We determined the low values as lower than mean of *Maintenance3km* and the high ones as higher than mean plus half of standart deviation. There is also variable for five year investment (Inv5) as investment definitely impacts quality and quality assessment fom previous year ( $Quality_{t-1}$ ). We expect higher values of quality to have negative impact on change.

**Table 5.2: Effect of maintenance expenditures on quality change**

Quality_change	Roads (FE)	Rails (FE)
<b>Maintenance</b>	-56.52732 (25.97449)	1.985366 (1.076929)
<b>Low_Maintenance</b>	-60.44221 (30.18227)	1.023751 (1.229009)
<b>High_Maintenance</b>	-5.974493 (4.323292)	-1.784775 (1.019003)
<b>Investment5</b>	.0000156 (8.11e-06)	-6.11e-06 (4.13e-06)
<b>GCI_1</b>	-.4920596 (.0589305)	-.4020547 (.092435)
<b>_cons</b>	2.674057 (.328463)	1.6234 (.3808559)
	R-sq = 0.3671 N = 167	R-sq = 0.2284 N = 284

*Source:* author's computations

In railroad sector, our hypothesis about High levels of income holds. Maintenance expenditures per km higher than 0.12 milions of Euro has very low effect on quality change ( $1.985366 - 1.784775 = 0.2$  per 1 more million of maintenance expenditures/km) and coefficient is statistically significant at 10% level. For low expenditures coefficient is statistically insignificant. This might be caused by lack of data for low levels of maintenance or the fact, that values of maintenance expenditures which do not affect quality are very low for railroads. Higher values of quality assessment implies need of higher expenditures to maintain quality. Coefficient of investment is not statistically significant, but its negative value may suggest overinvestment in some countries (and less resources available than required for maintenance).

In road sector, model shows that every increase in maintenance expenditures demans quality. This may be caused by previously mentioned problems with definition of investments. Also insufficient maintenance could be outweighed by investments. General repairs (as for example recent reconstruction of D1 highway in

Czech Republic) is included in investment expenditures and after them quality is better despite possible lack of maintenance expenses in preceding years. Another possible cause is that sole amount of funds do not determine their effect and effectiveness of their use varies greatly. For example in Sweden, maintenance values are two times lower than in Norway and quality reported is constantly better.

## 6 Conclusion

From examined institutions only road and railroad administrations appear to have significant impact on output efficiency (efficiency of network expansion). On contrary administrations seem to have minor impact on purposefulness. There is no evidence of impact of sole existence of Supreme audit institution and type of review system neither on output efficiency nor purposefulness. It implies that the very existence of institutions is not enough to improve the functioning of procurement and detailed comparison of processes in them is needed. European membership tends to decrease output efficiency in road sector, but has positive effect on purposefulness (increase in quality of network perception compared to expenses) in both road and railroad sector, especially in New Member countries. Candidate status does not have statistically significant effect in Output efficiency models, while it increases purposefulness in road sector, but not railroad sector. This is probably due to fact, that majority of resources from European funds are designated to development of road infrastructure. Application of EU procurement law (Directive 2004/18) seem to have positive effect in Old Member states on Output efficiency, while effect in new member states is dubious. In relation to purposefulness effect of of enactment Directive is also dubious. However new Directives on public procurement were enacted lately in most of the Member states and effects of them should be examined again after several more years. In Old Member countries purposefulness is lower in railroad sector compared to New Members, but still higher than outside EU. This might be caused by higher demands of local citizens. It is likely that there is a difference in perception of quality change. Road sector does not share statistically significant effect of Old Member countries. Models also suggest that extent of networks alone do not determine perception of quality.

Investment in transport infrastructure grew in most of the New Member countries after accession to EU, mainly in road sector. However, there is no clear evidence of crowding out of maintenance expenditures (at least in terms of volume) by investments in EU member states and trend in maintenance expenditures (in reported values) varies case by case. Models suggest that quality of roads is in general lowered by level of maintenance. This may be caused by problems with definition of investments. Also insufficient maintenance could be outweighed by investments. In railroad sector our assumption about lower impact of maintenance for higher values of expenditures holds. Low levels of maintenance expenditures tends to increase quality

too, which we did not expect. This is probably due to fact, that levels of expenditures which are not sufficient for maintenance of quality are very low.

Data quality, especially on extent of road network, limits the scope of empirical work. The secondary conclusion of this thesis is that data from international databases like WBD or Eurostat are not always reliable. It could be interesting to assess overall quality of data available there, because if unreliability is not an exception in case of transport network extend, studies of World Bank using data from their databases could be questioned.



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# Bibliography

- Aschauer, D.A. (1989): “Is Public Expenditure Productive?”, *Journal of Monetary Economics*, 23, pp. 177–200.
- Berndt, E. R. & B. Hansson (1991): “Measuring the Contribution of Public Infrastructure Capital in Sweden”, NBER Working Paper No. 3842, National Bureau of Economic Research, Inc.
- Bianchi, T. & V. Guidi (2010): “The Comparative Survey on the National Public Procurement Systems across the PPN”, Authority for the Supervision of Public Contracts, Department for the co-ordination of European Union Policies
- Bougheas, S., Demetriades, P. O. & Edgar L. W. Morgenroth (2003): “International Aspects of Public Infrastructure Investment”, *The Canadian Journal of Economics*, Vol. 36, No. 4, Canadian Economics Association, Wiley
- Colman, A. & E. Niewiadomska (2012): “Public procurement review and remedies bodies – models for success”, European Bank for Reconstruction and Development, London
- European Bank for Development and Reconstruction (2011): “Review of laws and practice in the EBRD region”, Public Procurement Assessment
- European Bank for Development and Reconstruction (2012): “Law in Transition online”, available from [http://www.ebrd.com/downloads/research/news/lit112\\_full.pdf](http://www.ebrd.com/downloads/research/news/lit112_full.pdf)
- Égert, B., T. Kozluk & D. Sutherland (2009): “Infrastructure and Growth: Empirical Evidence”, OECD Economics Department Working Papers, No. 685, OECD Publishing
- Esfahani, H. and M.T. Ramíres (2003): “Institutions, Infrastructure and Economic Growth.” *Journal of Development Economics* 70, pp. 443–477.
- Estache, A. & A. Iimi (2008): “Procurement Efficiency for Infrastructure Development and Financial Needs Reassessed”, The World Bank, Finance, Economics and Urban Development Department, Economics Unit, Working Paper 4662

- European Commission (2012): “Annual Public Procurement Implementation Review 2012”, Commission staff working document, Brussels
- Gwiazda, A. (2002): “Europeanisation in Candidate Countries from Central and Eastern Europe”, Department of Political Science. Trinity College Dublin
- Jiwattanakulpaisarn, P. (2008): “The Impact of Transport Infrastructure Investment on Regional Employment: An Empirical Investigation”, Centre for Transport Studies, Department of Civil and Environmental Engineering, Imperial College London, South Kensington, London
- Kräuchi, Ch. & U. Stöckli (2004): “More train for Switzerland. The Rail 2000-Story”, AS-Verlag, Zürich
- Lopez-Claros, A. (2004): “The Global Competitiveness Report 2004-2005”, World Economic Forum, Geneva
- Nello, S. S. (2012): “The European Union: Economics, Policies and History”, 3rd ed. New York: McGraw-Hill Higher Education.
- OECD (2005): “National Systems of Transport Infrastructure Planning”, European Conference of Ministers of Transport, Paris
- OECD (2010): “Investment and Maintenance in Inland Transport Infrastructure 1995-2008”
- OECD (2011), “Transparency in public procurement”, in Government at a Glance 2011, OECD Publishing.
- OECD (2013a): “Spending on Transport Infrastructure 1995-2011”
- OECD (2013b): “Government at a Glance 2013: Procurement Data”, Public Governance and Territorial Development Directorate, Public Governance Committee
- OGC (2008): “Guidance on Central Purchasing Bodies”, Office of Government Commerce, Rosebery Court, St Andrews Business Park, Norwich
- Olken, Benjamin (2005): “Monitoring corruption: evidence from a field experiment in Indonesia”, NBER Working Paper Series 11753

- Operační program doprava (2013): “Dopravní sektorové strategie 2. Fáze: Střednědobý plán rozvoje dopravní infrastruktury s dlouhodobým výhledem”, Ministerstvo Dopravy ČR
- Planco Consulting (2003): “Transport Infrastructure Costs and Investments between 1996 and 2010 on the Trans-European Transport Network and its Connection to Neighbouring Regions, including an Inventory of the Technical Status of the Transport-European Transport Network for the Year 2000: Final Report ”, PLANCO Consulting GmbH, Essen, Germany
- Queiroz, C. & H. Kerali (2010): “A Review of Institutional Arrangements for Road Asset Management: Lessons for the Developing World”, The World Bank, Washington, DC
- Santiso, C. (2005): “Budget Institutions and Fiscal Responsibility: Parliaments and the Political Economy of the Budget Process”, World Bank Institute Working Paper No. 37253, Washington, DC
- Schwab, K. (2008): “The Global Competitiveness Report 2008–2009”, World Economic Forum, Geneva
- Schwab, K. (2009): “The Global Competitiveness Report 2009–2010”, World Economic Forum, Geneva
- Sigma (2007): “Public Procurement Review and Remedy Systems in the European Union”, Support for Improvement in Governance and Management SIGMA Paper, No. 41, OECD Publishing, Paris
- Sigma (2011): “Central Purchasing Bodies”, Support for Improvement in Governance and Management, SIGMA Paper, No. 20, OECD Publishing, Paris
- Sigurbjörnsdóttir, K. (2010): “EU Funds for Roads”, Conference of European Directors of Roads, Paris
- Spit, W., van Veen, M., Stephan, P. & H. Pauwels (2007): “International comparison: Road Administrations”, Rijkswaterstaat AVV Transport Research Centre
- World Bank (1998): “Public Expenditure Management Handbook”, The World Bank, Washington D.C.