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Infrastructure in the EU:

Developments and Impact on Growth

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ABBREVIATIONS

Countries

EA	Euro area
NEA	Non Euro area
EC	European Commission
EU	European Union
AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	The Netherlands
OECD	Organisation for Economic Cooperation and Development
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	The United Kingdom

Graphs/table unit

Bn	Billion
Mn	Million
MWh	Megawatt hour
MW	Megawatt
Pkm	Passenger-kilometres
Tkm	Tonne-kilometres

Other abbreviations

WEF	World Economic Forum
CEER	Council of European Energy Regulator
GFCF	Gross Fixed Capital Formation
Pp	Percentage point
SAIDI	System Interruption Average Duration Index
TEN-T	Trans-European Transport Network

EXECUTIVE SUMMARY

The economic and financial crisis resulted in a sharp decrease in both private and public investment in the EU. Stimulus efforts were put in place right at the beginning of the crisis in 2008, which resulted in support for infrastructure investment worth about EUR 32 billion (0.25 % of EU GDP) ([1]), over 2009 and 2010, but these measures subsequently stalled as the crisis wore on and governments decreased investment as part of their efforts to strengthen public finances.

Today, investment needs are high in areas such as research, innovation and ICT which are important drivers of growth and competitiveness. However, there are also arguments to suggest that Europe should invest in energy and transport infrastructure. Energy and transport infrastructure play a vital role in the integration and efficiency of the EU's internal market. Moreover, they are central to the EU's strategic transformation towards a low-carbon economy over the medium-long run. Investment in cross-border energy infrastructure is also needed to improve the EU's energy security and the functioning of the energy market. The EU's energy and transport infrastructure investment needs are expected to remain high in the near future.

This report analyses the macroeconomic impact of infrastructure development in the EU, focusing on inland transport and energy. It also assesses infrastructure investment patterns in Member States, before and after the economic crisis.

Over the last four decades, all Member States have expanded their transport and energy infrastructure networks. Since the mid-1990s, the development of road infrastructure has increased significantly and in some cases has exceeded the growth in road traffic (freight and passenger). Railway infrastructure has grown more slowly as trains have been losing market share in both passenger and freight traffic. The expansion of electricity infrastructure, however, has increased in line with electricity consumption.

Despite these positive developments, the availability and quality of infrastructure still varies considerably across the EU. The difference in the quality and availability of infrastructure in older and newer Member States has narrowed and reflects the catching up of these countries. In some older Member States, the quality of infrastructure has deteriorated due to insufficient maintenance spending and the ageing of networks. Cross-border transport and energy connections, which are vital to make the EU's internal market work, remain insufficient, particularly when it comes to railways and electricity. Building these missing interconnections to achieve a fully interconnected internal market could contribute to economic growth.

The report confirms that there is a positive relationship between the growth of transport and electricity infrastructure and economic growth. Policies that promote spending in these areas have a positive impact on growth, provided they do not create excess capacity, as overprovision of infrastructure has been shown to create inefficiencies by diverting resources away from more productive investments.

Member States have different infrastructure needs and increased investment in those sectors should take account of their investment pattern before and after the crisis. Analysis of recent infrastructure investment patterns in the Member States reveals signs of underinvestment in some countries. In the core countries of the euro area, there are indications of low investment in both road and rail infrastructure so boosting investments in these network would be justified. In the euro area periphery, there seems to be an adjustment following a period of high investment in roads. In the newer Member States, investment in both road and rail infrastructure has been higher than expected, with a sustained increase in investment that corresponds to their need to catch up with the rest of the EU. In most of these countries, the stock of infrastructure is still lower than the EU average. Investment in energy across the EU has been dynamic in most Member States, reflecting the shift to renewable and low-carbon energy encouraged by the EU's climate and energy strategy.

([1]) European Commission (2009).

Increased investment in infrastructure can have a positive impact on growth, provided it is well targeted. Evidence suggests that Member States in which the stock of infrastructure is low, or has suffered from underinvestment, could benefit from higher infrastructure investment. To meet the EU's policy goals, considerable investment will be needed in energy infrastructure but such investment decisions are largely in the hands of the private sector and need to take place in well-designed markets ([2]). This paper by no means provides a blanket justification for undiscriminating public investment in infrastructure. Targeted public infrastructure investment can be very valuable in some cases but must take into account macroeconomic conditions, including fiscal constraints and the need to increase private financing.

([2]) European Economy (2014c).

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1. INTRODUCTION

Investment fell sharply during the crisis and has since remained weak in the EU. By contrast, investment needs in the EU are estimated to be high and concern both private and public investments. This development has been identified in a broad range of sectors, including manufacturing, education and healthcare ([3]). There is a case to increase investment in R&D, innovation and ICT infrastructure as they are important drivers of growth and competitiveness. In particular, the digitalisation of the economy contributes to accelerating productivity growth through several channels including the investment one ([4]).

However, this report shows that there are arguments to also increase investment in more traditional sectors such as energy and transport. First, these networks have always played an important role in the economy, as service and infrastructure providers. Transport networks connect producers and consumers to markets, whereas energy networks provide essential inputs for production and consumption. As such, energy and transport infrastructures form an essential input in an economy's production, which is complementary to other inputs, including labour and capital. ([5]) The economic importance is reflected in the share of total investment directed to these sectors; the share of energy and transport investments in total gross fixed capital formation amounted to about 10% in 2011 ([6]). Second, they play a vital role in the integration and efficiency of the EU's internal market. Investment in cross-border energy infrastructure is also needed to improve the EU's energy security and the functioning of the market. Third, energy and transport are central to the EU's strategic transformation towards a low-carbon economy over the medium-long run. Investment needs in energy and transport infrastructures are therefore expected to remain high in the near future ([7]).

The debate on the need and merits of boosting investments in infrastructure has intensified against the backdrop of the sluggish post-crisis economic performance of EU Member States and the associated need to boost growth. The contribution of infrastructure to growth has become a crucial issue in this time of recession in view of both the fiscal consolidation challenges and the search for new ways to boost growth. The call for infrastructure investments has further strengthened in the light of the current low borrowing costs, which, according to some recent contributions, in the longer run could even render infrastructure investments budget-neutral under certain macro-economic conditions (e.g. identification of investment needs, economic slack, efficiency of investment). ([8])

This report analyses the macro-economic impact of extending infrastructure networks in the EU, focusing on inland transport and electricity infrastructures, and assesses investment patterns in these sectors in a post-crisis context. Section 2 reviews the infrastructure provision and the quality of infrastructure in Member States in these sectors over the past decade. It also describes investment needs in the EU for the coming decade. Section 3 aims to assess whether these infrastructure investments contribute to growth in EU economies. This is a relevant question as infrastructure growth has been high in most Member States and the literature shows that overprovision of infrastructure can divert resources and lead to suboptimal equilibrium. Section 4 analyses investment patterns of these sectors in Member States. Concluding remarks are provided in section 5.

([3]) DIW (2014)
([4]) Van Ark (2014)
([5]) IMF (2014)
([6]) Based on Eurostat data
([7]) European Commission (2011a and 2001b); European Commission (2014a).
([8]) See e.g. IMF (2014)

2. INFRASTRUCTURE IN THE EU: STYLISED FACTS

2.1. INTRODUCTION

Infrastructure in the EU plays an important role in connecting markets. Transport infrastructures provide the means of moving goods and passengers, thus contributing to regional development and the creation of an internal market. Energy infrastructures, by interconnecting markets, not only improve market integration, but also contribute to enhancing security of supply. Over the past decades, infrastructure provision has expanded in Member States.

This chapter describes the evolution of physical infrastructures in inland transport and electricity in Member States. ([9]) It also assesses the improvement in the quality of infrastructures in Member States. Finally, it presents the investment needs as identified by the policy agenda in the near future.

2.2. INFRASTRUCTURE PROVISION IN MEMBER STATES: 2001-2011

The level of provision of physical infrastructure varies across Member States, with the EU15 having on average a much higher level of provision per capita than the EU12, except for the railway network where it is slightly lower (see Graph 2.1).

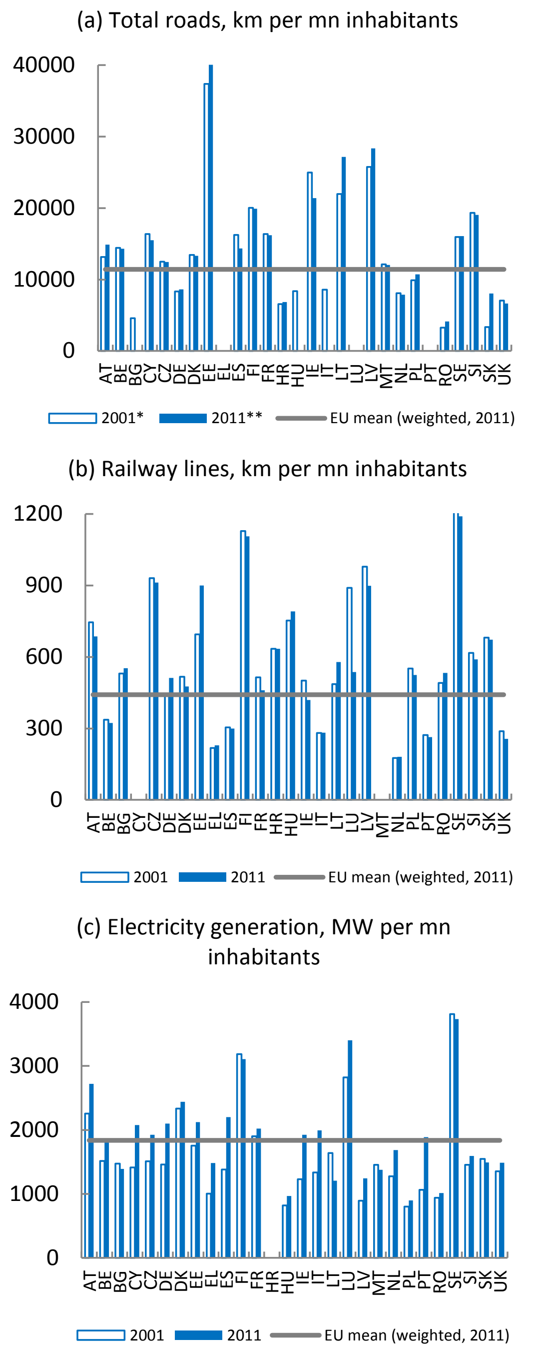
On average, the total road network density in 2011, measured in per capita terms, is higher in the new Member States than in the EU15. This is likely to be related to the comparatively sparse population in the EU12 countries. A country's road network density appears to have some relation to its population density and degree and geographical pattern of urbanisation. Furthermore, since 2001, the road network has expanded in the new Member States, in part because of EU funding in the context of cohesion policy, whereas in the EU15 it has slightly decreased during the same period. Nevertheless, the sparsest networks are found in Croatia and Romania, two new Member States where investment in road has not yet resulted in a network of the same degree of development as in the other new Member States. The network density is relatively low for a number of densely populated old Member States including Germany, the United Kingdom and the Netherlands. By contrast, the motorway network density is more developed in the EU15 than in the new Member States, although the heterogeneity within each group is more pronounced than the heterogeneity between them (see also Section 2.3). Similar as for the total road network, a country's motorways network density appears to be related to population and urbanisation. In the case of motorways there also is a relation with the centrality of its geographical location, which is a determinant factor of the relative importance of transit traffic flows. ([10])

Compared to road, the railway network density is rooted into somewhat different factors, reflecting the influence of economic development, geographical characteristics and historical heritage ([11]). In railways, the contrast between the EU15 and EU10 ([12]) is less striking than for road, since the new Member States have inherited from the communist period a sizeable railway network. The railway network in most of these countries still seems over-dimensioned in view of the disappointing growth in rail traffic, hence the need for (further) rationalisations. In comparison, in countries such as the Netherlands, the United Kingdom, Greece, Portugal and Belgium the overall railway length per capita is relatively low.

([9]) Due to data limitations, the analysis of this report focuses on electricity, rail and road infrastructures. Data are not available for gas capacity and very often are not included in the empirical literature. As regards telecommunication infrastructures, only data on the number of telephone lines are available for a long period. These data have not been included in the analysis as they do not capture the technological developments in this sector.

([10]) Eurostat (2010), chapter 10.
([11]) Eurostat (2010), footnote 7.
([12]) During the communist era, transport policies were part of the planned economy which favoured non-private modes of transport and the corresponding infrastructures. For instance, the preference for an extensive railway network was in line with the well-known predilection for heavy and bulk manufacturing (Pucher and Buehler, 2005).

Graph 2.1: **Physical infrastructure provision per capita: total road, railway lines and electricity capacity**



* Except IT (1999); ** Except BE, ES, NL (2010); DK, IE, SE (2009); MT (2008)
Source: Commission Services based on Eurostat

As regards the electricity generation capacity ([13]) the variation across EU countries seems less pronounced than for the stock of motorways and railways. Compared to the EU average, generation capacity is relatively low in Romania, Hungary, Latvia and Poland, whereas it is very high in Sweden, Luxemburg and Finland. Overall, the EU15 countries tend to have higher capacity than the EU12 countries. However, there are notable exceptions: Estonia has an above EU average capacity and the Netherlands one below average. Other explanatory factors to the observed capacity differences include the composition of the energy mix as some technologies have a higher capacity factor than others, and the interconnections with other countries ([14]).

2.3. EVOLUTION OF THE QUALITY OF INFRASTRUCTURE IN MEMBER STATES: 2001-2011

The quality of infrastructure is an important dimension of infrastructure provision in a country, as it improves the efficiency and effectiveness of network services. Infrastructure quality means, among other things, the possibility for business to get their goods and services in a secure and timely manner in the case of transport, and the absence of interruption and shortages in the case of energy. However, it is difficult to measure as it is intrinsically linked to the services it provides ([15]). Empirical work on developing countries use indicators such as the share of paved roads in total road and the percentage of transmission and distribution losses in the production of electricity ([16]). With these indicators, the authors want to capture the reliability of the network system to provide services. Similarly, in

([13]) As regards the energy sector, the analysis focuses on electricity generation capacity (measured in Megawatt per million people) since data on the length of transmission and distribution network are lacking on a long period. Generating capacity of a power station is the maximum electrical net active power it can produce continuously throughout a long period of operation in normal conditions.
([14]) Ideally, generation capacity of a Member State should be judged at the hand of the transmission system operator's capacity to deal with peak demand and their import capacity. See European Commission (2013) and European Commission (2014c) which provide indicators on the capacity of the TSO to deal with peak demand and their import capacity.
([15]) OECD (2011).
([16]) Calderon (2004; 2009).

the EU, the share of motorways can reflect not only the capacity of the network, but its quality in terms of safety and rapidity. In rail, the percentage of electrified line reflects the modernisation of the network. Finally, in electricity, the quality of the system can be measured by its reliability in terms of the duration of electricity disruptions.

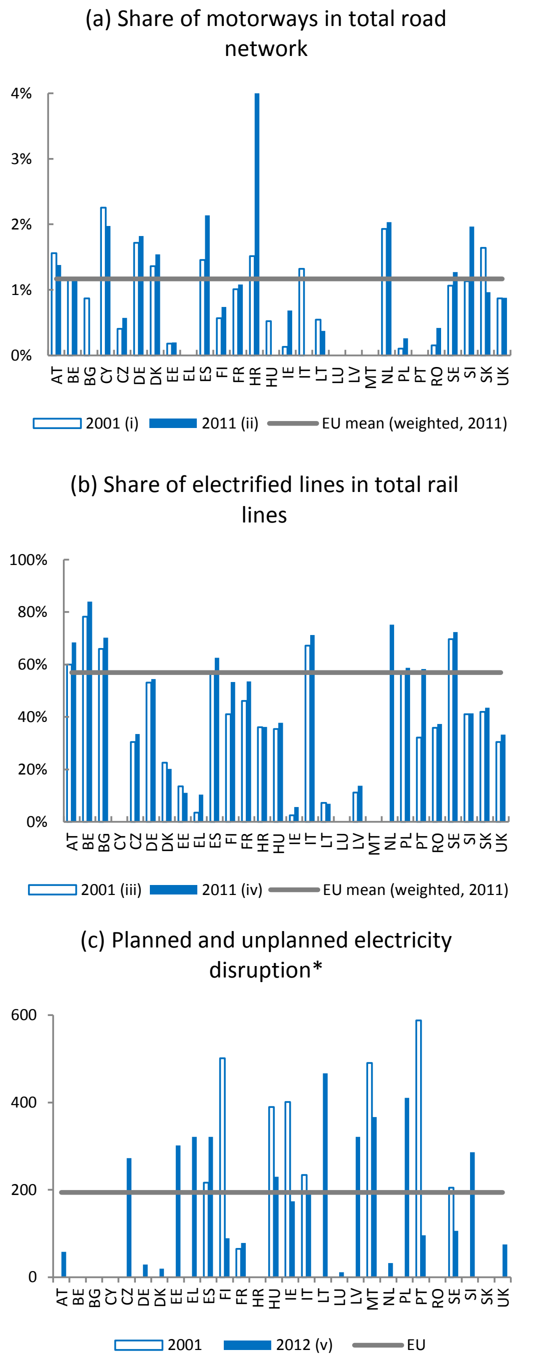
Overall, the quality of the road, rail and electricity networks has improved over the past decade (Graph 2.2**).** The share of motorways in total road network has increased in the majority of the Member States. The same holds for the quality of the railroad, measured in terms of the share of electrified lines in total railway lines. In 2011, the overall share of electrified lines at the EU level exceeds 50%. Finally, the reliability of the electricity network, as measured by the SAIDI index ([17]), has improved since 2001 in most of the countries for which data was available.

The World Economic Forum highlights the importance of infrastructures as a key driver of competitiveness. Infrastructure is one of the twelve pillars of competitiveness defined as "*the set of institutions, policies, and factors that determine the level of productivity of a country*" ([18]). The presence of good infrastructure influences the location of economic activities and their development. For this reason, the World Economic Forum includes scorings on the quality of various infrastructures which are based users' perceptions ([19]). As seen in graph 2.3, the perception of the quality of infrastructures is positively correlated to the share of motorways, modernisation of railways and the reliability of the electricity system ([20]).

Finally, poor quality of the road, rail or electricity network can contribute to lowering the network performances in terms of reliability, safety and punctuality, hence the importance of maintenance spending. Maintenance spending includes different types of quality enhancement such as local repair, winter maintenance, renewal, addition of new functionalities (bridge, tunnel, etc…) as well as prolongation of the lifetime of existing infrastructures. The needs vary across networks and Member States according to various economic and sector-specific factors (see section 4).

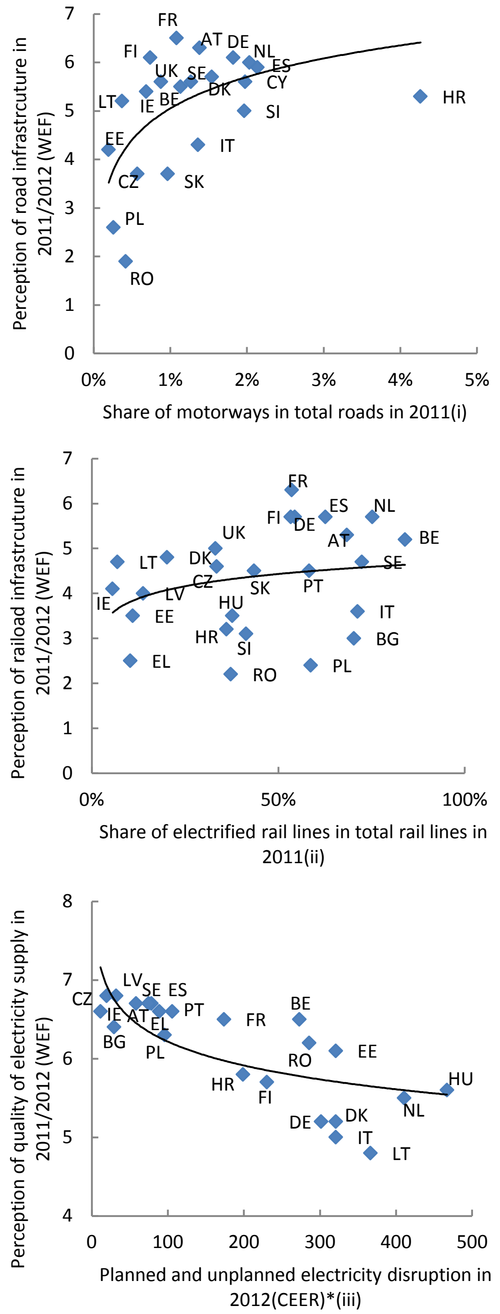
([17]) System Average Interruption Duration Index (see CEER, 2014)
([18]) WEF (2013).
([19]) WEF (2013). As regards general infrastructures, the question is the following: "How would you assess general infrastructure (e.g. transport, telephony and energy) in your country?".
([20]) The correlation is weaker for electrified rail lines. Arguably the quality of the railway network could be measured by other indicators such as punctuality and frequency, which are more important from a user point-of-view. Note that electrified rail lines not only account for the modernisation of the network, but also contribute to decreasing greenhouse gas emissions.

Graph 2.2: Quality of road, rail and electricity infrastructure



*Measured by the SAIDI index (CEER, 2014)
(i)Except IT (1999); (ii) Except BE, ES, NL (2010); DK, IE, SE (2009);(iii) Except IT (2000); (iv)Except DE, FR, UK (2010); BE (2009); DK, EL (2008) (v)Except EL, IE, LV, ES (2011)
Source: Commission Services based on Eurostat and CEER

Graph 2.3: Quality versus perceived quality of road, rail and electricity infrastructure



*Measured by the SAIDI index (CEER, 2014)
(i) Except BE, ES, NL (2010); DK, IE, SE (2009); (ii) Except DE, FR, UK (2010); BE (2009); DK, EL (2008); (iii) Except EL, IE, LV, ES (2011)
Source: Commission Services based on Eurostat, WEF and CEER

2.4. INFRASTRUCTURE NEEDS: 2011-2030

Infrastructure needs are high. OECD projections ([21]) estimate that worldwide infrastructure needs will be high during the coming decades, given the traffic growth forecast. Traffic in aviation (passenger, cargo), maritime transport (freight) and railways (passenger and freight) is expected to grow worldwide, including in Europe ([22]).

In Europe, infrastructure plays a crucial role in connecting and integrating markets, but also in ensuring the transition to a low carbon economy. For this reason, taking account of the policy agenda, Commission services estimate that infrastructure needs will remain high in the medium term for several reasons.

First, energy and transport infrastructures are necessary for the completion of the internal market. Cross-border infrastructures, by increasing trade flows and competition, can have positive effects on growth. In transport, the completion of the TEN-T network requires about €550 bn until 2020. The total costs until 2030 are estimated by Commission services at €1.5 trillion ([23]). In energy, the Commission estimates that €200 bn are required up to 2020 to develop cross border interconnections ([24]). The completion of a fully integrated internal market also contributes to securing energy supply in Europe.

Second, the transition to the low carbon economy has been put as a priority for the EU. Since 2008, the EU has set an ambitious policy agenda with three targets: a 20% reduction target for greenhouse gas emissions, a 20% share of renewable energy as part of the energy consumption and 20% energy efficiency improvements. It is estimated that investments amounting to €205 bn per year are needed up to 2020 to replace ageing infrastructure and achieve the 2020 climate and energy targets ([25]). In October 2014, the European Council reached an agreement on new energy and climate targets to be reached by 2030. In this context, investment needs are projected to be high, in particular to make these policies cost effective, The Commission proposal estimate the investment needs to €209 bn per year for the period 2021-2030 ([26]). These figures include investment in the power, building (residential and tertiary) and industrial sectors, and covers both the needs for replacement of existing installations as well as additional needs due to the raised policy ambition.

([21]) OECD (2012)
([22]) Airline traffic worldwide could grow by 4.7% per year over 2010-2030; air freight by 5.9% per year during the same period, maritime container by more than 6% per year, rail passenger and freight traffic by 2-3% per year. These projections have to be manipulated with caution. OCDE. Strategic Transport Infrastructure Needs to 2030. 2011.
([23]) White Paper on Transport (2011).
([24]) European Commission (2014b)
([25]) Based on PRIMES, European Commission (2014a). It assumes full achievement of 2020 binding targets..
([26]) COM/EIB non paper on options for scaling up finance in the context of the 2030 energy and climate framework.

3. ASSESSING THE RELATIONSHIP BETWEEN INFRASTRUCTURE AND GROWTH IN THE EU: AN EMPIRICAL INVESTIGATION

3.1. INTRODUCTION

Economic theory identifies four channels through which infrastructure can have a positive impact on economic growth. First, energy and transport are used as inputs in firms' production function and hence influences their production cost, directly or indirectly, and ultimately their competitiveness from an international and national perspective (Pradhan and Bagchi, 2013). Second, investment in infrastructure may boost capital accumulation by providing opportunities for capital developments (Kirkpatrick, 2004). Third, it can stimulate aggregate demand by increasing expenditure in construction and maintenance operations (Wang, 2002; Esfahani & Ramirez, 2003; Phang, 2003; Short & Kopp, 2005; Pradhan, Bagchi, 2013). Finally, it may induce other investments by providing signals to key sectors in the economy (Fedderke and Garlick, 2008).

A large number of empirical papers have tried to assess the impact of infrastructure on economic growth. The findings vary considerably, in terms of both the sign and magnitude of the impact. Many studies find a positive and important contribution of infrastructure provision to economic growth, but quite a few studies have found a weak or negligible impact. Some studies even report some statistically significant negative effects.

This chapter reviews the existing literature and investigates the relationship between physical infrastructures (electricity and inland transport) and growth, using an econometric approach.

3.2. EVIDENCE FROM THE LITERATURE

3.2.1. Estimation methods

The applied economics literature on the empirical relation between infrastructure and economic growth traditionally identifies as its starting point the seminal papers by Aschauer (1989a, 1989b). Aschauer found a strong empirical positive relation between public capital and GDP growth in developed economies. More specifically, he found that a 1% rise in the public capital stock would raise total factor productivity by 0,39%. His empirical analysis provoked intense interest because of its high policy relevance, and the economic and econometric issues involved. As regard the method, many authors ([27]) have noted serious shortcomings in Aschauer's approach both from an economic and econometric perspective. The major issues which have played a role in the subsequent literature concern the difficulty to disentangle the different effects of infrastructure on growth, the possible "reverse causation" effects (from GDP to infrastructure), the possible misspecifications of the model and the statistical problems with infrastructure data availability.

This wide array of challenges has triggered a large follow-up in the literature, displaying a wide variation in geographic scope and estimation specifications and methods. Over time, two tendencies can be observed: first, the attempts to overcome the data availability problems through compiling longer time series and adding a geographic cross-section dimension; second, the application of more sophisticated estimation methods. As regards the underlying economic model, the literature can be divided into two key approaches. The first one is, the "production function" approach, i.e. enhancing the standard macro production function with (public) infrastructure as (free) production factor. The second is the "cost function" approach ([28]) which measures the productivity effects of public infrastructure in terms of cost savings.

3.2.2. Data challenges: monetary or physical values?

The challenges encountered in the empirical work using public capital as a proxy for (public) infrastructure have prompted some authors to use more targeted measures for infrastructure, monetary values and physical ones. A systematic discussion of the pros and cons of using public capital or more focussed measures appears absent from the literature. Shanks and Barnes (2008) does

([27]) Shanks and Barnes (2008, p.7 and pp 15-25); Calderon and Serven (2002, pp5-7).
([28]) Shanks and Barnes (2008; pp. 29-30, A14-15).

not devote more than a paragraph in a box to physical measures and admit that data limitations often prompt authors to use a stock variable in value terms rather than the theoretically preferred "flow of capital services".

González Alegre *et al.* (2008) indicate how crude the measures of public capital and investments are**.** They find that traditional infrastructure accounts on average for about 33% of overall government investment while for some specific countries this share runs up to about 40% ([29]). For a part, this huge difference in value comes from the investments in public housing and hospitals. Moreover, aspects of both valuation and aggregation reduce the adequacy of the resulting measure for growth and productivity estimations. Government investments aggregate many types of infrastructure on the basis of construction costs rather than use value, hence implicitly assuming away composition effects (and also differences in prices and efficiency across countries) ([30]). Consequently, all types of public capital are effectively assumed to be homogeneous as regards their productivity impact.

Égert *et al.* (2009) argue that the process of liberalisation and privatisation have rendered government expenditures / investments a less reliable proxy for (public) infrastructure expansion as most of the physical capital and investments are no longer classified as government expenditures. Arguably, this argument is quite relevant for EU countries as the EU has undertaken a process of market opening of network industries since the 1990s. In railways, electricity and communications, network investments are undertaken by private and state-owned enterprises. In some cases (railway in particular), the company can receive "investment grants" that would not be recorded as public gross fixed capital formation ([31]). Moreover, in road, some countries have used concessions to develop infrastructures, which might not be accounted in public gross capital formation. Ignoring them is a straightforward underestimation of infrastructure development. The unbundling of network operators and services makes financial data on infrastructure investment more difficult to identify. Moreover, market opening in this area underlines the issue of providing incentives to invest rather than spending public money ([32]).

Finally, the empirical literature on infrastructure rarely focuses on EU countries. Little empirical work has been done for the new EU Member States (Rutkowksi, 2009). Probably for this reason, the literature does not account for the role of EU funds in financing infrastructure. Here again, data on national public spending would underestimate the real amount of financing devoted to infrastructure, or at least leave out the part financed by the EU ([33]).

Given data limitations in terms of availability and accounting, there are some grounds to use physical data rather than financial ones. A large part of the empirical literature has used physical data when investigating infrastructure and growth, while acknowledging its limitations in terms of information on costs and quality.

3.2.3. Overview of empirical studies

Tables A1.1 and A1.2 in Appendix 1 present an overview of empirical studies. They are largely based on Shanks and Barnes (2008) and Égert *et al.* (2009).

A few general observations can be made. First, the sample shows that more targeted measures for infrastructure have been used after the Auschauer (1989a, 1989b) studies, in particular after the year 2000. Second, the number of studies using data for

([29]) Namely, the EU15 "cohesion countries" (Greece, Ireland, Portugal, Spain) which over the period of observation, 2000 -2005, have a higher share than the group of EU12 countries.
([30]) Canning and Pedroni (1999).
([31]) However, as mentioned by González Alegre *and a*l (2008), public ownership does not imply that investment is a government one. According to the national account rules, the principal source of revenues determines the recording of investment in corporate or government investment.
([32]) Such an issue goes beyond the scope of this paper. For example, Égert (2009) has carried out an empirical investigation on the role of incentive regulation and regulatory independence in boosting investment in network industries of OECD economies. He finds that incentive regulation associated with an independent sector regulator has a strong positive impact on investment in network industries.
([33]) The minimum national contribution to interventions supported by Cohesion Policy funds (Cohesion Fund, ERDF) varies, in the current programming period (2007-2013), between 15% and 50% of total eligible expenditure, depending on the relative wealth of the country and/or region concerned. The poorer the region and the Member State, the lower the national co-financing requirement.

European countries appears relatively modest. No study has been found which takes the EU as a scope of study. Third, just like the wider empirical literature which has used public capital as infrastructure proxy, there is a natural tendency over time to use longer time series, more cross-sectional aspects (regions and countries) and more sophisticated estimation models. Fourth, one can tentatively conclude that the cost function approach has not quite established itself as an alternative for the production function approach. This is probably due to the higher data requirements and because it does not directly generate an estimate of the growth effect. Fifth, as regards studies on specific types of infrastructure, the sample strongly suggests that more studies have been carried out for road and telecom infrastructures, and much less so for electricity and rail.. Finally, the notion that a co-integration (long-term) relation is crucial for establishing the correct magnitude of the growth effect of infrastructure is present in the literature since the 2000s.

More importantly, the literature has not produced a clear convergence in views on the quantitative size of the growth impact of infrastructure and has not observed any common effects of infrastructure on growth. The results largely depend on the country, the existing capital stock, the time frame and type of infrastructure considered. Some recent empirical works find a positive relationship between infrastructure and growth in OECD countries. Kamps (2005) analyses the impact of public capital on real GDP in 22 OECD countries. In most cases, he finds a positive relationship with a long-run elasticity between 0,41 and 0,84 (Denmark, Finland, France, Greece, Portugal, Spain). Jong-A-Pin and de Haan (2008) find a positive relationship between public capital and output in Sweden, Finland, France and Greece, but a negative one in Ireland, Portugal, United Kindgom, Belgium and Spain. Canning and Pedroni (2004) and Égert et al. (2009) find a positive relationship in some countries, but the results vary across infrastructure types. Other previous empirical studies also find a positive long term relationship between infrastructure and growth in Australia and the US (Otto and Voss, 1992, 1994; Garcial-Mila and McGuire, 1992; Madden and Savage, 1998). Similarly, Broyer and Gareis (2013) concluded based on a VAR specification concerning France, Italy, Germany and Spain that an increase in public infrastructure investment is associated with an increase in output, private investment and employment. Their estimates for the output elasticity of public infrastructure investment ranged between 0.09 for Spain to 0.22 for Italy, with a weighted average equal to 0.17. More recently IMF in the world economic outlook (2014) included a study on the infrastructure investment and supported that there is a positive relationship between infrastructure investments and output, both in the short and long-run. The authors claim that the magnitude of this impact increases during periods of low growth and high investment efficiency. Bom and Ligthart (2011) carry out a metaregression analysis based on 578 estimates from 68 studies which cover the period 1983-2008. They find a range of estimates from -1.726 to 2.040. The authors suggest that most of the variation found in elasticities are explained by study design characteristics such as the definition of public capital and output, restrictions on return to scale, the impact of business cycle, the stationarity of variables and endogeneity concerns. Controlling for all these factors, they estimate a long run estimate of public capital elasticity of 0.17/0.14.

Finally, the literature provides different views on the direction of the relationship between infrastructure and growth. Some authors ([34]) discuss the estimation challenges and acknowledge that a strong statistical association does not provide any information on the direction of the causality. Moreover, in some infrastructures, the causal relationship might be bi-directional. Fedderke and Garlick (2008) review the evidence from the empirical literature in developing countries and point to different relationship depending on the type of infrastructures. In general, road are found to drive growth. The same is observed for public investments as a whole. By contrast, GDP is found to drive ports' freight handling levels and airports' passenger levels. Finally, the findings are less straightforward for electricity and rail. Most of the authors find a bi-directional causality in electricity.

([34]) Fedderke and Garlick (2008), Calderon and Serven (2004).

Box 3.1: **Infrastructure and growth**

A large number of empirical studies have been carried out to assess the relationship between the capital infrastructure and the economic growth. The majority of them follow Aschauer's famous work (1989a) and base their estimates on the production function approach. In particular, the study of Canning and Pedroni (2004) uses a supply side model to analyse the impact of infrastructure on growth with physical measures of infrastructure.

Canning and Pedroni derive from their growth model a "bi-variate" cointegration relation between (the log of) output (GDP/capital) and (the log of the) stock of infrastructure. They start with a growth model derived from Barro (1990) and present a Cobb-Douglas production function, as follows:

$$Y_{it} = A_{it} F[K_{it} G_{it} L_{it}] \qquad (1)$$

Where Yit is the aggregate output, Git is the infrastructure capital, Kit is the other capital, Lit is the labour and Ait is the total factor productivity. Furthermore, for simplicity reasons, they assume that an increase in infrastructure investment reduces the investments in other types of capital, as infrastructure investment is financed out of savings (s), implying that:

$$G_{t+1} = r_t s Y_t \qquad (2)$$
$$K_{t+1} = (1 - r_t) s Y_t \qquad (3)$$

To complete their growth model, the authors assume that the technical progress, the share of investment going to infrastructure as well as the size of the workforce is determined by an exogenous stochastic process. The presence or not of a unit root in per capita income will be generated following different assumptions on the random term (stationarity) of total factor productivity and the income share of parameters of the production function. Taking into account these assumptions and equation (2), they derive the specification of their growth model and the relationship between infrastructure and income per capita, which is given form the following dynamic specification (ECM) ([1]):

$$g_{t+1} - \bar{r} - s - y_{t+1} = \Delta y_{t+1} + \mu - \bar{n} - n_{t+1} \qquad (4)$$

They justify the absence of other key variables in the co-integration relation (notably private capital and human capital) with the argument that "many economic variables tend to move together in a long-run relationship with per capita income," and hence (although this is not explicitly argued) the output variable adequately represents the movement of all the other factors not present in the long-term relation. They also mention that a positive shock of infrastructure will increase income per capita only when the proportion (r) of savings spent on infrastructure investments is below the optimal level and vice versa. Egert et al (2009) point to the strong assumptions of the authors, i.e. the instantaneous depreciation of infrastructure, which lead them to overcome the problem of omitted variables and help them to reduce the problem to two variables.

The advantages of their approach are simplicity and parsimony, which matters in view of the limited number of observations. Moreover, the estimates of the error-correction equation inform on the direction of the causality and whether the amount of infrastructure is below or above the optimal (i.e. long-run) level. The authors find that shocks in infrastructure indeed affect economic growth in the subsequent periods, in particular when the stock of infrastructure is relatively low vis-à-vis the level of output. For roads and telecom infrastructure, the level of infrastructure is found to be on average close to optimal, while electricity production capacity is on average under -provided, which may explain why so many studies have found strong significant growth impacts from electricity infrastructure.

([1]) The variables are in logs.

3.3. MODEL

Following the work carried out by Canning and Pedroni (1999 and 2004), the relationship between GDP per capita and infrastructure provision per capita, for electricity sector and inland sector (road and rail), over the period 1950-2012 is investigated. The objective is to see whether there is a long term relationship between both variables (see Box 3.1) and how they relate to each other. For this purpose, a panel analysis is employed, consisting of three main steps.

First, in order to determine the appropriate empirical approach, the time series properties of the data are analysed and the series are tested for stationarity. Second, after determining the order of integration in the series, heterogeneous panel cointegration tests are used to investigate whether a long term relationship between the variables exists. Where this was applicable, the cointegrated relationship between both series is then analysed in order to estimate the long-run relationship between infrastructure and GDP based on the Full Modified OLS and Dynamic OLS estimations of the following specification:

$$y_{it} = a_i + \beta_1 g_{it} + \varepsilon_{it} \qquad (1)$$

where i is the country (for i = 1,…,28), t is time (for t = 1950,…,2012), g_{it} is the measure of physical infrastructure per unit in country i at time t, y_{it} is GDP per million people in PPS, α and β are the coefficients for the individual effects and the independent variable, respectively and ε is the error.

Finally, as a third step where there was a co-integrating relationship, a panel error correction model was chosen, including the lagged error of equation (1), so as to be able to assess in which way the causality is running and to distinguish between long-run and short-run effects. Appendix 4 provides more details on the model.

3.4. DATA

The model uses a physical infrastructure approach − kilometres of roads and railway lines (transport) and megawatt of electrical capacity (electricity). As regard transport, the model uses a composite indicator reflecting the combined network length of road and rail infrastructure. ([35])

Data availability as well as the review of the empirical literature played a role in choosing physical data ([36]).

The difficulty was to find long time series with cross-country comparable data. Eurostat provides data from 1990 until 2008. In general, the literature uses the database of Canning (1998) with a time span of 1950 to 1998 a starting point. It has later been updated and merged with the World Bank database (Canning, 1998; Canning and Farahani, 2007). In this paper, the merged database of Canning and the World Bank is used. It is updated with Eurostat data when possible (see Appendix 2 for more details). GDP per capita in PPS is retrieved from the AMECO database of the European Commission.

In order to express all the variables with the same magnitude, values are expressed in per capita terms (divided per million people). The population series comes from Eurostat. A logarithmic transformation is applied to every series.

3.5. RESULTS

The findings from the econometric analysis ([37]) indicate that in the long term both transport and electricity infrastructures are positively correlated with GDP (see Table 3.1 and Graph 3.1). Investments in electricity capacity and transport infrastructure have a long-term horizon, and are thus expected to provide long term supply effects. These results are consistent with the findings provided by the empirical literature where

([35]) The indicator is calculated as a weighted sum of the total length of the road and rail network. The weights are proportional to the road and rail traffic per network kilometre, with traffic calculated as the geometric mean of the passenger and freight tonne kilometres. The calculation results in a weight of 1 for one kilometre of road and a weight of 2.614 for one kilometre of rail.

([36]) See section 3.2.2 for more information.

([37]) See Appendix 3 for detailed results and Bom and Lightart (2011) for a recent review of empirical estimates. The relationship can be negative for some countries with high stock of infrastructure.

most of the empirical studies find a positive relationship([38]).

As regards the magnitude of the relationship, the size of the long-run elasticity for both sectors is in line with the existing literature. As mentioned in section 3.2 and appendix 3, estimate range widely from 0.06 to 0.84. Most of these differences can be explained by the econometric specifications, the sample coverage and time span, but also by other dimensions such as the type of infrastructure and the definition of output (see Bom and Lightart (2011) in section 3.2)

Results reveal that the time trend is positive and significant. This may be regarded as long-run technological innovations effects on growth (Canning and Pedroni, 2008).The positive sign of the trend over the output might reflect the efficiency gains over the period.

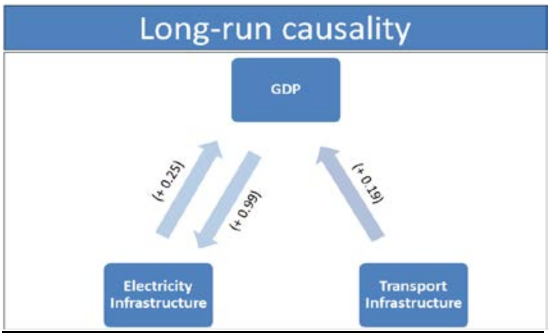
Table 3.1: **Panel long-run estimates**

	Dependent Variable:GDP	
Variable	$GDP_{it}= \alpha_i+\gamma*t+b*El_{it}+\varepsilon_{it}$	$GDP_{it}= \alpha_i+\gamma*t+b*RORA_{it}+\varepsilon_{it}$
FMOLS b-Coeff.	0.250***	0.189***
Constant (a)	21.180***	20.585***
Trend (t)	0.019***	0.025***

Note: *, **, *** indicate significance at 10%, 5% and 1% confidence level.
FMOL: Fully Modified Ordinary Least Squares
Source: Commission Services

As regards the causality, electricity and transport infrastructures drive GDP growth in the long-run. In the case of electricity capacity, the long-term causality with GDP is bidirectional, i.e. GDP has a positive effect on electricity capacity, in line with Canning and Pedroni's findings (2008) and other studies (Fedderke and Garlick, (2008). This could be related to the fact that economic growth leads to higher electricity consumption and hence higher generation capacity is needed to meet the increased demand. By contrast, the unidirectional causality running from inland transport infrastructure to GDP, implies that higher economic growth demands higher levels of infrastructure investments, given that these investments have not exceed the growth-maximizing level. The literature is inconclusive on the direction of the causality and, thus this finding would require further investigation.

Graph 3.1: **Long-term relationship between GDP and infrastructure stock**



Source: Commission Services

Short-run shocks in electricity and transport infrastructure appear to have less substantial impact on the current GDP level. This suggests that positive effects from investments in transport or electricity infrastructure require time to materialise. However, the findings indicate that the infrastructure provisions and GDP always converge to their positive long term relationship and that any shocks do not have a permanent impact.

([38]) It should be noticed the range of estimates on the sign of this relationship is wide. This is explained by different factors such as the type of variables chosen, the time span investigated and the methodologies used, Canning and Pedroni (2004), Kamps (2005), Jong-A-Pin and de Haan (2008) and Egert et al. (2009), Otto and Voss (1992, 1994), Garcial-Mila and McGuire (1992) and Madden and Savage (1996) for Australia and US.

4. ASSESSING RECENT INVESTMENT PATTERNS IN THE EU

4.1. INTRODUCTION

Over the past decade, investment in infrastructure has been hit by the crisis. While some countries may have heavily invested in infrastructure during the pre-crisis period, the same countries have been particularly hit by the crisis. Lack of investment hampers growth, but over-investment also negatively impact growth. Thus, it is important to analyse the recent investment patterns in Member States.

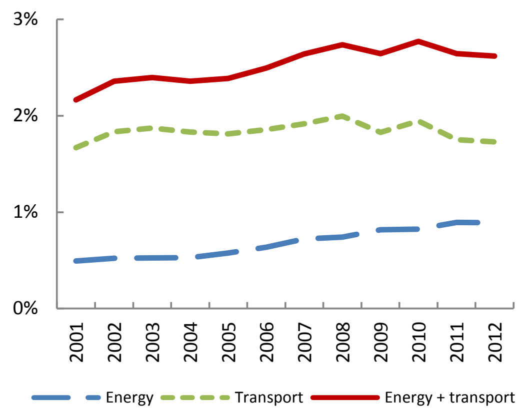
This chapter analyses the investment patterns of Member States in a pre and post crisis context and provide an attempt to understand the investment evolution in the light of macro-economic trends.

4.2. INVESTMENT AND MAINTENANCE SPENDING DURING THE CRISIS IN THE EU

Compared to other sectors, investments in energy and transport have slightly decreased after the crisis The infrastructure investment rate (i.e. the ratio of gross fixed capital formation (GFCF) to GDP) in the combined transport and energy sector ([39]) increased from 2.2 to 2.7% in the pre-crisis period 2001-2008 (Graph 4.1). During 2008-2012 the rate decreased by 0.1pp; a 0.2pp increase in the energy sector rate was offset by a 0.3pp decrease in the transport sector rate. GFCF in the combined transport and energy sector decreased less sharply than that in other sectors in the economy during the post-crisis period (Graph 4.2).

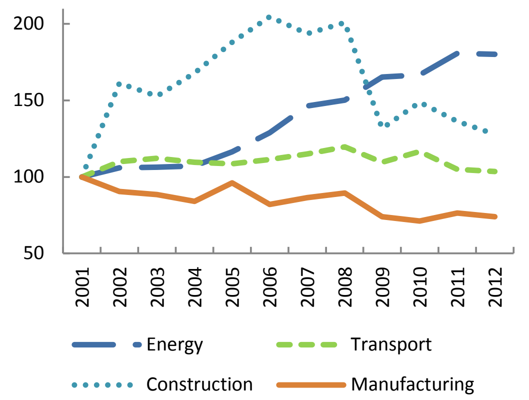
The data at EU level masks disparities across different Member States. In some Member States, the investment was low during the pre-crisis period and did not increase after the crisis. By contrast, in other Member States, the investment rate was quite sustained before the crisis in conjunction with an increase in construction investment ([40]).

Graph 4.1: **Evolution of GFCF rate in the transport and energy sector**



Source: Commission Services based on Eurostat

Graph 4.2: **GFCF in different sectors (index 2001=100)**



Source: Commission Services based on Eurostat

4.3. ASSESSING INVESTMENT PATTERNS IN THE EU: METHODOLOGICAL APPROACH

Assessing investment patterns helps understand the recent evolutions of Member States before and after the crisis. For this reason, it is useful to identify the presence of over- or underinvestments in Member States, i.e. the expected investment rate taking into account demand and structural factors.

([39]) The transport and energy sectors cover the sections D and H of the NACE rev 2 nomenclature, respectively. Furthermore, they include the parts of Section F (construction) which cover transport and energy infrastructure, respectively. The share of the parts of Section F covering transport and energy infrastructure are estimated at 15.8% and 0.9%, respectively, based on Eurostat structural business statistics data for the period 2008-2012.

([40]) DIW (2014).

Table 4.1: **Overview of dependent and explanatory variables**

Dependent variable	Explanatory variables
1.Road infrastructure investment rate	- Road use
2.Road infrastructure maintenance spending rate	- Cohesion dummy variable
	- Road network density
	- Industrialization rate
	- Employment rate
3.Rail infrastructure investment rate	- Rail use
4.Rail infrastructure maintenance spending rate	- Cohesion dummy variable
	- Rail network density
	- Industrialization rate
	- Employment rate
5.GFCF rate in the energy sector	- Electricity consumption
	- Cohesion dummy variable
	- Industrialization rate
	- Employment rate

Source: Own calculations based on data from OECD (road and rail infrastructure investment and maintenance spending rate) and Eurostat (all other data)

In this analysis under- or overinvestment is defined as the difference between the observed investment rates and the investment rates predicted by an econometric model accounting for specific macro-economic and sector-specific factors which impact on the investment rate in these sectors. Given the shorter period under scrutiny, monetary data are used as opposed to physical data in the previous chapter.

The analysis zooms in on investment in the road, rail and energy sectors. It also analyses maintenance spending on road and rail infrastructure. Maintenance is closely linked to the length of the network, but also to the traffic intensity as it influences wear and tear of roads. Under-spending in maintenance can lead to a deterioration of the quality of the network, hence lowering the efficiency of the whole network (see section 2.2).

The methodology consists of a number of steps ([41])**.** First, based on annual panel data from 1996 to 2012, an econometric model is estimated. It specifies the investment or maintenance spending rate as a function of a number of macro-economic and sector-specific indicators (see Appendix 4 for details). Second, the estimated coefficients are used to calculate the model-predicted investment rate for each Member State and each year. The predicted investment rate can be interpreted as a long-run equilibrium or structural investment rate, commensurate to a Member State's macro-economic and sector-specific fundamentals. As a final step the predicted value is compared with the observed investment rate in order to identify over- or underinvestment.

A number of caveats to the methodology used should be noted. First, the terms over- and underinvestment should not be interpreted as representing the difference between the actual investments and the investment *needs*. While infrastructure investment needs correspond to a specific objective set by policy makers (e.g. connectivity, network coverage, policy target), over- or underinvestment refer to deviations of the observed investment rate from the model-predicted investment rate based on the internal macro-economic and sector-specific factors of a region or country. Second, the analysis rests on the assumption that the statistical relationship between the macro-economic and sector-specific indicators and the investment (maintenance) rate is common to all Member States. Third, due to data constraint, the investment rates do not dissociate private and public investment. Fourth, the focus on monetary measures of investment does not capture possible differences in efficiency of investment between countries and over time.

4.4. DATA AND SPECIFICATION

The econometric model is estimated based on panel data using country fixed effects (see

([41]) The methodology is based on a similar approach used by DIW (2014) to assess over- and underinvestment in overall gross fixed capital formation in OECD countries.

Table 4.2: **Over- and underinvestment before and after the crisis (difference between observed and predicted investment rate, pp)**

Subsector	Member State group	Pre-crisis average (1995-2007)	Trough*	Post-crisis average (2008-2012)
Road infrastructure investment rate	Core EA	0.005%	-0.071%	-0.021%
	Rest of EA	0.014%	-0.092%	-0.050%
	New Member States	-0.102%	0.186%	0.351%
	Rest of non-EA	-0.009%	-0.001%	0.043%
Rail infrastructure investment rate	Core EA	0.01%	-0.05%	-0.04%
	Rest of EA	-0.022%	0.009%	0.067%
	New Member States	-0.01%	0.00%	0.03%
	Rest of non-EA	0.023%	-0.083%	-0.070%
Road infrastructure maintenance spending rate	Core EA	-0.01%	-0.01%	0.01%
	Rest of EA	0.046%	-0.059%	-0.072%
	New Member States	-0.02%	0.06%	0.11%
	Rest of non-EA	0.015%	-0.087%	-0.043%
Rail infrastructure maintenance spending rate	Core EA	-0.01%	-0.01%	0.04%
	Rest of EA	-0.026%	-0.059%	0.055%
	New Member States	0.01%	-0.01%	-0.03%
	Rest of non-EA	-0.013%	0.033%	0.042%
GFCF in energy	Core EA	-0.01%	0.01%	0.03%
	Rest of EA	-0.054%	-0.031%	0.190%
	New Member States	0.03%	-0.14%	0.04%
	Rest of non-EA	-0.103%	0.155%	0.271%

*"Trough" corresponds to the year in the 2008-2012 period in which the observed investment rate was the lowest.
Source: Commission Services

Appendix 4 for technical details). The estimations are done with five different dependent variables, corresponding to the different subsectors under analysis, i.e., (i) road infrastructure investment rate, (ii) road infrastructure maintenance spending rate, (iii) rail infrastructure investment rate, (iv) rail infrastructure maintenance spending rate ([42]), and (v) gross fixed capital formation rate in the energy sector ([43]). The set of explanatory variables differs between subsectors, taking account of macro-economic characteristics, sector-specific variables and possible EU funding.

Transport-specific variables account for the existing stock of infrastructure and the use of it. High provision of infrastructure is expected to induce less investment in new infrastructure, but higher maintenance costs. The provision of infrastructure is given by the network density. The road network density variable is equal to the length of the road network in kilometres divided by the population. The rail variable is analogously computed based on the length of rail tracks. By contrast, higher use of infrastructure measured by the road and rail traffic intensity on the respective networks ([44]) would justify additional investments as well as higher maintenance spending.

The electricity consumption variable accounts for the use of the electricity infrastructure. Higher electricity consumption would justify a more extensive electricity network and hence higher investment in electricity generation capacity. However, one important shortcoming is that the model does not specifically account for the infrastructure investments required by the penetration of new low carbon technologies. Such limitations might lead to underestimation of the model-predicted investment rate in that sector (see below).

Macro-economic variables take account of the characteristics of the country and its economic structure. The industrialization rate is equal to the share of the industrial sector in total gross value added. A higher share of manufacturing is expected to induce higher investments in

([42]) Data on road and rail infrastructure investment come from OECD (2013). Investment includes new construction, extensions, reconstruction, renewal and major repair. Maintenance covers other maintenance expenses. Estimates of under- and overinvestment based on GFCF in transport give a more aggregate picture and confirm the results at sector level.

([43]) The energy sector covers section D of the NACE rev 2 nomenclature plus the parts of Section F (construction) which covers energy infrastructure. The share of the part of Section F covering energy infrastructure is estimated at 0.9%, based on Eurostat structural business statistics data for the period 2008-2012. GFCF in the energy sector includes GFCF in grids (transmission and distribution) as well as generation.

([44]) Road use is calculated as road traffic divided by road network length, where road traffic is calculated as the geometric mean of road passenger kilometres and road freight tonne kilometres. The rail use variable is analogously calculated.

infrastructure. The employment rate represents the active share of the total population. The expected relationship with investment depends upon whether labour and infrastructure investments are complements or substitutes in production ([45]).

The level of income plays an important role in infrastructure investment. In the case of the EU, lower income countries benefit from support from EU's structural funds ([46]). The cohesion variable is a dummy variable which has the value one for Member States receiving support. This is considered to be the case during multi-annual framework periods if the ratio of absorbed cohesion policy funding to national GDP exceeded a certain threshold ([47])

4.5. INVESTMENT PATTERNS IN MEMBER STATE GROUPS: COMPARISON IN THE LIGHT OF MACRO-ECONOMIC TRENDS

The impact of the crisis as well as infrastructure provision and transport-modal orientation differ across Member States. Member States have been grouped into four different groups ([48]), i.e., (i) Core Euro Area, (ii) Rest of Euro Area, (iii) New Member States, and (iv) Rest of non-EA countries ([49]). The analysis of under- and overinvestment is carried out for each of the Member State groups ([50]) and for each of the subsectors. Annex I provides results for individual Member States.

The results of the analysis show a complex picture reflecting substantial differences in investment profiles, both between subsectors and across Member State groups (Table 4.2 and Graphs 4.3 - 4.7).

In road infrastructure, there are indications of underinvestment in the Euro Area during the post-crisis period. The two Euro Area groups (i.e. Core EA and Rest of EA) appear to have lower investment patterns compared to what could be predicted in the post-crisis period, following a period of overinvestment before the crisis. This pattern is most pronounced in the Rest of EA Member States and is likely to reflect an adjustment following the construction-focused investment boom in the pre-crisis years. By contrast, the other two Member States groups (New Member States and Rest of non-EA), display investment above the predicted rate during the post crisis period, following underinvestment in the preceding period. This pattern is most pronounced in the New Member States group, where it is linked to the sustained increase in the investment rate throughout the period under consideration. This reflects a catch-up effect in combination with increasing EU funding, which has been provided in the context of the cohesion policy.

As for maintenance spending on road infrastructure, the results indicate a situation of underspending during the post-crisis period in the Rest of EA and the Rest of non-EA group. Interestingly, for each of the country groups, the pattern of the difference between the observed and predicted line appears to be opposite of that for road investment spending. This suggests that overinvesting in new infrastructure is associated with underspending on maintenance, and vice versa.

For rail infrastructure, results point to underinvestment in the Core EA and Rest of non-EA countries during the post-crisis period. In the case of the Core EA group the underinvestment amounts to a larger shortfall than for road infrastructure. Observed investment rates in the New Member States group have generally been below the predicted rate, which can be related to the historical focus on the rail mode. Hence, the

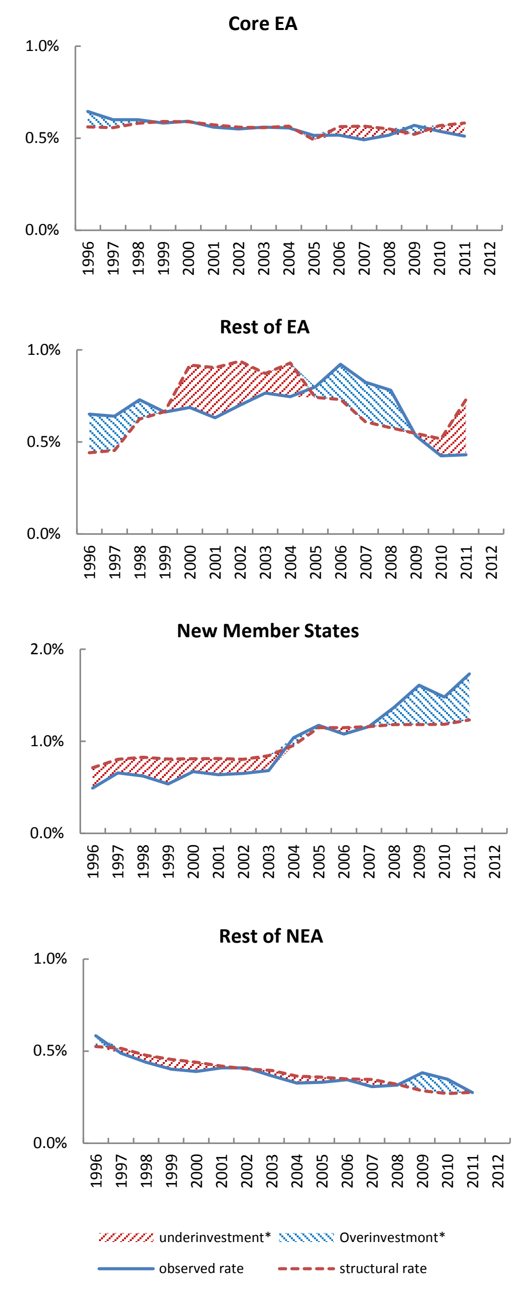
([45]) World Bank (1996).
([46]) However, given the development of infrastructure in Member States, the financial support has shifted towards other areas such as innovation, SMEs and social policies. See European Commission (2014d).
([47]) The threshold is determined as the median value of the ratio of absorbed cohesion policy funding to GDP for the 2007-2013 multi-annual framework period.
([48]) The main criterion has been the distinction between euro area and non-euro area countries. Each group has been further split. In the euro area group, the countries which have been hit hard by the crisis have been grouped together. In non-euro area countries, the new Member States have been isolated from the rest.
([49]) The Core EA group (core Member States of the Euro Area) includes AT, BE, DE, FI, FR, LU and NL. The Rest of EA group (other Member States of the Euro Area) includes CY, EL, ES, IE, IT, PT and SI. The New MS group (New Member States) includes BG, CZ, EE, HU, LT, LV, MT, RO and SK. The Rest of non-Euro Area group (Member States that do not belong to any of the other groups) includes DK, SE and UK.
([50]) The observed and predicted investment rates for the four Member State groupings are calculated as weighted averages of the corresponding Member State-specific investment rates

high provision of rail infrastructure in the past has reduced the need for new investments. In the post-crisis period the rate has increased up to a point above the predicted rate which, similarly as for road, could be related to EU funding provided following their accession. However, in this case the surplus is of a much lower magnitude than for rail. In the Rest of EA group, the rail infrastructure investment rate has exceeded the predicted rate since the beginning of the century, resulting on average in overinvestment during the post-crisis period.

As for maintenance spending on rail infrastructure, the results show that there is less underspending during the post-crisis period than during the preceding period. Only for the new Member States do the results indicate a situation of (minor) underspending.

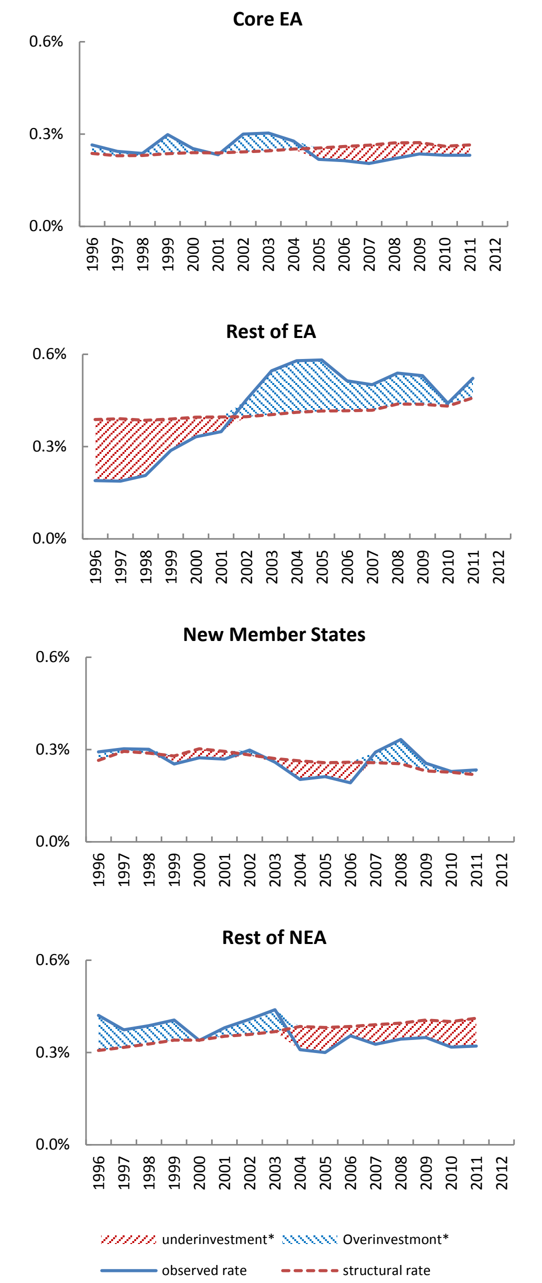
As regards the GFCF rate in energy, the analysis does not indicate underinvestment in the post-crisis period. The GFCF rate in energy has generally increased since the turn of the century in all Member State groups, in part reflecting increasing investments in renewable energy infrastructure. Notably, the investment rate has been largely unaffected by the crisis, resulting in comparatively high investment rates in recent years which have resulted in the current situation of overinvestment. In particular, in the Rest of EA and Rest of non-EA groups there seems to have been relatively high investments in energy in recent years. As mentioned above, the econometric specification does not specifically account for the ongoing energy transformation (aimed at high penetration of renewables) which induces investment needs higher than what can be predicted based on demand factors.

Graph 4.3: **Road infrastructure investment rate patterns**



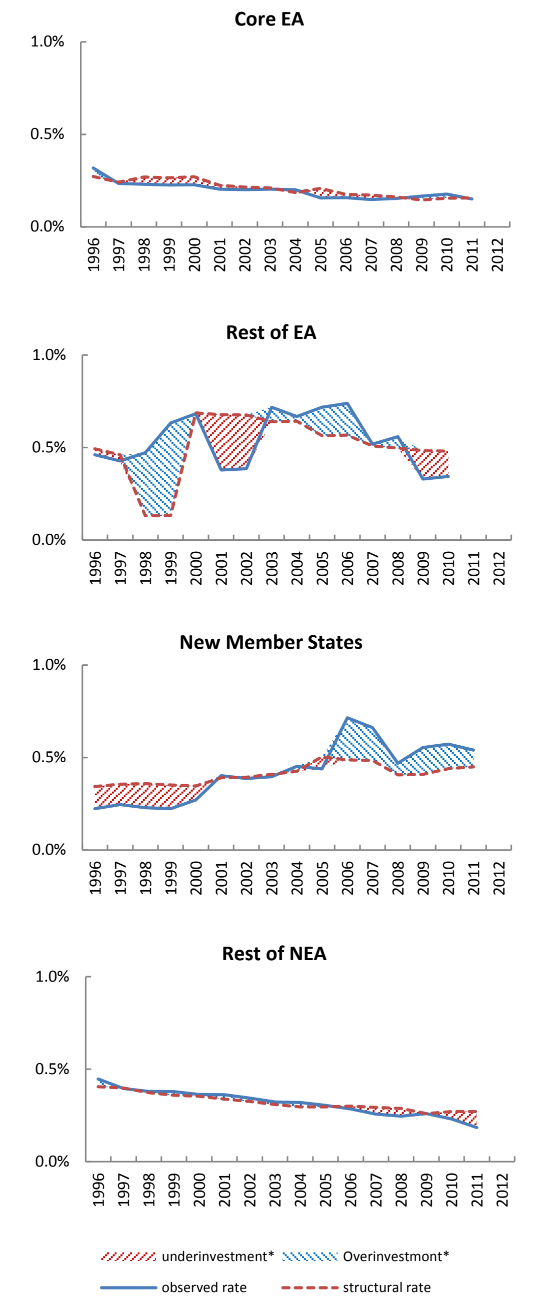
*Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.
Source: Commission Services

Graph 4.4: **Rail infrastructure investment patterns**



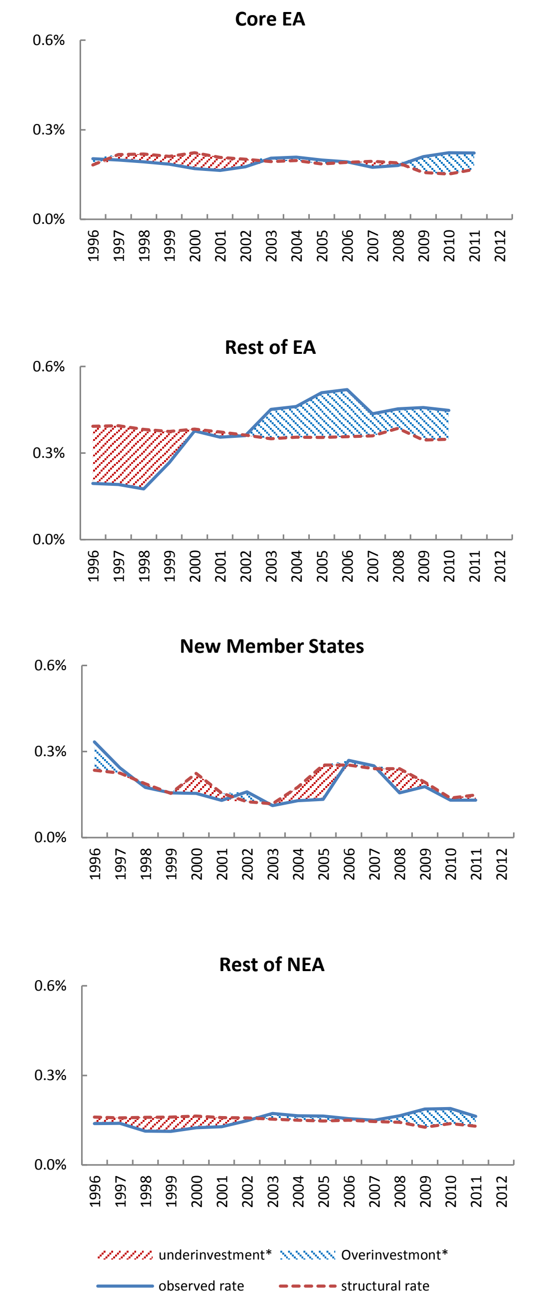
*Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.
Source: Commission Services

Graph 4.5: **Road maintenance spending patterns**



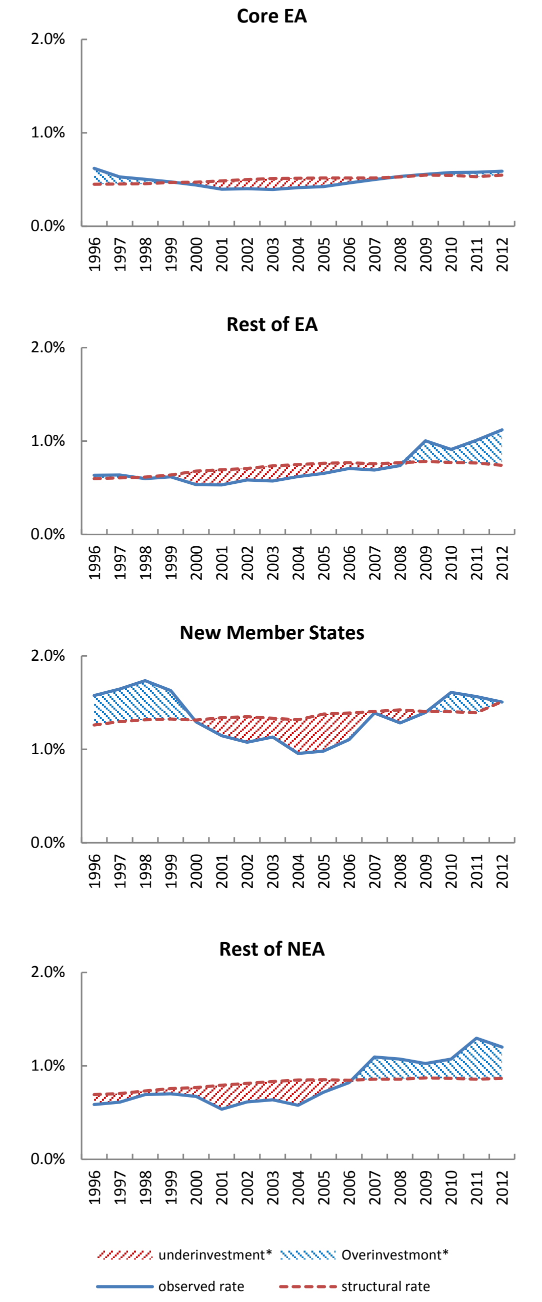
*Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.
Source: Commission Services

Graph 4.6: **Rail maintenance spending patterns**



*Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.
Source: Commission Services

Graph 4.7: **Gross fixed capital formation patterns in the energy sector**



*Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.
Source: Commission Services

5. CONCLUDING REMARKS

Over the past decades, infrastructure growth has been sustained in the EU, in particular in road transport, and to a lesser extent in other types of infrastructure – railways and electricity. In general, infrastructure provision is still lower in new Member States (except in railway). Filling the gap between the EU15 and the EU12 is justified for cohesion reasons and has provided the rationale of investing in infrastructure.

Energy and transport infrastructure needs are high on the policy agenda. Interconnections are crucial to complete the internal market, while the transition to the low carbon economy also requires massive investment in the energy and transport sectors. For this reason, investments are expected to remain high in this sector in the coming years.

As for the macroeconomic impact, there is a positive relationship between transport and electricity infrastructures and growth in the long term. Policies promoting spending in transport and electricity infrastructures can lead to positive impacts on growth provided there is no overprovision of infrastructure. In the case of electricity, the results furthermore show that growth, through increased electricity consumption, can translate into additional infrastructure investment, which in turn would benefit economic growth.

Analysis of recent infrastructure investment patterns shows different investment patterns across Member States. In Core Euro Area countries infrastructure investment has been low for both road and rail. In the Rest of EA countries, there seems to be an adjustment following a period of investment boom in the past. In New Member States, a sustained increase in the investment rate corresponds to the need to fill the gap with the rest of the EU. The result is an observed investment that is higher-than predicted in both road and rail transport infrastructure. In the energy sector, the analysis confirms the dynamic developments of investment in this sector, which reflects the recent transformation supported by the EU climate and energy agenda.

Current macro-economic conditions combined with the EU policy agenda provide opportunities to increase investment in infrastructure. However, this should be done in an appropriate way, taking account of the individual situation of economies in terms of infrastructure stock, transport and electricity demand as well as other parameters such as fiscal space and cost-benefit analysis of projects.

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APPENDIX 1

Literature Review

Table A1.1: **A selection of empirical studies using targeted infrastructure measures and the production function approach**

Author	Specification / method	Infra variable / dependent variable	Period	Data	Elasticity / Outcome	Comment
Otto and Voss (1992, 1994)	Cobb-Douglas	Investment in road infra / private sector TFP	1966-67 to 1991-92;	Australia; time series	Agg. 0,27	Follows Aschauer's approach
Garcia-Mila & McGuire (1992)	Cobb-Douglas	Capital expenditure highways (next to education) / gross state production	1970 - 1983	Cross-section, time series for 48 US states	Highways: around 0, 045	Cannot reject increasing returns to scale
Canning, Fay & Perotti (1994)	Output growth	Physical infra data for road, rail, electricity and telecom	1960 - 1985	Panel, 98 countries (cross-section & panel analysis)	Telecom and electricity significant. Road and rail unclear due to statistical problems	Relationship between infra level and output growth
Garcia-Mila et alia (1996)	Cobb-Douglas	Highways (next to water & sewer, and other public capital)	1970 - 1983	As (1992) study	Negative values, statistically insignificant	Preferred specification of first differences with fixed state effects
Madden and Savage (1998)	Cobb-Douglas, transformed into Error Correction Model (multivariate co-integration relation)	ITT capital (telephones) / labour productivity	1950 - 1994	Australia; time series	LR: 0,183 ; SR: 0,264 (on labour productivity)	Although no explicit co-integration relation specified, LR elasticities suggest one between labour, capital and telecom infra
Fernald (1999)	Translog	Roads infra	1953 -1989	US: macro and industries	0,35 to 0,38 for macro (outcomes for industry level not reported)	Takes account of congestion. Finds strong production spill-overs for roads through car use. Decreasing returns to additional investments to the existing stock.
Canning and Bennethan (2000)	Variant of translog	Physical infra data for road, electricity / Output	1960 - 1990	Panel, 62 countries	Roads 0,09; Electricity 0,09	Constant returns to scale imposed. Infra complementary with other types of capital
Stephan (2000)	Cobb-Douglas and translog	Road infra capital stock / regional GDP (in 2000 PPP)	1970 - 1995 (west DE). 1978 - 1992 (FR)	11 Länder (west)-DE; 22 French regions	Road infra significant; using "pooled" elasticities. For DE and FR generates more reliable estimates	Control with time trend and fixed cross-section effects. No account taken of inter-regional spill-overs
Kam (2001)	Variation on Barro's stochastic growth model, (see Canning & Pedroni) resulting in multivariate co-integration relation between GDP, infrastructure and private capital and time trend	Net public capital stock (plants & equipment + railways of general government and public enterprises) / labour productivity	1931 - 1991	Australia; time series	LR: 0,10 (output)	This study follows the path-breaking study by Lau and Sin(1997) with US public capital data. The estimates find in favour of exogenous growth relation and not an endogenous one (curiously here a restricted case of the former)
Roller and Waverman (2001)	Cobb-Douglas for aggregate production function; coupled with demand and supply functions for telecom investments	Penetration rate (main lines per capita) / GDP (in 1987 USD)	1971 -1990	21 OECD countries	Contribution to GDP growth, (about one third). Results similar in size as early literature on public capital. Growth impacts non-linear: they become much larger when threshold of universal service is exceeded	Control with fixed country effects mitigates the size of the outcomes. Estimations make use of price and waiting list data telecom.
Calderón and Servén (2002)	Cobb-Douglas	Total physical stocks of roads & rail combined; electricity and telecom / GDP (in 1990 PPP USD).	1960 - 1997	101 industrial and developing countries	Positive and significant growth contributions of physical and human capital and all three infrastructure asset types	Calculation elasticities only for Latin-American countries as it requires cost share data. The estimates for their infra elasticities have similar size for the various types. Few "outside" control variables collected (urban population, pop density).
Canning and Pedroni (2004, 2008)	Barro stochastic growth model (Cobb-Douglas prod function combined with specific capital accumulation functions relating reinvestment to fixed output shares; rewritten into a LR level estimation equation)	Total physical stocks of roads; electricity and telecom / GDP (in 2000 PPP)	1950 - 1992	Panel, 43 to 67 countries (exact number not reported)	On average countries are close to optimal level of infra provision for roads and telecom and under-provision for electricity (hence no growth impacts exceeding LR effect). The average hides strong variation over countries and infra type (with indications electricity has strongest growth impact)	The growth model condenses into a "reduced form" co-integration relation between physical infra and GDP. This relation includes the effect that resources spent on infra extension come at the expense of the other prod factors
Shanks and Barnes (2008)	MFP regressions (general-to specific selection of adequate ARDL representations of co-integration relation)	Public infra capital or roads; private telecom capital / TFP or labour productivity	1974/75 - 2002/03	Australia; time series (market sector and indiv. industries). Large set of control variables put up for possible inclusion.	High spill-over effect found for both wide public infra and just roads only (0,3 to 0,4). Smaller positive effect for telecom capital.	Authors question own estimation results, despite statistical significance: (i) implausibly high spill-overs public capital & roads, (ii) telecom effect imprecise. Moreover, no account for impact spatial spill-overs, measurement errors
Égert, Kozluk, Sunderland (2009)	Mankiw-Romer-Weil exogenous growth model: similar to Barro model (see above at Canning and Pedroni, 2004) but with different capital accumulation functions and without stochastic trends in inter alia technology	Total physical stocks of roads or motorways; rail; electricity and telecom / GDP (in 2000 PPP)	1960 -2005 (at maximum); actual time series have 16 - 25 annual observations	24 OECD countries (with CZ, DE, HU, LU, PL and SK excluded due to data problems).	Main conclusion: estimated growth model is significant, but no common effect found of infrastructure on output growth. Electricity has significant infra-specific effects (elasticity 0.17). Robust country-specific excess effects (mainly for electricity, much less so for rail and road, while telecom outcomes in doubt)	In contrast to Canning & Pedroni (2004), numerous control variables: (i) non-parametric (time trend and fixed cross-section effects; (ii) parametric (land area; human capital; total investments; tax revenues; trade openness)
Bom and Ligthart (2011)	Meta regression - dependent variable is the output elasticity of public capital	578 estimates collected from 68 studies	1983-2008	68 studies, 31 of them on the US; the rest on OECD countries.	Main conclusion: estimates are biaised by econometric specifications, data and publication bias. The authors find a short run elasticity of 0.051 and a long run elasticity of 0.14 when public capital is installed by national governments.	The authors focus on empirical studies using the Cobb-Douglas production function approach.
Broyer and Gareis (2013)	VAR model	Output, employment, private investment, infrastructure spending.	1995-2011, Quarterly data	France, Italy, Germany and Spain	The output elasticity of public infrastructure investment ranged between 0.09 for Spain to 0.22 for Italy, with a weighted average equal to 0.17	The authors find that infrastructure investment has a higher impact on activity in economic bad times than in economic normal times
World Economic Outlook (2014)	VAR-VECM, and Dynamic general equilibrium model	Electricity Generation Capacity, General Government Gross Debt, GDP, Private and public Gross Fixed Capital Formation, Quality of Roads, Real Public Capital Stock, Predicted Disbursement of Loans	1970-2013	EU, Asian, African, Pacific, South American countries	The effect varies depending if it concerns low-income developing countries or advanced/emerging market economies.	The effect varies depending if it concerns low-income developing countries or advanced/emerging market economies.

Source: Commission Services

Table A1.2: **A selection of empirical studies using targeted infrastructure measures and the cost function approach**

Author	Specification cost function	Infra variable / dependent variable	Period	Data	Elasticity (direct effect)	Elasticities on other production factors (indirect effects)
Keeler and Ying (1988)	Translog	Highway stock/costs trucking industry	1960 - 1988	US regions	Cost savings	Not reported
Seitz (1993)	Generalised Leontief	Length motorway system, public roads	1970 - 1989	West Germany, 31 2-digit industries, pooled industry-specific effects	Cost savings	Substitute for labour (-0,0004) Complement for capital (0,03 to 0,04)
Nadiri and Mamuneas (1996)	Normalised symmetric MacFadden	Highway capital stock	1950 - 1989	US, 35 2-digit industries; Pooled cross-section	On aggregate: -0,04 (costs) 0,04 to 0,06 (output)	Substitute for labour. Complement for capital
Khanam (1996)	Translog	Total core capital and highway capital stock	1961 -1994	Canada, Aggregate and provincial levels	Cost savings	Substitute for labour Complement for capital
Nadiri and Mamuneas (1998)	Translog	Highway capital stock; Other capital stock	1950 - 1991	US, 35 2-digit industries; Pooled cross-section	On aggregate: -0,08 (costs); 0,08 (output)	Substitute for labour. Complement for capital. (significant contributions to productivity growth, but with a steep decline over time
Sturm (2001)	Modified generalised symmetric MacFadden	Net stock of public grounds, roads & waterways (in value terms, derived through PIM)	1952 -1993	The Netherlands	-0,308	Substitute for labour (-0,243 ; yet not consistent over time). Substitute for capital (-0,526)

Source: Commission Services

APPENDIX 2
Building an infrastructure database

The infrastructure database has been built from Canning and Farahani (2007). In order to cope with the limited time dimension available, the technique used by Canning and Farahani (2007) is adopted. In 2007, Canning and Farahani merged two datasets from the World Bank and Canning (1998) in order to build a dataset over the period 1950-2005. The authors report the ratio and difference between the two series and merge the series. When the ratio between the two series is one, they used the Canning data to fill in missing observations in the World Bank series. When the ratio is close to one (or the difference close to zero) they adjust the Canning data corrected by a proportionality factor (ratio between the datasets) to match the World Bank data for the overlapping years. When the series match in some years but not in others the authors used a year in which they match to generate overlap. When the two series differed substantially the authors reported only the data set they believe was more consistent.

For the analysis in this note, four different data sets are used in order to build the infrastructure database - Canning (1998), the World Bank World development indicators, Eurostat and Transport statistical Pocketbook 2011 (for railways only). The datasets are merged to give an estimate of infrastructure over the period 1950-2012 using the method of Canning and Farahani (2007). The series are combined in order to obtain longer time series.

The Canning dataset covers the time span 1950-1995; the World Bank covers 1980-2002 (2009 for rail) and Eurostat covers 1970-2012 (1990 for electricity). Ratios and differences between the different series from different sources are calculated in order to identify the magnitude of the discrepancies between them. Data from Canning and the World Bank are used to match the Eurostat data for the overlapping years. Canning data were used to fill in gaps in Eurostat data, as both databases are very close to each other. When this was not possible because of the lack of overlapping years, the World Bank series were used. In order to adjust the datasets, we use a proportionality factor calculated as the average of the ratios between each couple of dataset. When the ratio is close to 1, the Canning or World Bank datasets are deflated by the proportionality factor in order to match the Eurostat dataset.

Table A2.1: **Physical Infrastructure Database**

Type of infrastructure	Source	Time span
Electricity generating capacity (Mw)	Canning (1998)	1950-1995
	World Bank, World Development Indicators 2006	1980-2002
	Eurostat	1990-2012
Railways (length of line in use, km)	Canning (1998)	1950-1995
	World Bank, World Development Indicators 2011	1980-2002
	Eurostat	1990-2012
	Transport Statistical pocketbook 2011	1995-2010
Roads (length of paved roads, km)	Canning (1998)	1950-1995
	World Bank, World Development Indicators 2006	1980-2002
	Eurostat	1979/90-2012

Source: Commission Services

Table A2.2: **Merged database per Member States**

Country	Motorways (km)	Railways (km)	Electricity (megawatt)
AT	1965-2012. Canning + Eurostat	1950-2012. Canning + Eurostat + Transport Pocketbook	1950-2012. Canning + Eurostat
BE	1970-2010. Eurostat Compound average estimated for 1971-1974 and 1974-1978.	1950-2011. Canning + Eurostat	1950-2012. Canning + Eurostat
BG	1968-2001. Canning + Eurostat. Compound average estimated for 1981-1984 and 1986-1989.	1950-2012. Canning + Eurostat	1950-2012. Canning + World Bank + Eurostat
CY	1963-2012. Canning + Eurostat. Compound average estimated for 1981-1984 and 1986-1989.	No railways in use	1950-2012. Canning + World Bank + Eurostat
CZ	1980-2012. Eurostat. Compound average estimated for 1980-1989.	1990-2012. Eurostat.	1990-2012. Eurostat
DE	1970-2012. Canning + Eurostat.	1950-2012. Canning + Eurostat Average estimated 2003-2005 and 2005-2007.	1950-2012. Canning + World Bank + Eurostat
DK	1952-2009. Canning + Eurostat.	1950-2011. Canning + Eurostat + Transport Pocketbook	1950-2012. Canning + Eurostat
EE	1990-2012. Eurostat.	1980-2012. Eurostat.	1991-2012. Eurostat
ES	1970-2009. Eurostat Compound average estimated for 1971-1974 and 1976-1978.	1950-2012. Canning + Eurostat + Transport Pocketbook Average 2002-2004	1950-2012. Canning + Eurostat
FI	1965-2011. Canning + Eurostat.	1950-2011. Canning + Eurostat	1950-2012. Canning + Eurostat
FR	1970-2011. Eurostat. Compound average estimated for 1971-1974 and 1974-1978.	1950-2012. Canning + Eurostat Average estimated 2006-2008.	1950-2012. Canning + Eurostat
EL	1970-1994. Eurostat.	1950-2011. Canning + Transport Pocket book.	1950-2012. Canning + Eurostat
HU	1951-2001. Canning + World Bank + Eurostat	1950-2011. Canning + Transport Pocket book. Average 2001-2008.	1950-2012. Canning + Eurostat
IE	1973-2009. Canning + Eurostat	1950-2011. Canning + Transport Pocket book.	1950-2012. Canning + Eurostat
IT	1960-1999. Canning + World Bank.	1950-2011. Canning + Eurostat	1950-2012. Canning + Eurostat
LT	1990-2011. Eurostat.	1980-2011. Eurostat.	1990-2012. Eurostat
LU	1959-1994. Canning + Eurostat Compound average estimated for 1971-1974, 1974-1978 and 1994-1994.	1979-2011. Eurostat + Transport Pocketbook.	1950-2012. Canning + Eurostat
LV	1990-2012. Eurostat.	1980-2012. Eurostat.	1990-2012. Eurostat
MT	1970-2008. Eurostat.	No railways in use	1950-2012. Canning + World Bank + Eurostat
NL	1963-2010. Canning + Eurostat.	1950-2011. Canning + Eurostatt + Transport Pocket book.	1950-2012. Canning + Eurostat
PL	1963-2010. Canning + Eurostat.	1950-2012. Canning + Eurostat	1950-2012. Canning + Eurostat
PT	1970-1994. Eurostat.	1950-2012. Canning + Eurostat + Transport Pocket book.	1950-2012. Canning + Eurostat
RO	1990-2012. Eurostat.	1950-2012. Canning + Eurostat + Transport Pocket book.	1950-2012. Canning + World Bank + Eurostat
SE	1959-2009. Canning + Eurostat.	1950-2011. Canning + Eurostat + Transport Pocket book. Average 1981-1983	
SI	1990-2012. Eurostat	1980-2012. Eurostat	1991-2012. Eurostat
SK	1990-2012. Eurostat	1990-2012. Eurostat	1992-2012. Eurostat
UK	1950-2011. Canning + Eurostat.	1950-2011. Canning + Eurostat + Transport Pocket book.	1950-2012. Canning + Eurostat

Source: Commission Services

APPENDIX 3

Methodology on establishing the relationship between infrastructure and growth

The relationship between GDP per capita and infrastructure provision per capita over the period 1950-2012 is examined. The objective is to see whether there is a long term relationship between both variables and how they relate to each other. For this purpose, a panel analysis is employed, consisting of three main steps: **First**, the order of integration of all variables is tested. **Second**, heterogeneous panel cointegration tests were used to investigate whether a long term relationship between the variables in question exists. **Third**, a panel based error correction model is developed in order to identify the short and long-run causal relationship between the variables examined.

Panel Unit Root Tests

The results of the LLC, IPS, Fisher-ADF, and Fisher-PP, Breitung and Hadri panel unit root tests, for each of the variable, are presented in Table A3.1. The test is performed both for the level and first difference of Electricity installed capacity (EL), GDP, and the composite indicator of road and rail (RORA).

Table A3.1: **Panel unit root test results**

		H0: Non-stationarity					H0: Stationarity	
		Common process		Individual process				
		Levin, Lin & Chu t*	Breitung t-stat	IPS W-stat	ADF - Fisher	PP - Fisher	Hadri Z-stat	Heteroscedastic Consistent Z-stat
Level								
	EL	5.601	5.919	9.351	33.033	34.523	25.819***	22.600***
	GDP	4.602	3.341	1.857	57.326	67.912	16.412***	13.509***
	RORA	-2.930***	-0.042	-1.403*	121.099***	109.521***	9.603***	9.715***
First Differences								
	EL	-12.056***		-11.521***	256.365***	278.610***	13.972***	14.759***
	GDP	-9.843***	-1.744**	-8.189***	161.400***	360.957***	6.798***	4.338***
	RORA	-28.987***	9.888***	-19.757***	534.671***	590.402***	3.820***	9.177***

Note: The optimal lag length was selected based on the SIC criterion. The null hypothesis is that the variable follows a unit root process, except for the Hadri Z-stat and the Heteroscedastic Consistent Z-stat. Probabilities for the Fisher-type tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. *, **, *** indicate significance at 10%, 5% and 1% confidence level.
Source: Commission Services

The null hypothesis of a unit root cannot be rejected for the IPS, Fisher-ADF, and Fisher-PP tests for all variables, except for the composite indicator of road and rail infrastructure. After taking the first difference of variables, the four first tests reject the null hypothesis at the 1% significance level except for the Hadri tests, which still indicate that all series remain non-stationary. Thus, the results are fairly conclusive and indicate that all variables are non-stationary in levels, and become stationary only in first differences, which mean that they are integrated of order one or I(1).

Panel Cointegration Tests

The next step involves the test for cointegration of the variables in question based on the heterogeneous panel cointegration techniques developed by Pedroni (1999) and Kao (1999). According to Pedroni (1999) the following general specification can be used to test for cointegration. It allows for heterogeneous intercepts and trend coefficients across cross-sections:

$$Y_{it} = a_i + \delta_i t + G'_{it} b \quad + e_{it} \qquad (1)$$

where i stands for cross-sections, t for time periods and α_i and δ_i are individual and trend effects, respectively, Y_{it} is the GDP per capita and Git is the infrastructure provision per capita. Under the null hypothesis of no cointegration, the residuals e_{it} will be I (1). The Kao test follows the same basic approach as the Pedroni tests, but specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors.

Table A3.2 reports the within and between dimensions of the panel cointegration tests and the Kao's test. The results of heterogeneous panel tests indicate that the null of no cointegration between GDP and electricity infrastructure can be rejected at the 1% significance levels only for the within-dimension Pedroni's (2004) tests and for the Kao's test. Similarly, the panel v-statistic and ADF-statistic (within dimension) reject the null hypothesis of no cointegration between GDP and road and rail infrastructure at 1% and 5% significance level. The same conclusion is derived by the Kao's test for the same relationship and at 10% significance level. However, contrary to the relationship of GDP with electricity infrastructure, the between-dimension test and in particular the group ADF-statistic implies that individual coefficients can be estimated in inland transport.

Table A3.2: **Pedroni and Kao residual cointegration test results**

	GDP- ELECTRICITY	GDP- ROAD&RAIL
	Alternative hypothesis: common AR coefs. (within-dimension)	
	Statistic	**Statistic**
Panel v-Statistic	2.792***	6.032***
Panel rho-Statistic	-2.241***	1.384
Panel PP-Statistic	-4.058***	0.070
Panel ADF-Statistic	-3.914***	-1.909**
	Alternative hypothesis: individual AR coefs. (between-dimension)	
Group rho-Statistic	0.991	1.903
Group PP-Statistic	-0.749	-0.621
Group ADF-Statistic	-1.015	-3.024***
Kao's test (ADF)	-2.638***	-1.449*

Note: The null hypothesis is that the variables are not cointegrated. Under the null hypothesis, all the statistics are distributed as standard normal distribution. *, **, *** indicate significance at 10%, 5% and 1% confidence level.
Source: Commission Services

The long-run equilibrium is then estimated using the FMOLS and DOLS technique ([51]) (Table A3.3). Results of panel FMOLS and DOLS indicate that GDP is correlated with electricity installed capacity and the composite indicator of road and rail infrastructure, while a positive time trend is significant in both equations. All of the estimated coefficients are positive and statistically significant at the 1% levels, implying that there is a strong long-run relationship between GDP and EL (Electricity) and GDP and RORA (Road and Rail) based on both approaches: FMOLS and DOLS.

Table A3.3: **Panel FMOLS and DOLS long-run estimates**

	Dependent Variable:GDP	
Variable	**$GDP_{it}=\alpha_i+\gamma*t+b*El_{it}+\varepsilon_{it}$**	**$GDP_{it}=\alpha_i+\gamma*t+b*RORA_{it}+\varepsilon_{it}$**
FMOLS b-Coeff.	0.250***	0.189***
Constant (a)	21.180***	20.585***
Trend (t)	0.019***	0.025***
R^2	97.00%	97.80%
DOLS b-Coeff.	0.255***	0.211***

Note: *, **, *** indicate significance at 10%, 5% and 1% confidence level.
FMOL: Fully Modified Ordinary Least Squares
DOLS: Dynamic Ordinary Least Squares
Source: Commission Services

Panel Granger Causality Tests

Once a long-run relationship between the variables examined has been identified, this relationship is used to estimate a panel error correction model, with the same specifications as in the co-integration tests. This

([51]) It is important to note again that the DOLS method has the drawback of reducing the number of degrees of freedom by including leads and lags in the variables studied, leading to less robust estimates. Hence, the DOLS estimation method is used to confirm the general trend and direction of the causality obtained by the FMOLS method.

will indicate the direction of the causal relationship of the variables in question, both in the long and short-run. Thus, the residuals of the lon-run model (equation 1) are included as regressors in the dynamic error correction model, which is specified as follows:

$$\Delta Y_{it} = a_{1i} + \lambda_1 \; EC_{It-1} \;\; + \textstyle\sum_{k=0}^{q} \beta_{11ik} \Delta Y_{it-k} + \sum_{k=0}^{q} \beta_{12ik} \Delta G_{it-k} \; + u_{1it} \qquad (2)$$

$$\Delta G_{it} = a_{2i} + \lambda_2 \; EC_{it-1} \;\; + \textstyle\sum_{k=0}^{q} \beta_{21ik} \Delta Y_{it-k} + \sum_{k=0}^{q} \beta_{22ik} \Delta G_{it-k} \; + u_{2it} \qquad (3)$$

Where Δ represents the difference operator, EC is the lagged error correction term derived from the long-run model (equation 1), α_i,λ_i and β_i are the coefficients, u_{it} is the error of the equations, Y_{it} is the GDP per capita, G_{it} is the infrastructure provision per capita and k is the number of lags based on Schwarz information criterion.

The direction of the causal relationship will be determined by the results of the Granger causality test. Hence, the short-run causal relationship between GDP and infrastructure provision will be identified by testing the significance of the coefficients ($\beta_{21,i}$) of the lagged differences of Y in equation (3) and respectively of coefficients ($\beta_{12,i}$) of the lagged differences of G_{it} in equation (2). Similarly, the long-run causality will be established by looking at the significance of the coefficient of the error term in each equation i.e. λ_1 and λ_2 in equation (2) and (3), respectively. For strong exogeneity of variable G, the joint hypothesis of H0: $\beta_{21,i}=\lambda_1=0$ is tested against the alternative and of variable Y the joint hypothesis of H0: $\beta_{12,i}=\lambda_2=0$.

Table A3.4: **Panel causality test results**

Exogenous Variables	Dependent Variables		Exogenous Variables	Dependent Variables	
	D(GDP)	D(EL)		D(GDP)	D(RORA)
Δ(GDP(-1))	0.436***	0.068	**Δ(GDP(-1))**	0.454***	-0.025
Δ(GDP(-2))	-0.013	-0.204***	**Δ(GDP(-2))**	-0.020	0.037
Δ(GDP(-3))	0.082***	0.095			
Δ(GDP(-4))	0.059**	0.071			
Δ(EL(-1))	0.028*	0.144***	**Δ(RORA(-1))**	-0.018	0.035
Δ(EL(-2))	0.002	0.078***	**Δ(RORA(-2))**	0.011	0.055
Δ(EL(-3))	0.017	0.170***			
Δ(EL(-4))	0.003	0.003			
C	0.009***	0.018***	**C**	0.015***	0.008***
ECt-1	-0.091***	0.071***	**ECt-1**	-0.160***	0.025
		Granger causality tests			
Short-run (Weak Exog.)	6.075	18.24***	**Weak Exog.**	1.52	0.4
Long-run (Srict Exog.)	79.359***	33.59***	**Srict Exog.**	105.66***	1.37
R^2	21.10%	11.00%		25.50%	0%

Note: *, **, *** indicate significance at 10%, 5% and 1% confidence level.
Source: Commission Services

The results of the VECM ([52]) are presented in Table A3.4. According to these, the GDP has a mixed (positive and negative sign) and statistically significant impact in the short-run on electricity infrastructure, whereas the coefficients of electricity infrastructure are statistically insignificant in the equation where the GDP is the dependent variable. Furthermore, the statistical significance of the error correction term in both equations suggests that both GDP and electricity infrastructure respond to deviations from the long-run equilibrium. The short-run causality tests imply that there is a unidirectional causality relationship from GDP to electricity infrastructure, while the long-run causality tests (joint hypothesis including short and long-run coefficients) indicate that there is a bi-directional causal relationship. Hence, in light of the short and long-run tests only electricity infrastructure can be considered as weakly exogenous variable in the model.

([52]) The significance of causality tests are determined by the Wald F-test, while the optimal lag structure of 5 and 3 years (in differences are 4 and 2) respectively for the two relationships is chosen based on the Schwarz Information Criterion.

Similar conclusions derived from the analysis of the relationship between the GDP and the composite infrastructure indicator for rail and road. Once more, the long-run causality test indicates that there is a unidirectional causal relationship from road and rail infrastructure to GDP and not vice versa. Moreover, in this relationship the variables in question do not respond to short term shocks, namely changes in their levels in the short-run. Thus, it is clear from the results that only the road and rail composite indicator can be considered as strictly exogenous in the system.

APPENDIX 4

Methodology of identifying under- and overinvestment analysis

The econometric approach is based on panel-data for 28 EU countries for the period 1995-2012.

In order to select the appropriate panel estimation technique we use a Hausman test to test the null hypothesis that the extra orthogonality conditions imposed by the random effects estimator are valid (Hausman 1978). For all types of investment, except rail investment, the test results indicate that the regressors are correlated with the disturbance terms, and thus that the fixed effects estimator would be consistent while the random effects estimator would not be. Based on this we use the fixed effects estimator.

The fixed effects model is a linear regression model in which the intercept term is allowed to vary over the cross-sectional units, in this case the Member States. The country-specific intercept terms, (i.e. the so-called country fixed effects) capture the systematic variation between countries). The general model specification is as follows:

$$y_{it} = \alpha_i + x'_{it}\beta + \varepsilon_{it}$$

where y_{it} is the dependent variable for country i at time t, x'_{it} is a K-dimensional vector of macro-economic and sector-specific explanatory variables and β is a K-dimensional vector of effects of x'_{it} on y_{it}, α_i denotes the country-specific intercept for country i and ε_{it} denotes the disturbance term. We estimate this general specification for different dependent variables. The set of explanatory variables is different for different dependent variables (see Table 4.2 in section 4).

Since the estimated coefficients are identified only through the within-country variation, the difference between the observed investment rate and the model-predicted investment rate represents the deviation from a country-specific average rate (corrected for macro-economic and sector-specific conditions), i.e., it does not include any systematic deviation from the overall EU average investment rate.

The results of the panel regression analyses (Table A4.1) indicate a consistent pattern across the different investment subsectors. The road and rail use variables, indicating the traffic intensity on the road or rail, respectively, enter significantly positive in each of the four transport-based estimations. The network density variables have a positive and significant effect on the rate of investment in road infrastructure and the rate of maintenance spending on rail infrastructure. The employment rate has a positive and significant effect on the road and rail infrastructure investment rate. The industrialisation rate has a positive and significant effect on the road investment and maintenance rate. The cohesion dummy variable enters positively significant in all estimations, except for rail investment and energy.

Table A4.1: **Estimation results from the panel regression analysis**

	Road investment	Road maintenance	Rail investment	Rail maintenance	GFCF in energy
Road use	.12708***	.02366***	-	-	-
Rail use	-	-	.01106***	.02092***	-
Energy consumption	-	-	-	-	.01214
Industrialisation rate	.01759*	.01416***	-.00897**	.00557	-.02275**
Cohesion	.28020***	.10710***	-.00533	.11218***	.04792
Road density	.06868***	-0.00186		-	-
Rail density	-	-	.23566	.68647***	-
Employment rate	.00320*	.00058	.00146*	.00036	-.00302
Adjusted R2[(i)]	0.689	0.648	0.364	0.632	0.584
R2 (within)	0.301	0.106	0.053	0.200	0.020
Country fixed effects	yes	yes	yes	yes	yes
Number of observ.	371	312	414	289	416

***, ** and * indicate a level of significance at 1, 5 and 10 percent, respectively.
(i) The adjusted R2 includes the contribution of the country fixed effects in explaining the variation in the dependent variable
Source: Commission Services

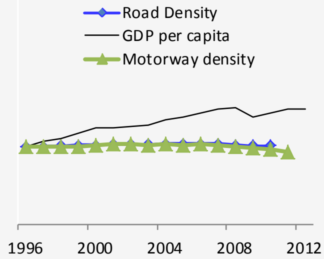
ANNEX 1

Country fiches

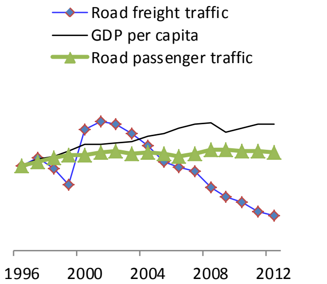
1. BELGIUM

Inland transport and Electricity infrastucture : provision and use

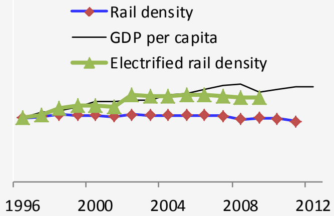
Index 1996 = 100



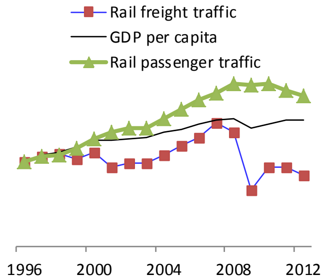
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Belgium	102	101	101	:	:
		EU	108	108	107	106	90
	Levels	Belgium	14399	14310	14318	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Belgium	100	99	99	97	:
		EU	133	136	138	139	:
	Levels	Belgium	165	164	163	160	:
		EU	137	139	141	142	:



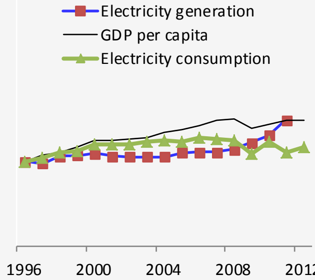
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Belgium	87	82	78	73	70
		EU	140	126	130	128	124
	Levels	Belgium	3596	3364	3229	3010	2894
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Belgium	109	109	109	108	108
		EU	114	115	113	113	110
	Levels	Belgium	10594	10549	10531	10503	10444
		EU	9399	9515	9378	9314	9115



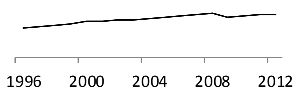
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Belgium	99	100	99	97	:
		EU	94	93	93	94	104
	Levels	Belgium	329	333	330	323	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Belgium	116	115	:	:	:
		EU	98	103	106	104	113
	Levels	Belgium	281	279	:	:	:
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Belgium	117	83	97	97	92
		EU	109	89	96	103	99
	Levels	Belgium	837	593	690	690	656
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Belgium	146	145	146	142	139
		EU	114	112	112	114	114
	Levels	Belgium	975	972	975	949	928
		EU	825	807	808	822	827



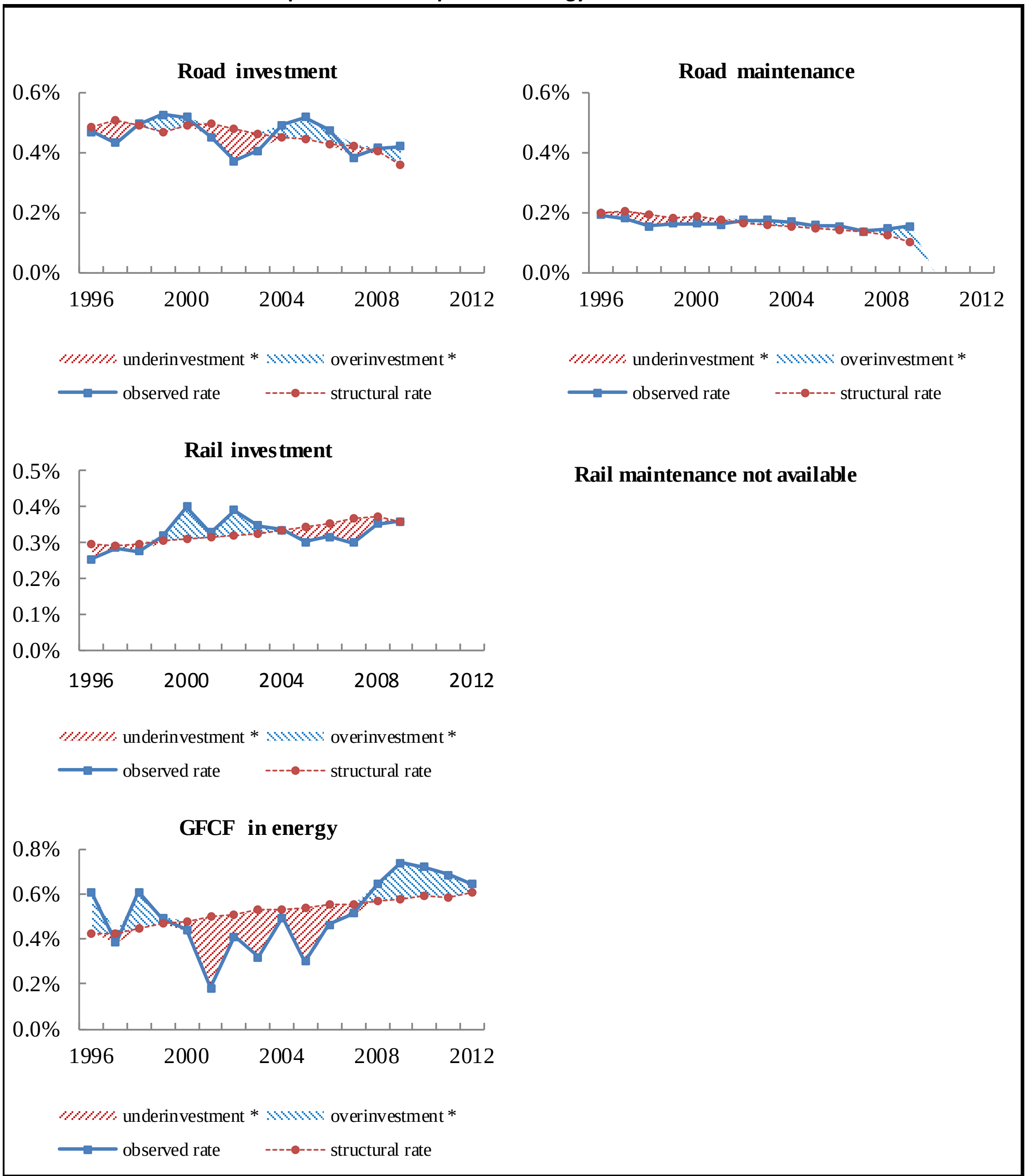
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Belgium	107	111	115	125	:
		EU	119	122	128	134	:
	Levels	Belgium	1.6	1.6	1.7	1.8	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Belgium	113	104	112	106	109
		EU	119	112	117	115	115
	Levels	Belgium	7.8	7.2	7.7	7.3	7.5
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Belgium	125	119	122	124	124
		EU	130	124	127	129	129
	Levels	Belgium	35216	33529	34308	34915	34867
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



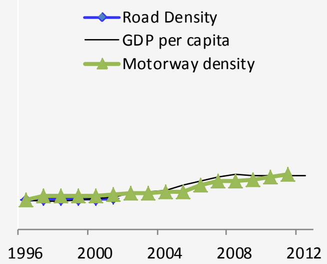
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

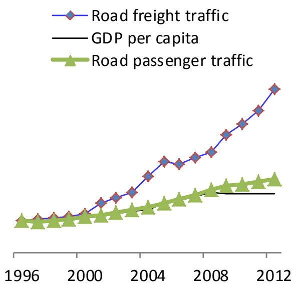
2. BULGARIA

Inland transport and Electricity infrastucture : provision and use

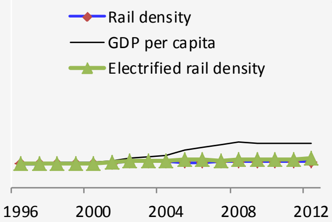
Index 1996 = 100



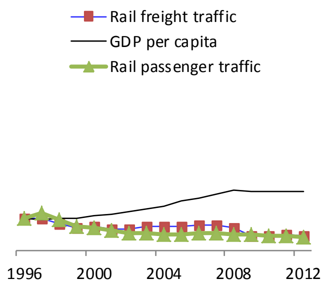
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Bulgaria	:	:	:	:	:
		EU	108	108	107	106	90
	Levels	Bulgaria	:	:	:	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Bulgaria	168	169	178	188	:
		EU	133	136	138	139	:
	Levels	Bulgaria	56	56	59	62	:
		EU	137	139	141	142	:



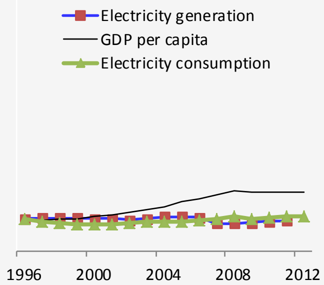
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Bulgaria	316	369	407	447	516
		EU	140	126	130	128	124
	Levels	Bulgaria	2038	2376	2618	2879	3326
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Bulgaria	197	212	216	223	232
		EU	114	115	113	113	110
	Levels	Bulgaria	5746	6201	6319	6523	6783
		EU	9399	9515	9378	9314	9115



			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Bulgaria	108	109	108	108	108
		EU	94	93	93	94	104
	Levels	Bulgaria	551	556	552	553	555
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Bulgaria	116	117	116	120	121
		EU	98	103	106	104	113
	Levels	Bulgaria	376	379	375	388	391
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Bulgaria	70	47	46	50	44
		EU	109	89	96	103	99
	Levels	Bulgaria	624	421	413	447	397
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Bulgaria	51	48	47	46	42
		EU	114	112	112	114	114
	Levels	Bulgaria	311	287	283	280	256
		EU	825	807	808	822	827

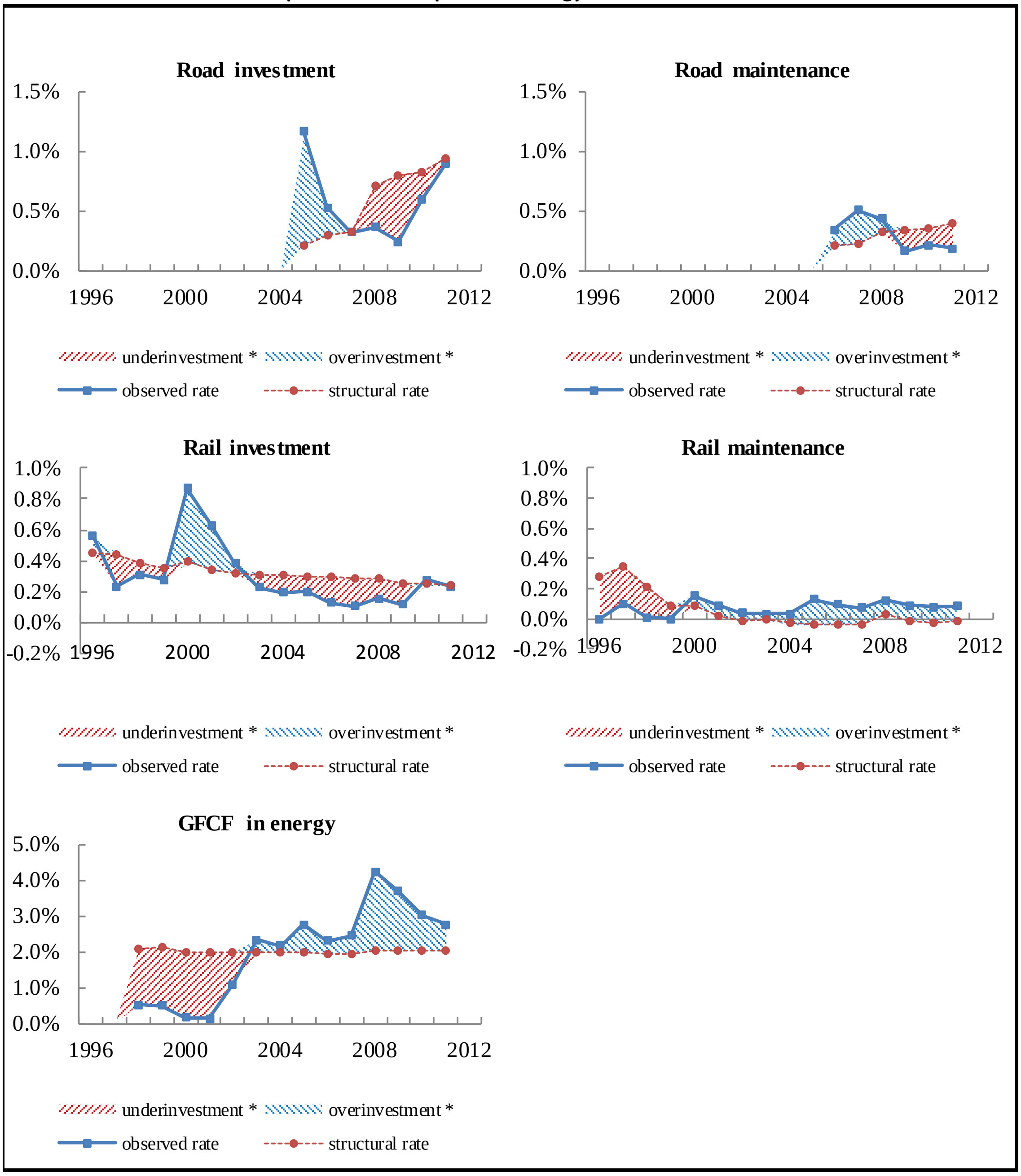


			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Bulgaria	87	87	92	94	:
		EU	119	122	128	134	:
	Levels	Bulgaria	1.3	1.3	1.4	1.4	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Bulgaria	107	101	102	108	107
		EU	119	112	117	115	115
	Levels	Bulgaria	3.8	3.6	3.7	3.9	3.8
		EU	5.7	5.4	5.6	5.5	5.5

			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Bulgaria	190	184	185	185	187
		EU	130	124	127	129	129
	Levels	Bulgaria	10819	10529	10575	10567	10649
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



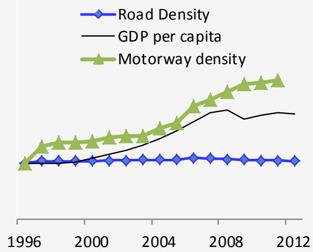
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

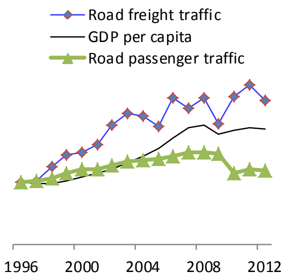
3. THE CZECH REPUBLIC

Inland transport and Electricity infrastucture : provision and use

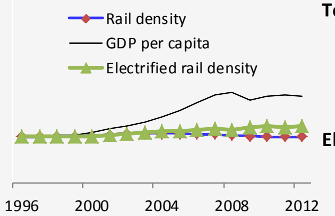
Index 1996 = 100



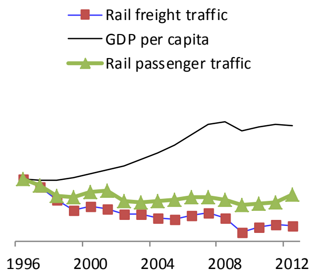
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Czech Republic	103	103	102	102	102
		EU	108	108	107	106	90
	Levels	Czech Republic	12624	12530	12490	12460	12435
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Czech Republic	163	171	171	173	:
		EU	133	136	138	139	:
	Levels	Czech Republic	67	70	70	71	:
		EU	137	139	141	142	:



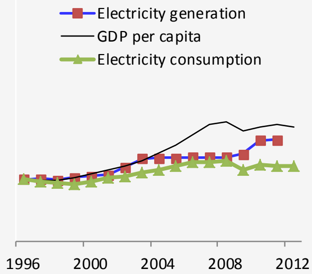
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Czech Republic	169	148	170	179	167
		EU	140	126	130	128	124
	Levels	Czech Republic	4919	4312	4954	5229	4876
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Czech Republic	125	124	108	111	110
		EU	114	115	113	113	110
	Levels	Czech Republic	6998	6934	6076	6245	6151
		EU	9399	9515	9378	9314	9115



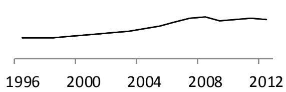
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Czech Republic	101	100	100	100	100
		EU	94	93	93	94	104
	Levels	Czech Republic	927	919	915	913	911
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Czech Republic	107	109	111	110	111
		EU	98	103	106	104	113
	Levels	Czech Republic	298	302	307	306	306
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Czech Republic	69	57	61	63	63
		EU	109	89	96	103	99
	Levels	Czech Republic	1492	1227	1316	1365	1358
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Czech Republic	84	79	80	81	88
		EU	114	112	112	114	114
	Levels	Czech Republic	658	624	630	640	692
		EU	825	807	808	822	827



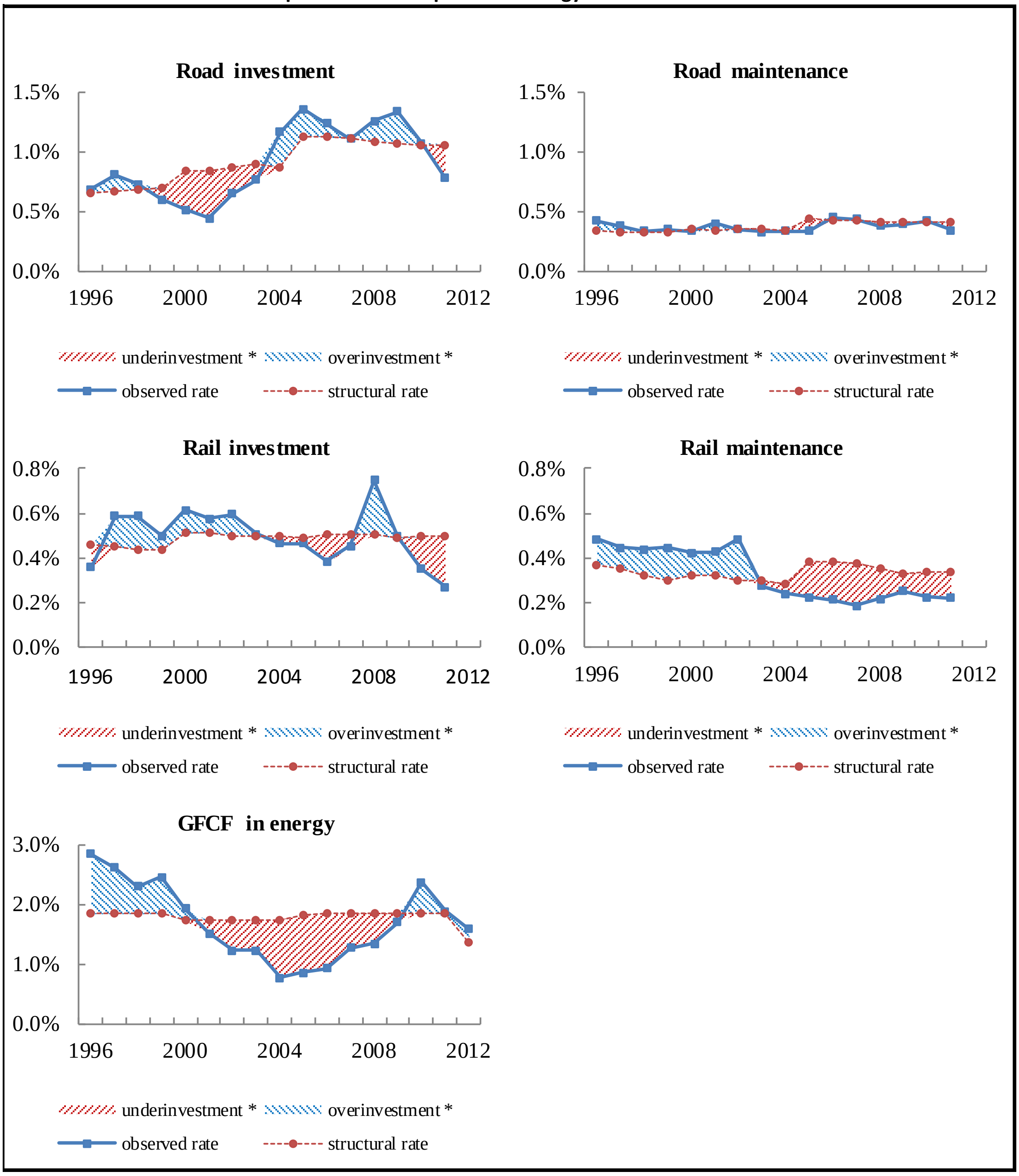
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Czech Republic	118	121	132	133	:
		EU	119	122	128	134	:
	Levels	Czech Republic	1.7	1.8	1.9	1.9	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Czech Republic	115	108	112	111	111
		EU	119	112	117	115	115
	Levels	Czech Republic	5.6	5.3	5.5	5.4	5.4
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Czech Republic	147	139	143	145	143
		EU	130	124	127	129	129
	Levels	Czech Republic	23773	22572	23135	23456	23216
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



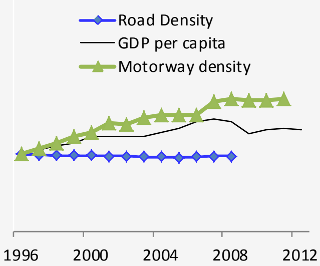
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

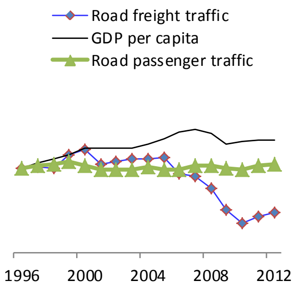
4. DENMARK

Inland transport and Electricity infrastucture : provision and use

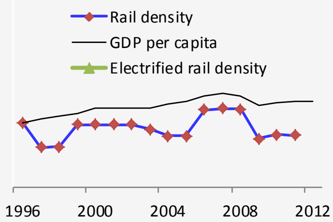
Index 1996 = 100



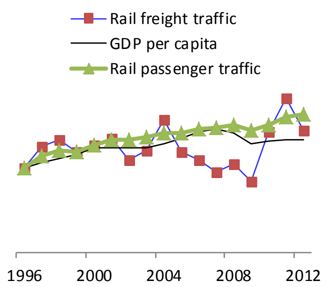
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Denmark	99	:	:	:	:
		EU	108	108	107	106	90
	Levels	Denmark	13392	:	:	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Denmark	136	135	135	135	:
		EU	133	136	138	139	:
	Levels	Denmark	206	205	204	206	:
		EU	137	139	141	142	:



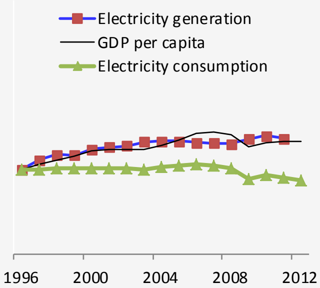
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Denmark	88	75	67	71	74
		EU	140	126	130	128	124
	Levels	Denmark	3557	3062	2713	2899	2989
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Denmark	101	100	99	101	103
		EU	114	115	113	113	110
	Levels	Denmark	9445	9334	9217	9433	9573
		EU	9399	9515	9378	9314	9115



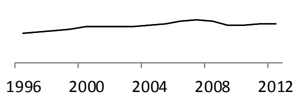
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Denmark	111	88	91	91	:
		EU	94	93	93	94	104
	Levels	Denmark	581	463	478	476	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Denmark	:	:	:	:	:
		EU	98	103	106	104	113
	Levels	Denmark	117	:	:	115	:
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Denmark	102	92	121	141	122
		EU	109	89	96	103	99
	Levels	Denmark	341	308	405	470	407
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Denmark	125	122	125	129	132
		EU	114	112	112	114	114
	Levels	Denmark	1147	1116	1147	1189	1210
		EU	825	807	808	822	827



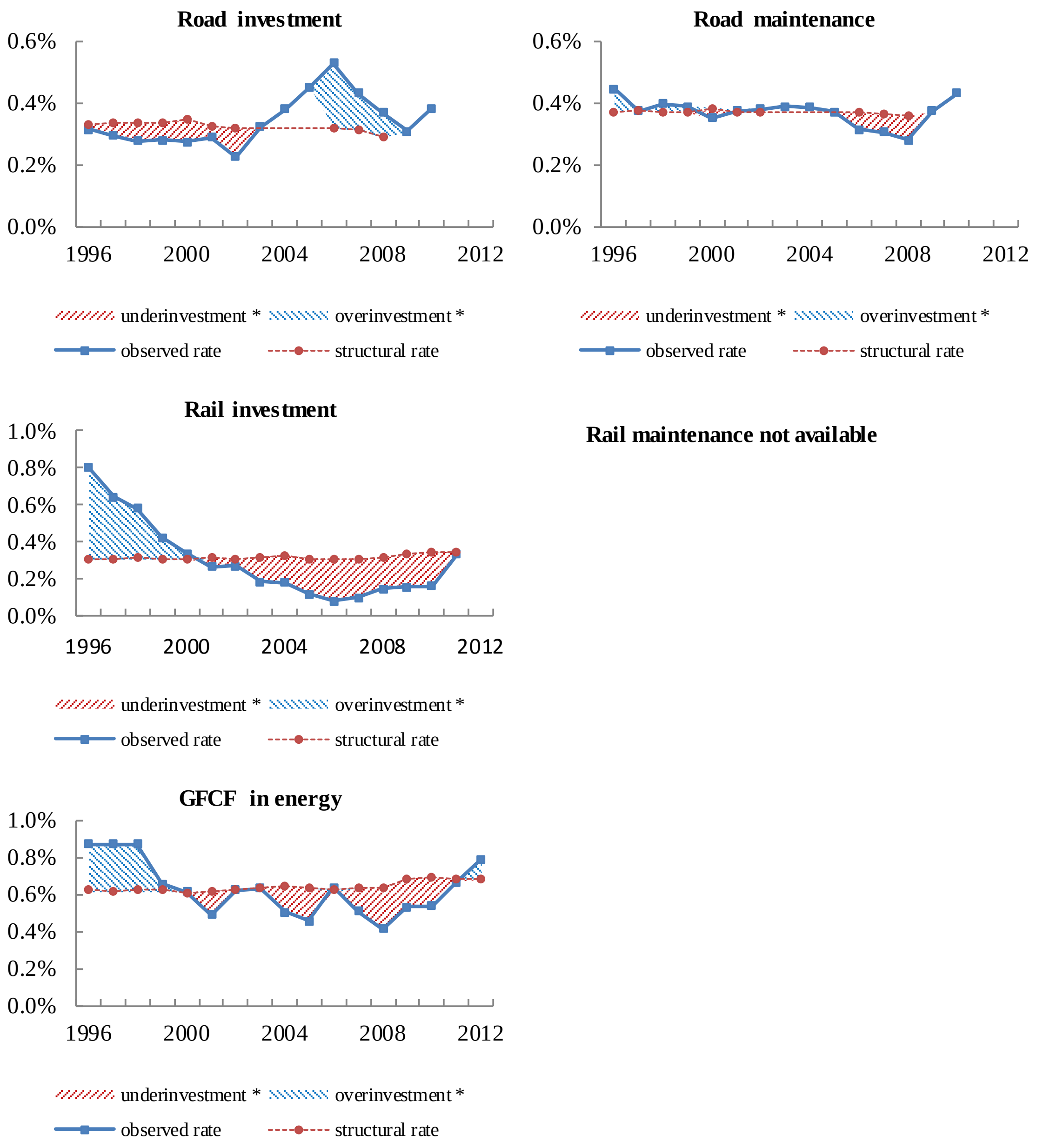
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Denmark	115	118	120	118	:
		EU	119	122	128	134	:
	Levels	Denmark	2.4	2.4	2.5	2.4	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Denmark	100	95	97	95	93
		EU	119	112	117	115	115
	Levels	Denmark	6.0	5.7	5.8	5.7	5.6
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Denmark	121	114	115	117	116
		EU	130	124	127	129	129
	Levels	Denmark	35931	33842	34376	34755	34624
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



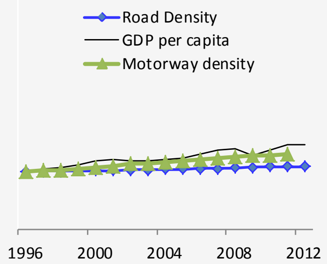
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

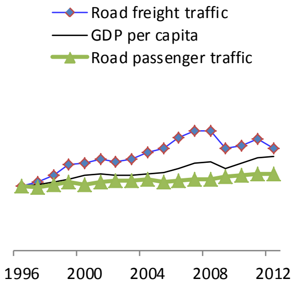
5. GERMANY

Inland transport and Electricity infrastucture : provision and use

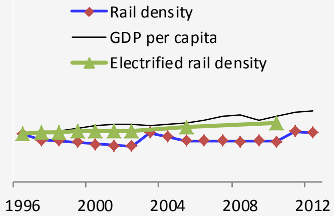
Index 1996 = 100



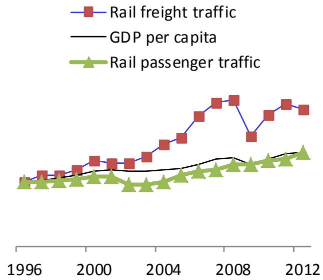
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
index 1996 = 100	Germany		103	103	104	104	104
	EU		108	108	107	106	90
Levels	Germany		8511	8554	8594	8623	8632
	EU		10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
index 1996 = 100	Germany		112	114	114	114	:
	EU		133	136	138	139	:
Levels	Germany		154	156	157	157	:
	EU		137	139	141	142	:



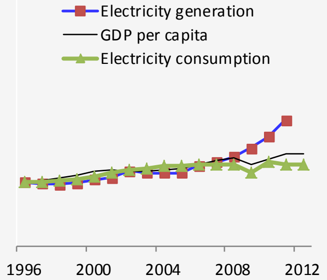
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
index 1996 = 100	Germany		144	130	132	137	130
	EU		140	126	130	128	124
Levels	Germany		4154	3750	3828	3961	3751
	EU		3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
index 1996 = 100	Germany		106	108	109	110	110
	EU		114	115	113	113	110
Levels	Germany		10598	10745	10843	10940	10935
	EU		9399	9515	9378	9314	9115



			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
index 1996 = 100	Germany		92	93	92	103	101
	EU		94	93	93	94	104
Levels	Germany		460	463	461	512	506
	EU		440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
index 1996 = 100	Germany		:	:	111	:	:
	EU		98	103	106	104	113
Levels	Germany		:	:	251	:	:
	EU		214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
index 1996 = 100	Germany		164	137	153	162	157
	EU		109	89	96	103	99
Levels	Germany		1407	1169	1312	1386	1345
	EU		885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
index 1996 = 100	Germany		114	114	117	119	123
	EU		114	112	112	114	114
Levels	Germany		1003	1004	1026	1041	1080
	EU		825	807	808	822	827

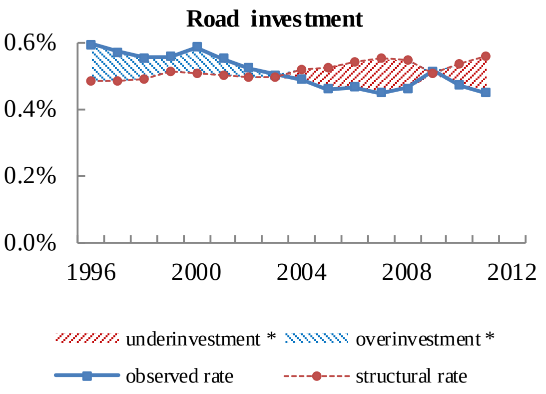


			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
index 1996 = 100	Germany		121	128	137	149	:
	EU		119	122	128	134	:
Levels	Germany		1.7	1.8	1.9	2.1	:
	EU		1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
index 1996 = 100	Germany		115	108	116	115	115
	EU		119	112	117	115	115
Levels	Germany		6.4	6.1	6.5	6.4	6.4
	EU		5.7	5.4	5.6	5.5	5.5

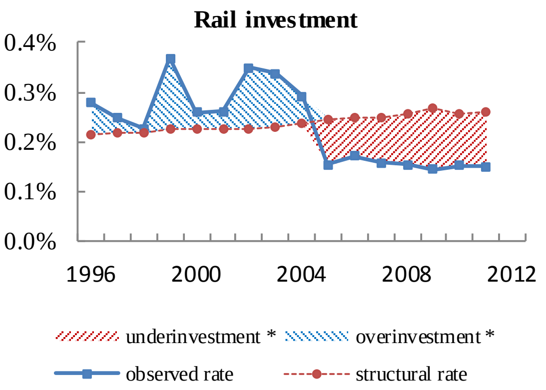
			2008	2009	2010	2011	2012
GDP per capita (EUR)							
index 1996 = 100	Germany		119	114	118	122	123
	EU		130	124	127	129	129
Levels	Germany		34012	32422	33723	34847	35087
	EU		29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

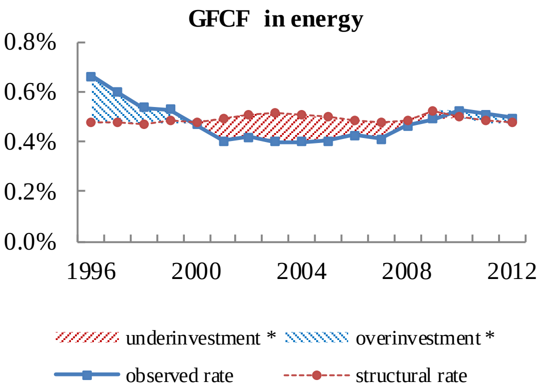
Investment and Maintenance pattern in Transport and Energy infrastructure



Road maintenance not available



Rail maintenance not available

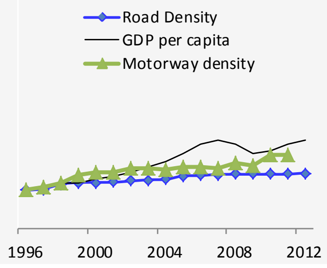


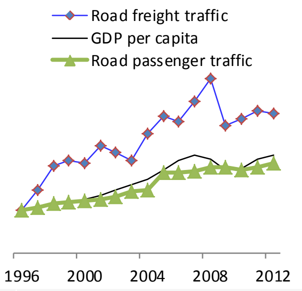
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

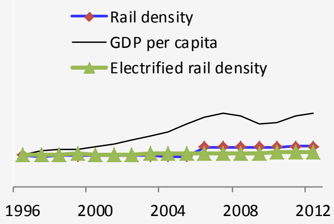
Source: Commission Services based on Eurostat and OECD

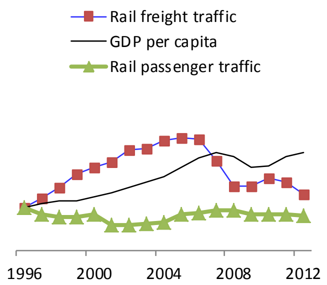
6. ESTONIA

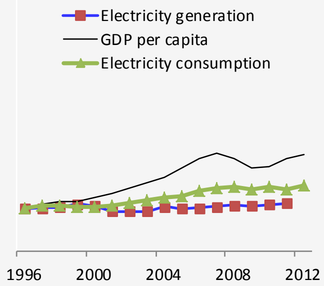
Inland transport and Electricity infrastucture : provision and use







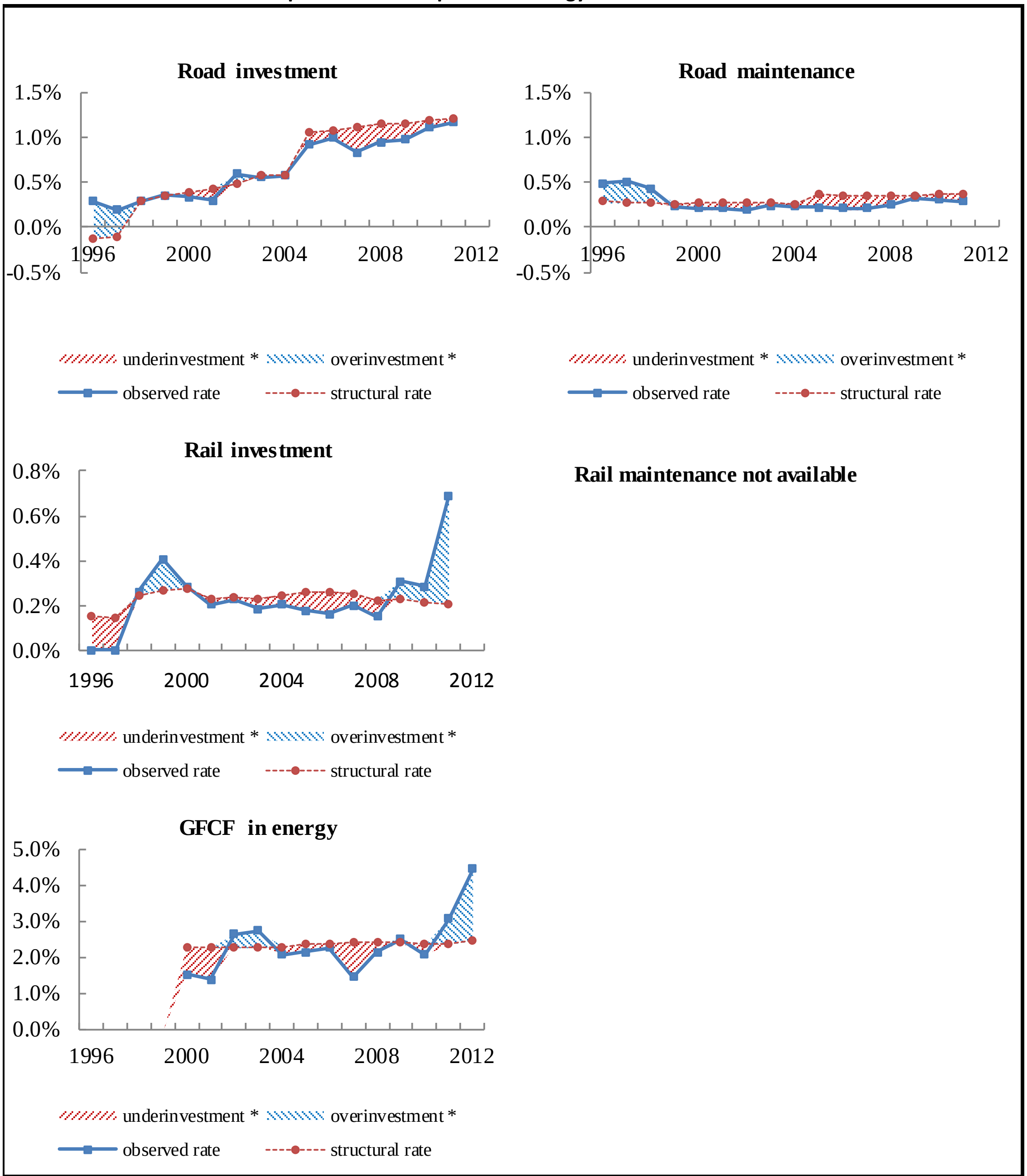




Index 1996 = 100		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Estonia	141	141	141	142	143
	EU	108	108	107	106	90
Levels	Estonia	43632	43721	43810	43986	44346
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Estonia	170	164	189	190	:
	EU	133	136	138	139	:
Levels	Estonia	78	75	86	86	:
	EU	137	139	141	142	:
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Estonia	413	300	316	334	328
	EU	140	126	130	128	124
Levels	Estonia	5494	3998	4211	4446	4370
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Estonia	203	204	196	202	211
	EU	114	115	113	113	110
Levels	Estonia	7845	7861	7575	7807	8156
	EU	9399	9515	9378	9314	9115
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Estonia	125	125	125	126	126
	EU	94	93	93	94	104
Levels	Estonia	894	895	897	899	902
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Estonia	105	105	107	107	108
	EU	98	103	106	104	113
Levels	Estonia	97	97	99	99	100
	EU	214	223	230	226	245
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Estonia	151	151	169	160	131
	EU	109	89	96	103	99
Levels	Estonia	4440	4452	4979	4716	3870
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Estonia	94	86	86	84	82
	EU	114	112	112	114	114
Levels	Estonia	205	186	186	183	177
	EU	825	807	808	822	827
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Estonia	107	106	110	113	:
	EU	119	122	128	134	:
Levels	Estonia	2.0	2.0	2.1	2.1	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Estonia	153	145	151	146	154
	EU	119	112	117	115	115
Levels	Estonia	5.2	5.0	5.2	5.0	5.3
	EU	5.7	5.4	5.6	5.5	5.5
GDP per capita (EUR)						
index 1996 = 100	Estonia	220	195	200	220	229
	EU	130	124	127	129	129
Levels	Estonia	17855	15816	16248	17851	18609
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



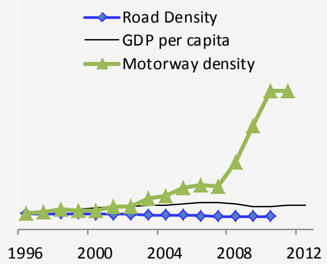
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

7. IRELAND

Inland transport and Electricity infrastucture : provision and use

Index 1996 = 100

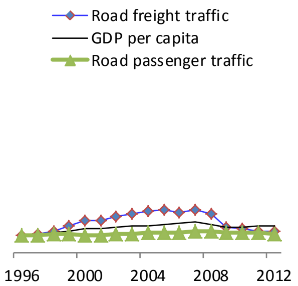


Total road density (km of roads per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	85	84	83	:	:
	EU	108	108	107	106	90
Levels	Ireland	21635	21386	21254	:	:
	EU	10064	10054	9984	9844	8391

Motorways density (km of motorways per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	429	664	895	891	:
	EU	133	136	138	139	:
Levels	Ireland	95	147	198	197	:
	EU	137	139	141	142	:

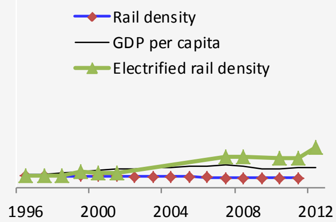


Road freight traffic intensity (tonne km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	224	149	138	127	125
	EU	140	126	130	128	124
Levels	Ireland	3904	2585	2404	2211	2177
	EU	3780	3385	3504	3455	3345

Road passenger traffic intensity (passenger km by car per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	121	119	117	115	112
	EU	114	115	113	113	110
Levels	Ireland	10967	10806	10569	10382	10172
	EU	9399	9515	9378	9314	9115

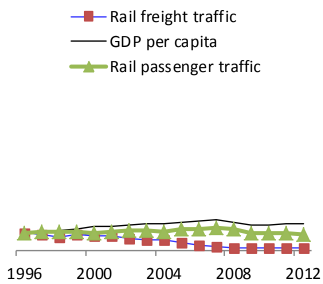


Total rail density (km of rail lines per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	79	79	78	78	:
	EU	94	93	93	94	104
Levels	Ireland	424	424	422	420	:
	EU	440	434	435	443	489

Electrified rail density (km of electrified rail lines per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	237	:	231	230	310
	EU	98	103	106	104	113
Levels	Ireland	24	:	24	24	32
	EU	214	223	230	226	245

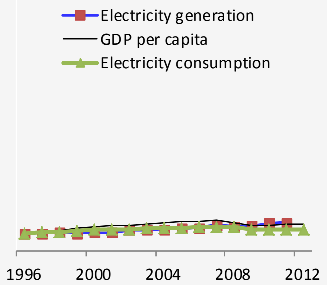


Rail freight traffic intensity (tonne km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	15	11	13	15	13
	EU	109	89	96	103	99
Levels	Ireland	23	17	20	23	20
	EU	885	724	782	836	805

Rail passenger traffic intensity (passenger km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	124	104	103	100	96
	EU	114	112	112	114	114
Levels	Ireland	443	372	369	358	344
	EU	825	807	808	822	827

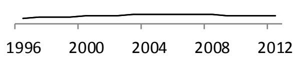


Electricity generation capacity (MW per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	143	145	162	166	:
	EU	119	122	128	134	:
Levels	Ireland	1.7	1.7	1.9	1.9	:
	EU	1.6	1.7	1.7	1.8	:

Electricity consumption (MWh per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	137	128	128	124	120
	EU	119	112	117	115	115
Levels	Ireland	6.0	5.6	5.6	5.4	5.3
	EU	5.7	5.4	5.6	5.5	5.5

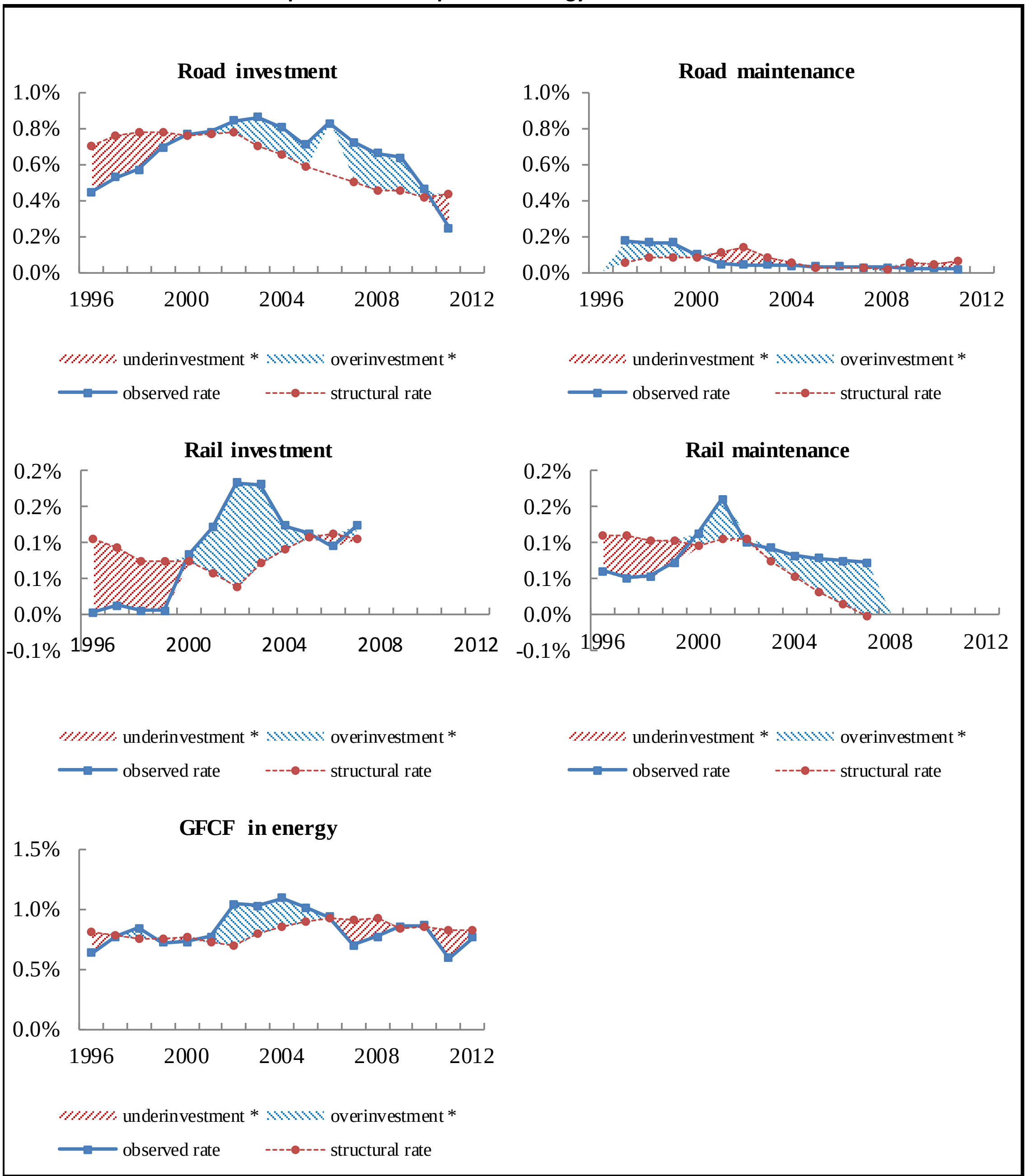


GDP per capita (EUR)

		2008	2009	2010	2011	2012
index 1996 = 100	Ireland	167	150	148	154	154
	EU	130	124	127	129	129
Levels	Ireland	37662	33780	33348	34692	34748
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



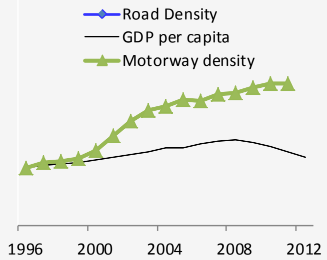
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

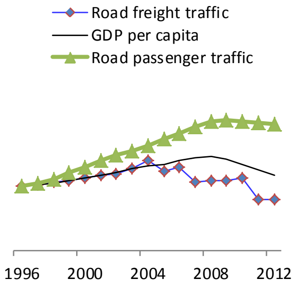
8. GREECE

Inland transport and Electricity infrastucture : provision and use

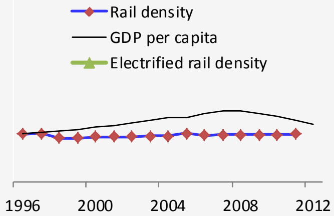
Index 1996 = 100



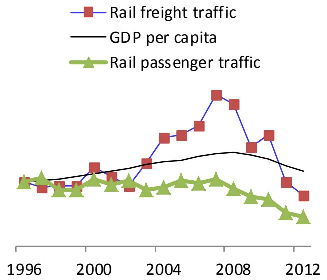
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Greece	:	:	:	:	:
		EU	108	108	107	106	90
	Levels	Greece	:	:	:	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Greece	229	238	245	246	:
		EU	133	136	138	139	:
	Levels	Greece	100	104	107	108	:
		EU	137	139	141	142	:



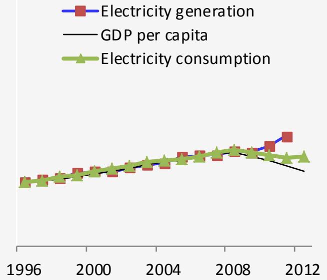
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Greece	110	109	114	79	80
		EU	140	126	130	128	124
	Levels	Greece	2580	2554	2666	1852	1873
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Greece	203	206	202	201	198
		EU	114	115	113	113	110
	Levels	Greece	8943	9052	8906	8839	8715
		EU	9399	9515	9378	9314	9115



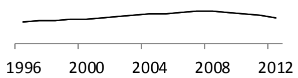
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Greece	98	98	98	99	:
		EU	94	93	93	94	104
	Levels	Greece	228	228	228	230	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Greece	:	:	:	:	:
		EU	98	103	106	104	113
	Levels	Greece	24	:	:	:	:
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Greece	223	156	174	100	81
		EU	109	89	96	103	99
	Levels	Greece	70	49	55	32	25
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Greece	90	77	73	52	46
		EU	114	112	112	114	114
	Levels	Greece	148	126	120	86	75
		EU	825	807	808	822	827



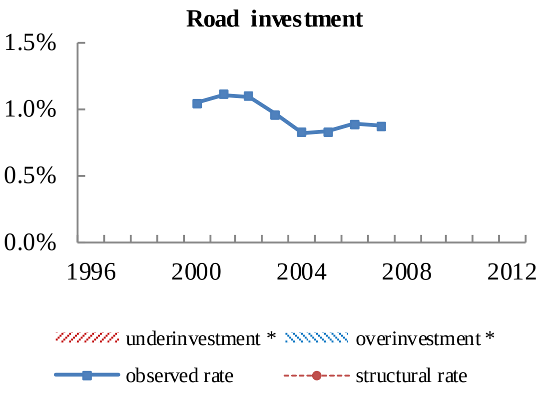
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Greece	149	149	158	174	:
		EU	119	122	128	134	:
	Levels	Greece	1.3	1.3	1.4	1.5	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Greece	152	147	143	140	140
		EU	119	112	117	115	115
	Levels	Greece	5.1	4.9	4.7	4.7	4.7
		EU	5.7	5.4	5.6	5.5	5.5



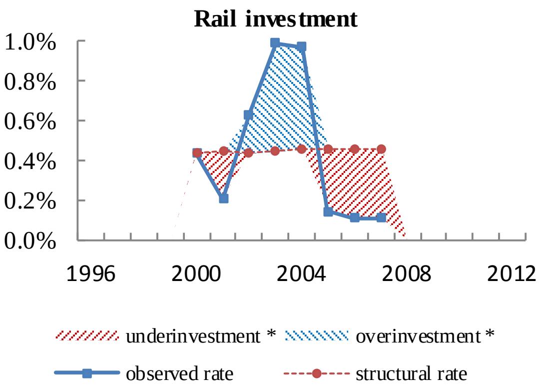
			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Greece	147	142	136	127	119
		EU	130	124	127	129	129
	Levels	Greece	27084	26179	25000	23359	21831
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

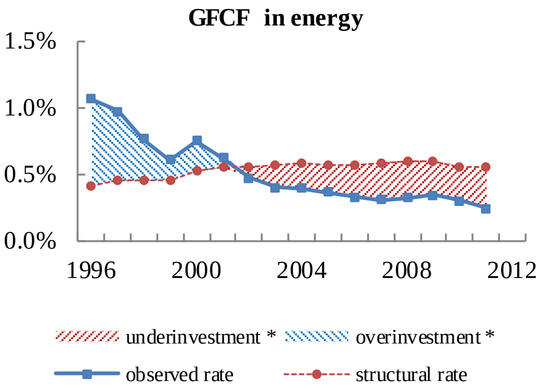
Investment and Maintenance pattern in Transport and Energy infrastructure



Road maintenance not available



Rail maintenance not available



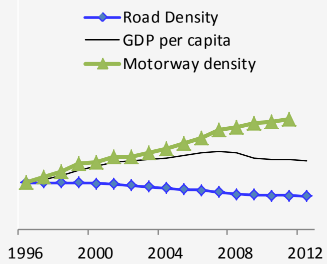
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

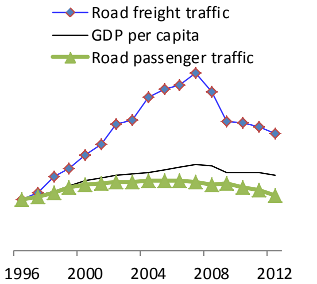
9. SPAIN

Inland transport and Electricity infrastucture : provision and use

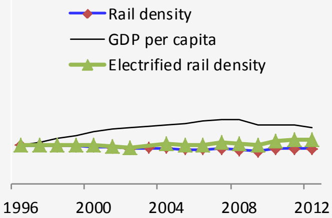
Index 1996 = 100



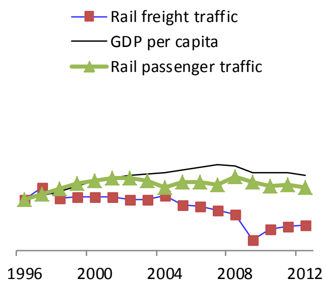
		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Spain	88	87	87	86	86
	EU	108	108	107	106	90
Levels	Spain	3615	3580	3566	3555	3537
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Spain	160	164	166	169	:
	EU	133	136	138	139	:
Levels	Spain	296	303	307	312	:
	EU	137	139	141	142	:



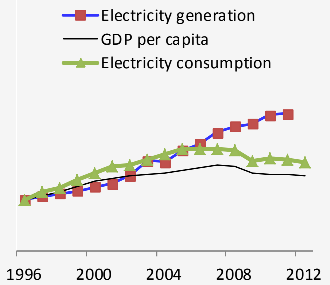
		2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Spain	206	177	175	171	164
	EU	140	126	130	128	124
Levels	Spain	5321	4583	4519	4432	4255
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Spain	114	115	112	109	104
	EU	114	115	113	113	110
Levels	Spain	7502	7578	7349	7158	6857
	EU	9399	9515	9378	9314	9115



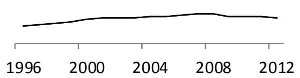
		2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Spain	94	93	96	96	96
	EU	94	93	93	94	104
Levels	Spain	292	289	298	299	299
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Spain	102	101	106	108	108
	EU	98	103	106	104	113
Levels	Spain	177	175	185	187	188
	EU	214	223	230	226	245



		2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Spain	85	61	70	74	75
	EU	109	89	96	103	99
Levels	Spain	240	172	198	209	213
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Spain	123	117	113	114	112
	EU	114	112	112	114	114
Levels	Spain	525	500	482	488	480
	EU	825	807	808	822	827



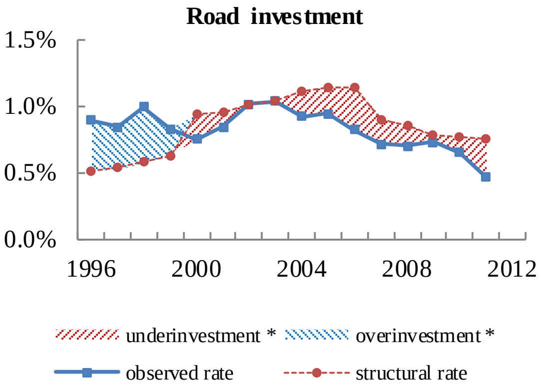
		2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Spain	172	175	184	185	:
	EU	119	122	128	134	:
Levels	Spain	2.1	2.1	2.2	2.2	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Spain	150	139	141	140	137
	EU	119	112	117	115	115
Levels	Spain	5.6	5.2	5.3	5.2	5.1
	EU	5.7	5.4	5.6	5.5	5.5



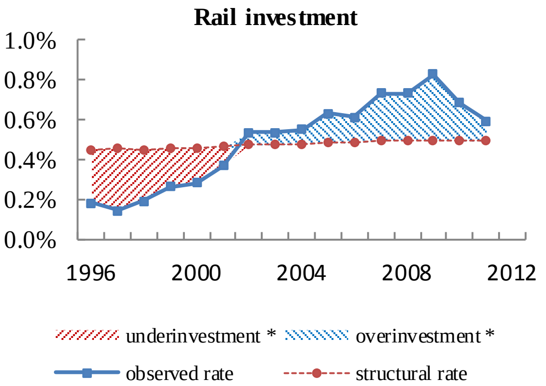
		2008	2009	2010	2011	2012
GDP per capita (EUR)						
index 1996 = 100	Spain	133	126	126	126	123
	EU	130	124	127	129	129
Levels	Spain	29111	27665	27559	27564	27050
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

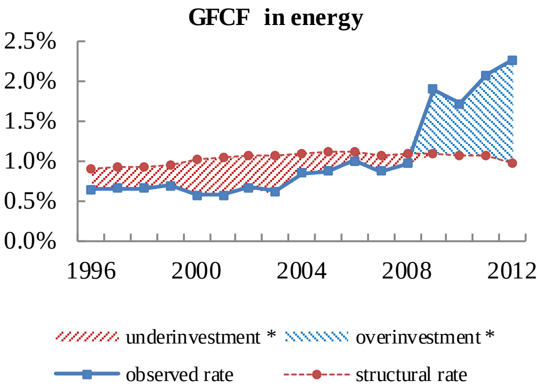
Investment and Maintenance pattern in Transport and Energy infrastructure



Road maintenance not available



Rail maintenance not available

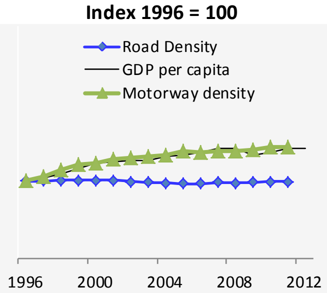


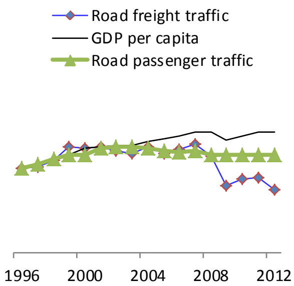
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

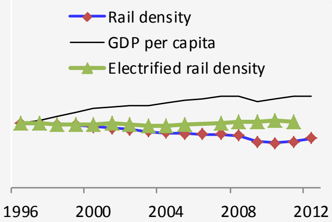
Source: Commission Services based on Eurostat and OECD

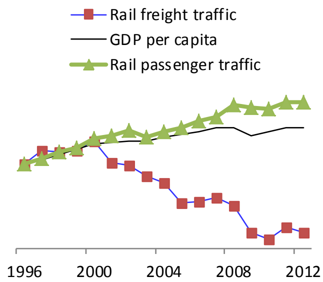
10. FRANCE

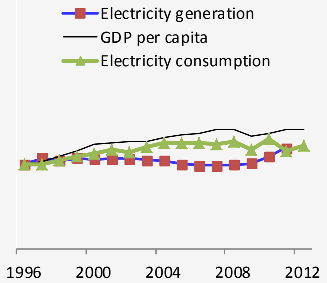
Inland transport and Electricity infrastucture : provision and use







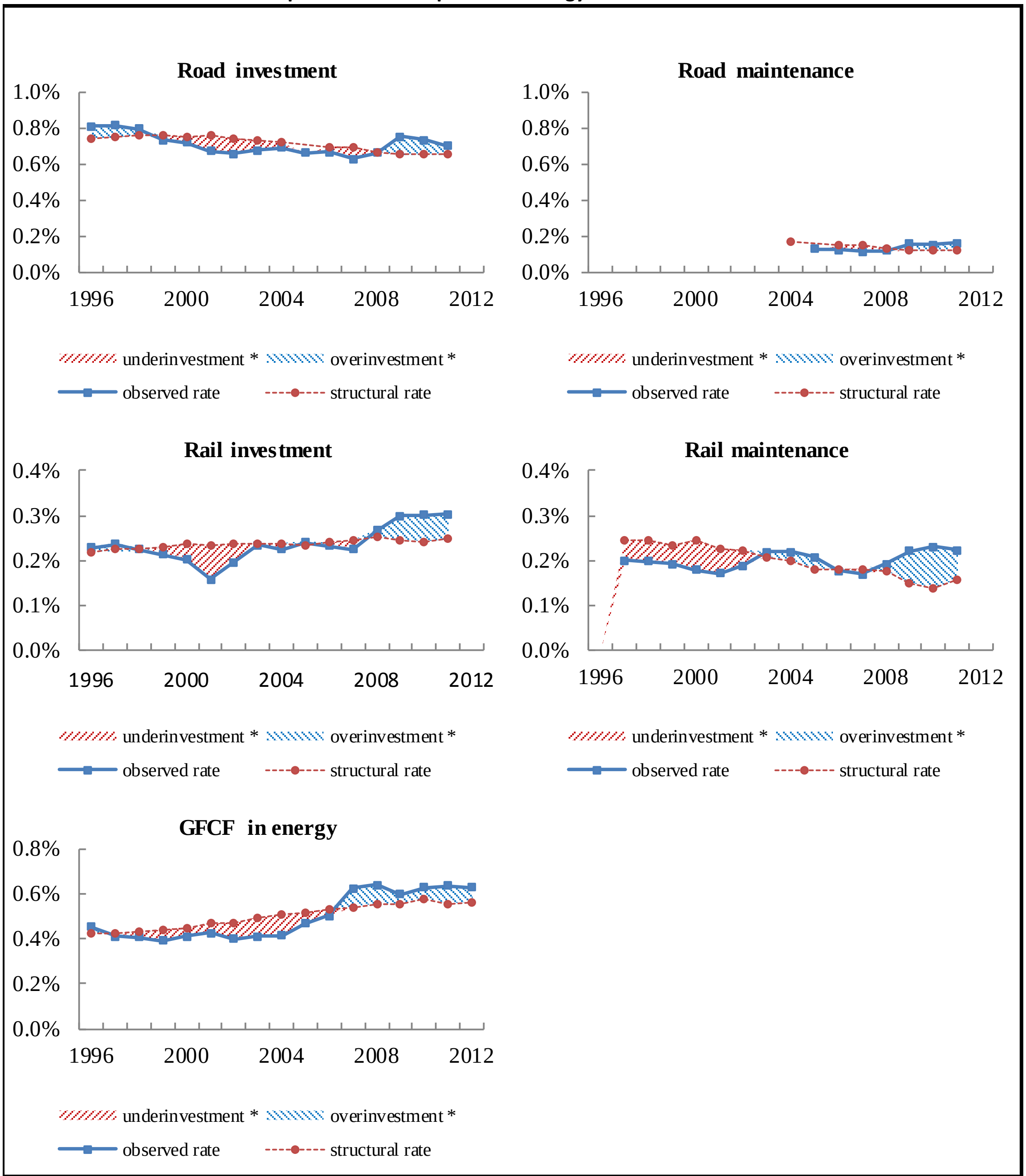




			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	France	99	99	100	100	:
		EU	108	108	107	106	90
	Levels	France	16057	16180	16241	16209	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	France	119	120	122	122	:
		EU	133	136	138	139	:
	Levels	France	173	173	176	176	:
		EU	137	139	141	142	:
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	France	107	89	93	94	87
		EU	140	126	130	128	124
	Levels	France	3223	2698	2818	2858	2641
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	France	108	107	108	108	108
		EU	114	115	113	113	110
	Levels	France	12289	12261	12324	12292	12270
		EU	9399	9515	9378	9314	9115
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	France	91	86	85	86	88
		EU	94	93	93	94	104
	Levels	France	485	458	453	460	473
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	France	101	101	102	101	:
		EU	98	103	106	104	113
	Levels	France	240	241	243	241	:
		EU	214	223	230	226	245
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	France	75	59	55	63	59
		EU	109	89	96	103	99
	Levels	France	633	499	463	526	499
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	France	135	133	132	136	136
		EU	114	112	112	114	114
	Levels	France	1353	1335	1328	1370	1364
		EU	825	807	808	822	827
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	France	100	100	105	110	:
		EU	119	122	128	134	:
	Levels	France	1.8	1.9	1.9	2.0	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	France	113	109	115	107	111
		EU	119	112	117	115	115
	Levels	France	6.8	6.5	6.9	6.4	6.6
		EU	5.7	5.4	5.6	5.5	5.5
GDP per capita (EUR)							
	index 1996 = 100	France	121	116	118	121	121
		EU	130	124	127	129	129
	Levels	France	32006	30855	31387	32031	32047
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



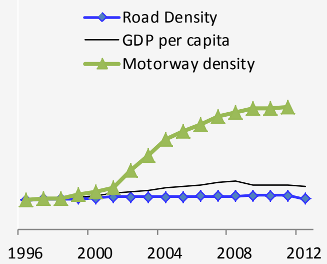
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

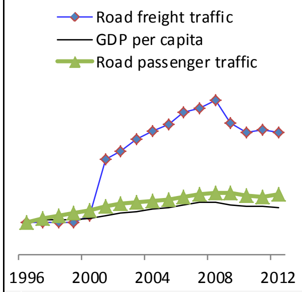
11. CROATIA

Inland transport and Electricity infrastucture : provision and use

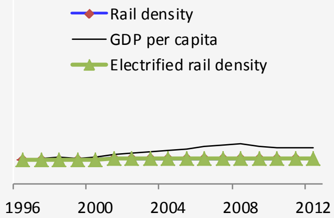
Index 1996 = 100



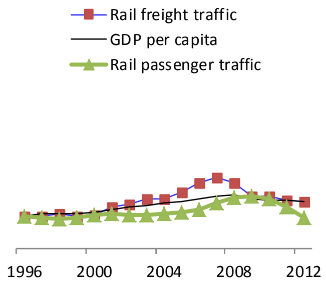
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Croatia	115	116	116	117	106
		EU	108	108	107	106	90
	Levels	Croatia	6783	6808	6817	6856	6242
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Croatia	401	416	416	421	:
		EU	133	136	138	139	:
	Levels	Croatia	278	289	289	292	:
		EU	137	139	141	142	:



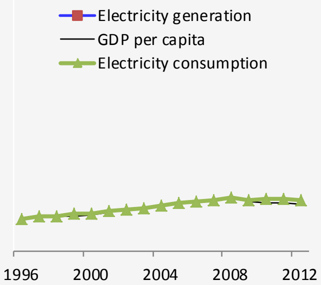
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Croatia	484	413	386	393	382
		EU	140	126	130	128	124
	Levels	Croatia	2561	2187	2041	2081	2023
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Croatia	194	193	186	183	190
		EU	114	115	113	113	110
	Levels	Croatia	6262	6218	5973	5884	6115
		EU	9399	9515	9378	9314	9115



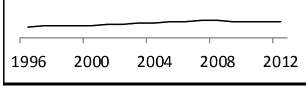
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Croatia	106	106	106	107	:
		EU	94	93	93	94	104
	Levels	Croatia	631	632	633	635	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Croatia	106	107	107	107	107
		EU	98	103	106	104	113
	Levels	Croatia	228	229	229	229	230
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Croatia	205	163	162	152	146
		EU	109	89	96	103	99
	Levels	Croatia	768	613	608	568	545
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Croatia	160	162	154	132	98
		EU	114	112	112	114	114
	Levels	Croatia	420	426	405	346	258
		EU	825	807	808	822	827



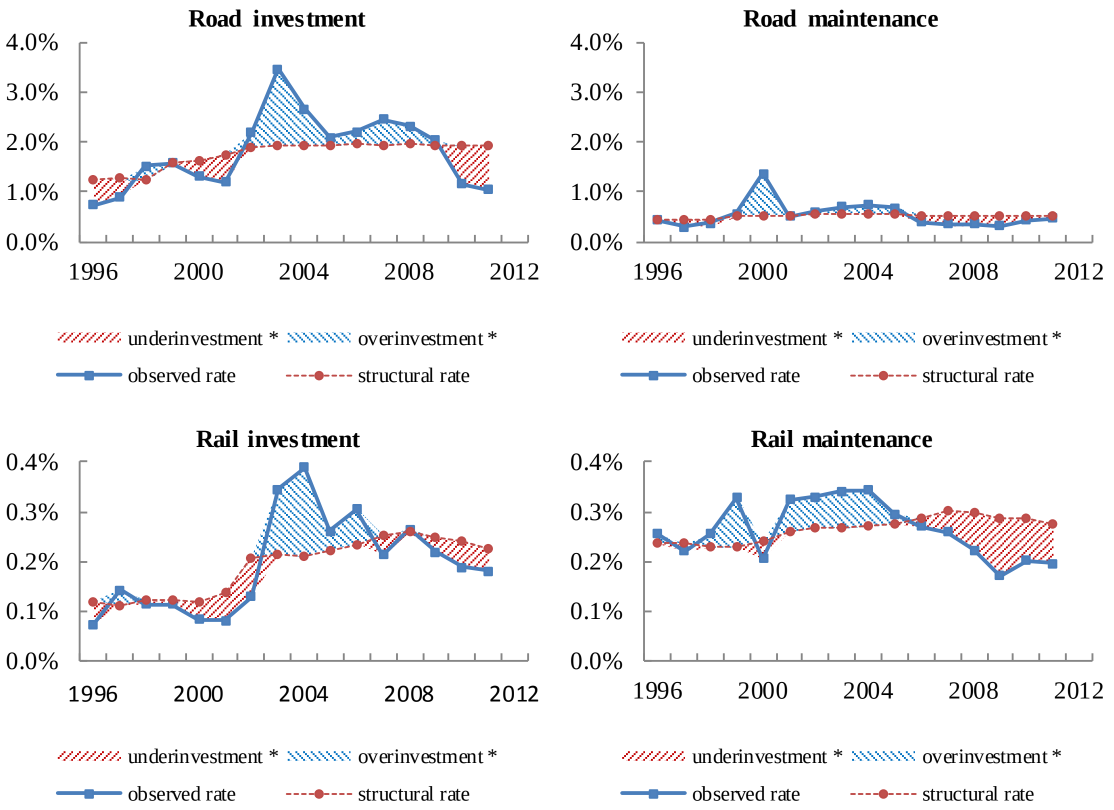
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Croatia	:	:	:	:	:
		EU	119	122	128	134	:
	Levels	Croatia	:	:	:	:	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Croatia	167	160	164	163	160
		EU	119	112	117	115	115
	Levels	Croatia	3.7	3.6	3.7	3.7	3.6
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Croatia	166	154	151	151	148
		EU	130	124	127	129	129
	Levels	Croatia	9404	8755	8570	8576	8415
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



GFCF in energy not available

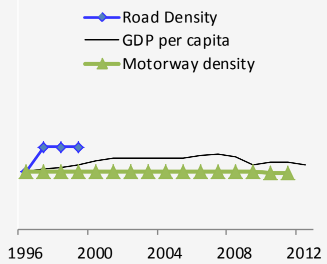
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

12. ITALY

Inland transport and Electricity infrastucture : provision and use

Index 1996 = 100

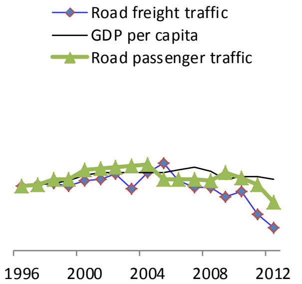


Total road density (km of roads per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	:	:	:	:	:
	EU	108	108	107	106	90
Levels	Italy	:	:	:	:	:
	EU	10064	10054	9984	9844	8391

Motorways density (km of motorways per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	99	99	99	99	:
	EU	133	136	138	139	:
Levels	Italy	113	113	113	112	:
	EU	137	139	141	142	:

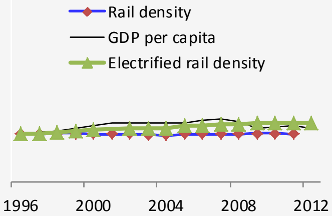


Road freight traffic intensity (tonne km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	100	92	96	78	68
	EU	140	126	130	128	124
Levels	Italy	3077	2841	2970	2406	2088
	EU	3780	3385	3504	3455	3345

Road passenger traffic intensity (passenger km by car per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	104	111	107	102	88
	EU	114	115	113	113	110
Levels	Italy	11532	12202	11799	11216	9743
	EU	9399	9515	9378	9314	9115

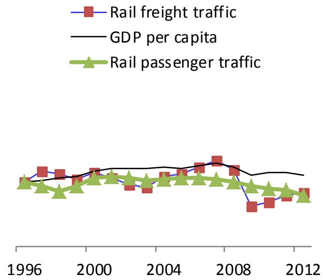


Total rail density (km of rail lines per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	100	100	100	100	:
	EU	94	93	93	94	104
Levels	Italy	282	283	282	282	:
	EU	440	434	435	443	489

Electrified rail density (km of electrified rail lines per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	110	111	111	111	111
	EU	98	103	106	104	113
Levels	Italy	200	201	201	201	201
	EU	214	223	230	226	245

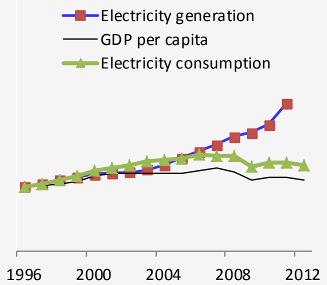


Rail freight traffic intensity (tonne km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	110	81	85	90	92
	EU	109	89	96	103	99
Levels	Italy	406	302	315	333	341
	EU	885	724	782	836	805

Rail passenger traffic intensity (passenger km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	101	97	95	94	90
	EU	114	112	112	114	114
Levels	Italy	844	816	797	789	751
	EU	825	807	808	822	827

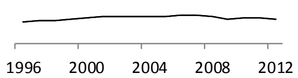


Electricity generation capacity (MW per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	140	143	150	166	:
	EU	119	122	128	134	:
Levels	Italy	1.7	1.7	1.8	2.0	:
	EU	1.6	1.7	1.7	1.8	:

Electricity consumption (MWh per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	125	116	119	120	118
	EU	119	112	117	115	115
Levels	Italy	5.3	4.9	5.1	5.1	5.0
	EU	5.7	5.4	5.6	5.5	5.5

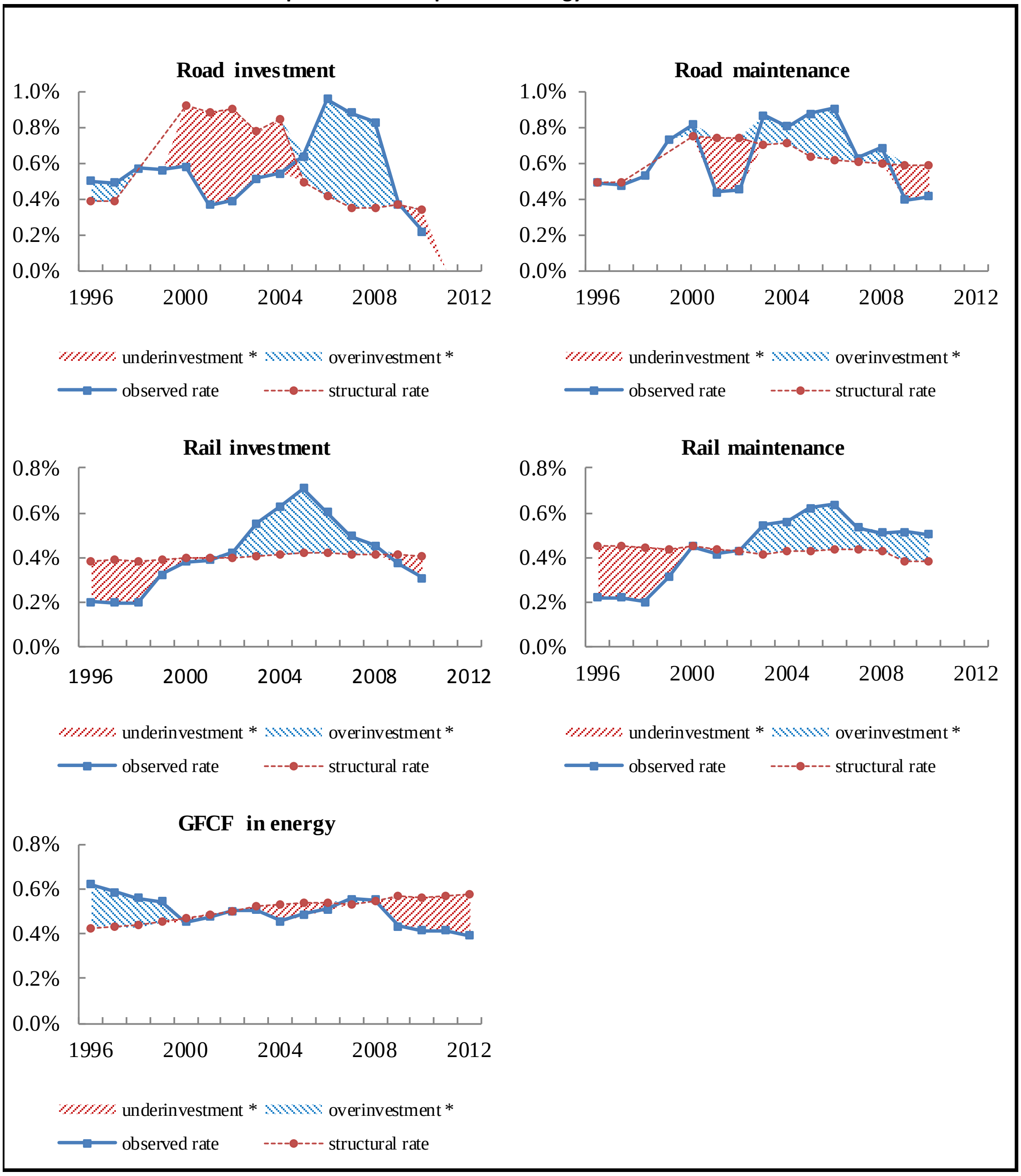


GDP per capita (EUR)

		2008	2009	2010	2011	2012
index 1996 = 100	Italy	112	105	107	108	106
	EU	130	124	127	129	129
Levels	Italy	30219	28378	28916	29106	28445
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



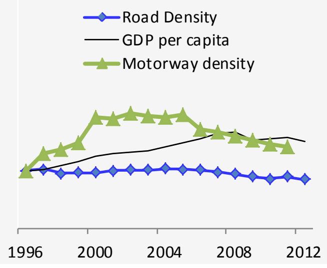
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

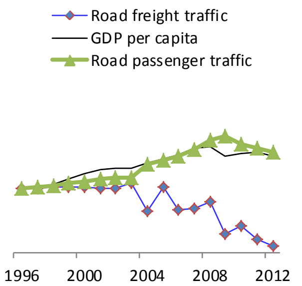
13. CYPRUS

Inland transport and Electricity infrastucture : provision and use

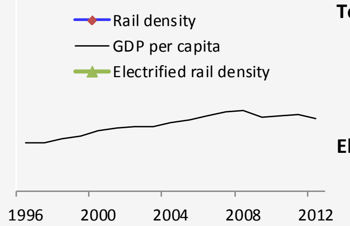
Index 1996 = 100



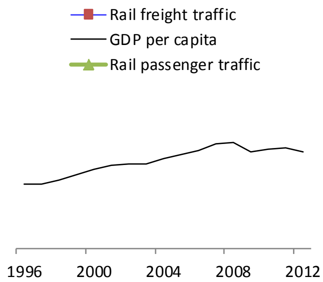
		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Cyprus	97	95	93	95	92
	EU	108	108	107	106	90
Levels	Cyprus	15871	15535	15239	15488	15138
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Cyprus	130	127	123	120	:
	EU	133	136	138	139	:
Levels	Cyprus	331	322	314	306	:
	EU	137	139	141	142	:



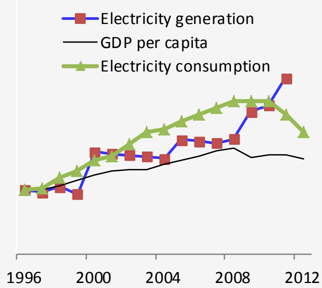
		2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Cyprus	90	64	71	60	55
	EU	140	126	130	128	124
Levels	Cyprus	1685	1208	1327	1121	1039
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Cyprus	139	141	135	132	129
	EU	114	115	113	113	110
Levels	Cyprus	7407	7529	7203	7064	6904
	EU	9399	9515	9378	9314	9115



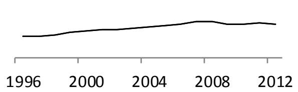
		2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Cyprus	:	:	:	:	:
	EU	94	93	93	94	104
Levels	Cyprus	:	:	:	:	:
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Cyprus	:	:	:	:	:
	EU	98	103	106	104	113
Levels	Cyprus	:	:	:	:	:
	EU	214	223	230	226	245



		2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Cyprus	:	:	:	:	:
	EU	109	89	96	103	99
Levels	Cyprus	0	0	0	0	0
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Cyprus	:	:	:	:	:
	EU	114	112	112	114	114
Levels	Cyprus	0	0	0	0	0
	EU	825	807	808	822	827



		2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Cyprus	141	162	167	189	:
	EU	119	122	128	134	:
Levels	Cyprus	1.5	1.8	1.8	2.1	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Cyprus	170	170	170	160	146
	EU	119	112	117	115	115
Levels	Cyprus	6.0	6.0	6.0	5.6	5.1
	EU	5.7	5.4	5.6	5.5	5.5



		2008	2009	2010	2011	2012
GDP per capita (EUR)						
index 1996 = 100	Cyprus	133	126	128	129	125
	EU	130	124	127	129	129
Levels	Cyprus	27290	25842	26182	26298	25663
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

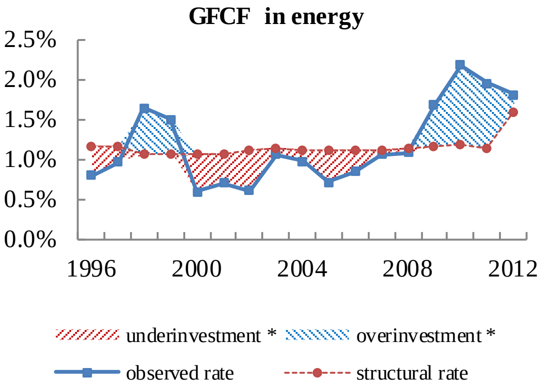
Investment and Maintenance pattern in Transport and Energy infrastructure

Road investment not available

Road maintenance not available

Rail investment not available

Rail maintenance not available



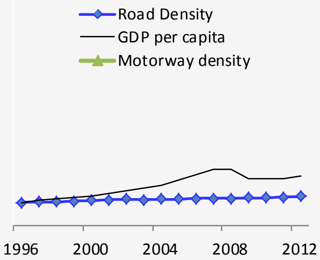
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

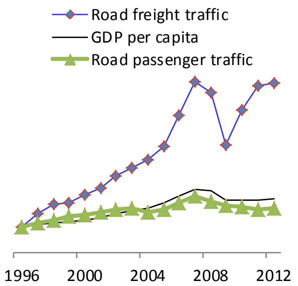
14. LATVIA

Inland transport and Electricity infrastucture : provision and use

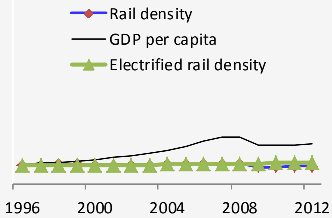
Index 1996 = 100



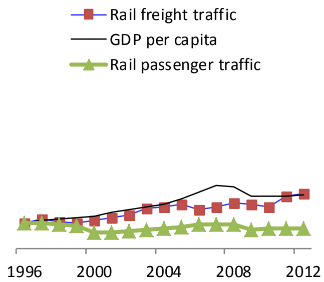
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Latvia	118	120	121	123	125
		EU	108	108	107	106	90
	Levels	Latvia	27021	27479	27789	28344	28641
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Latvia	:	:	:	:	:
		EU	133	136	138	139	:
	Levels	Latvia	:	:	:	:	:
		EU	137	139	141	142	:



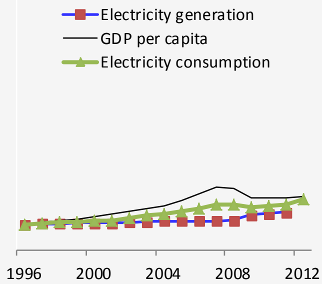
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Latvia	630	420	559	654	666
		EU	140	126	130	128	124
	Levels	Latvia	5632	3752	4994	5847	5956
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Latvia	201	181	179	169	174
		EU	114	115	113	113	110
	Levels	Latvia	6503	5874	5806	5471	5638
		EU	9399	9515	9378	9314	9115



			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Latvia	106	89	92	92	93
		EU	94	93	93	94	104
	Levels	Latvia	1032	871	895	899	909
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Latvia	107	108	110	113	111
		EU	98	103	106	104	113
	Levels	Latvia	117	119	121	124	122
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Latvia	178	172	161	205	213
		EU	109	89	96	103	99
	Levels	Latvia	8934	8658	8101	10320	10694
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Latvia	93	75	76	77	77
		EU	114	112	112	114	114
	Levels	Latvia	434	350	353	357	357
		EU	825	807	808	822	827

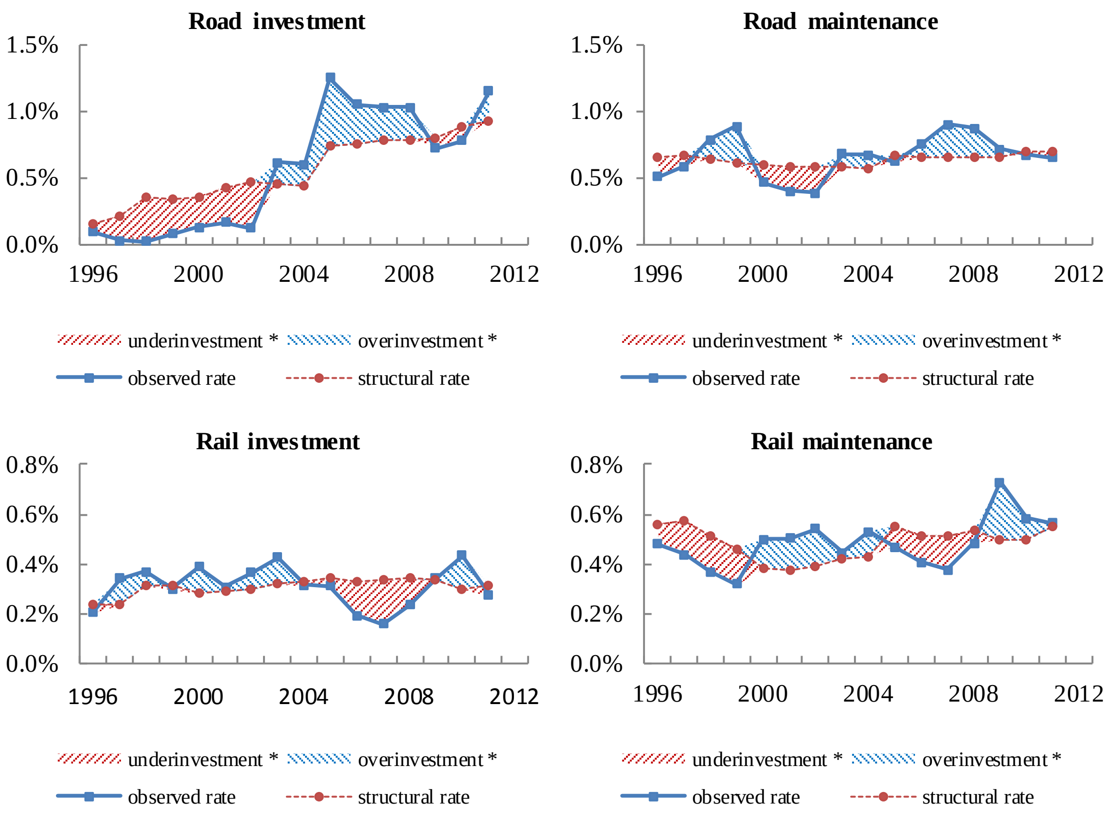


			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Latvia	116	137	142	147	:
		EU	119	122	128	134	:
	Levels	Latvia	1.0	1.2	1.2	1.2	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Latvia	181	169	175	178	200
		EU	119	112	117	115	115
	Levels	Latvia	3.0	2.8	2.9	3.0	3.3
		EU	5.7	5.4	5.6	5.5	5.5

			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Latvia	240	204	204	203	212
		EU	130	124	127	129	129
	Levels	Latvia	15527	13162	13174	13084	13721
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



GFCF in energy not available

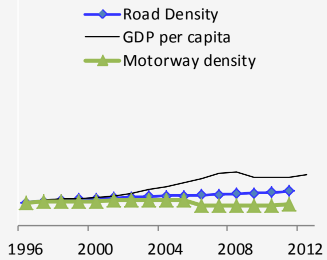
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

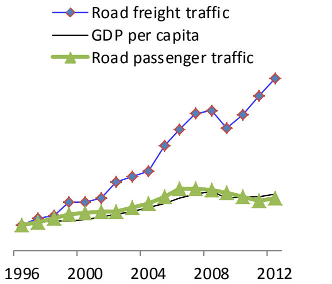
15. LITHUANIA

Inland transport and Electricity infrastucture : provision and use

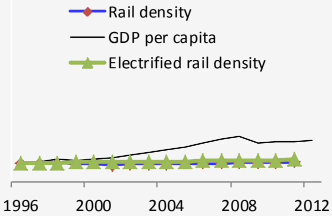
Index 1996 = 100



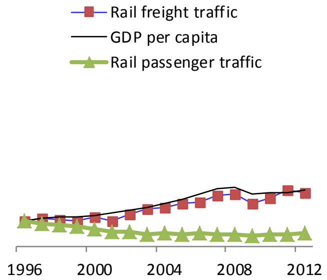
		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Lithuania	138	139	143	148	:
	EU	108	108	107	106	90
Levels	Lithuania	25223	25545	26140	27161	:
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Lithuania	86	87	88	91	:
	EU	133	136	138	139	:
Levels	Lithuania	96	97	98	101	:
	EU	137	139	141	142	:



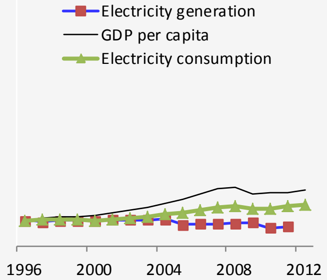
		2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Lithuania	548	481	533	608	673
	EU	140	126	130	128	124
Levels	Lithuania	6356	5577	6174	7047	7807
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Lithuania	238	227	208	197	203
	EU	114	115	113	113	110
Levels	Lithuania	11826	11324	10366	9798	10116
	EU	9399	9515	9378	9314	9115



		2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Lithuania	99	101	102	105	:
	EU	94	93	93	94	104
Levels	Lithuania	550	555	563	579	:
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Lithuania	113	114	115	118	:
	EU	98	103	106	104	113
Levels	Lithuania	38	38	39	40	:
	EU	214	223	230	226	245



		2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Lithuania	205	167	191	221	211
	EU	109	89	96	103	99
Levels	Lithuania	4591	3734	4275	4943	4718
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Lithuania	47	42	45	48	51
	EU	114	112	112	114	114
Levels	Lithuania	124	112	119	127	134
	EU	825	807	808	822	827

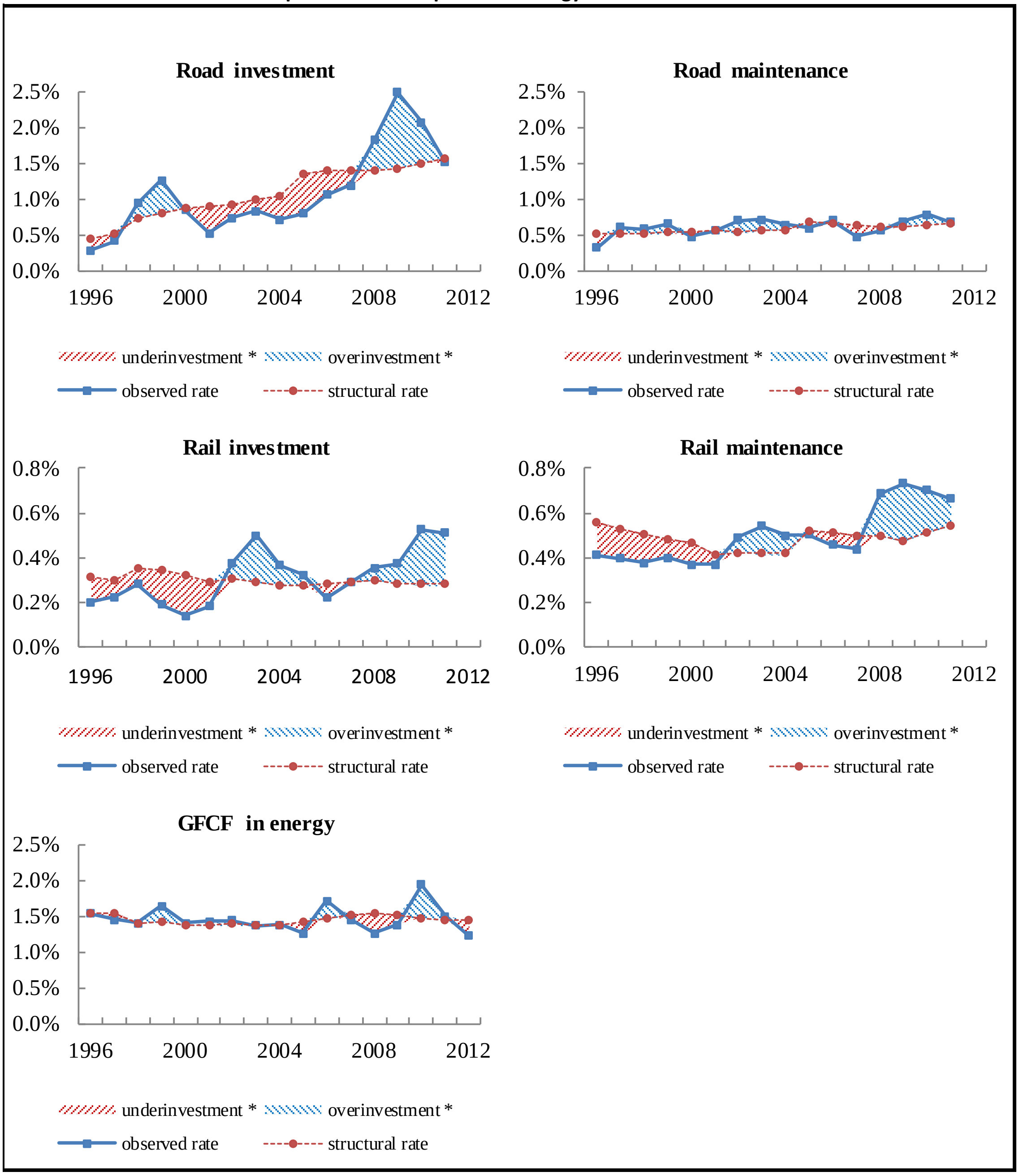


		2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Lithuania	89	91	70	75	:
	EU	119	122	128	134	:
Levels	Lithuania	1.4	1.5	1.1	1.2	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Lithuania	156	146	147	156	165
	EU	119	112	117	115	115
Levels	Lithuania	2.8	2.6	2.7	2.8	3.0
	EU	5.7	5.4	5.6	5.5	5.5

		2008	2009	2010	2011	2012
GDP per capita (EUR)						
index 1996 = 100	Lithuania	233	205	210	210	218
	EU	130	124	127	129	129
Levels	Lithuania	17999	15821	16187	16201	16817
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



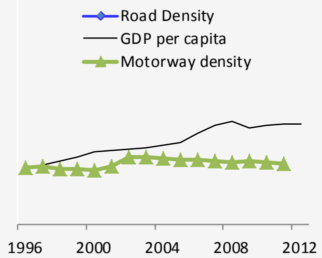
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

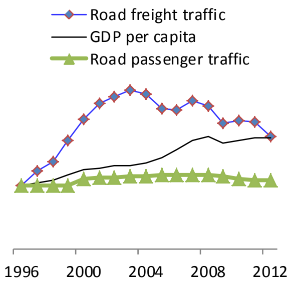
16. LUXEMBOURG

Inland transport and Electricity infrastucture : provision and use

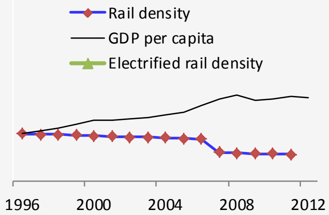
Index 1996 = 100



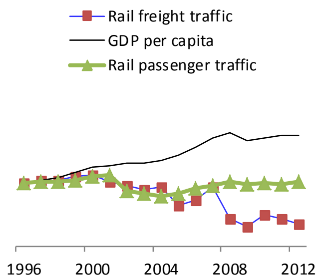
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Luxembourg	:	:	:	:	:
		EU	108	108	107	106	90
	Levels	Luxembourg	:	:	:	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Luxembourg	109	110	108	106	:
		EU	133	136	138	139	:
	Levels	Luxembourg	304	308	303	297	:
		EU	137	139	141	142	:



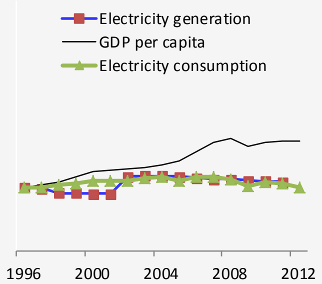
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Luxembourg	228	200	204	203	178
		EU	140	126	130	128	124
	Levels	Luxembourg	19392	17021	17316	17261	15147
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Luxembourg	119	116	111	110	110
		EU	114	115	113	113	110
	Levels	Luxembourg	13849	13576	12947	12879	12829
		EU	9399	9515	9378	9314	9115



			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Luxembourg	60	59	58	57	:
		EU	94	93	93	94	104
	Levels	Luxembourg	568	557	548	537	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Luxembourg	:	:	:	:	:
		EU	98	103	106	104	113
	Levels	Luxembourg	542	:	:	512	:
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Luxembourg	45	31	50	44	36
		EU	109	89	96	103	99
	Levels	Luxembourg	577	405	643	563	459
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Luxembourg	103	98	100	99	103
		EU	114	112	112	114	114
	Levels	Luxembourg	713	675	691	682	713
		EU	825	807	808	822	827

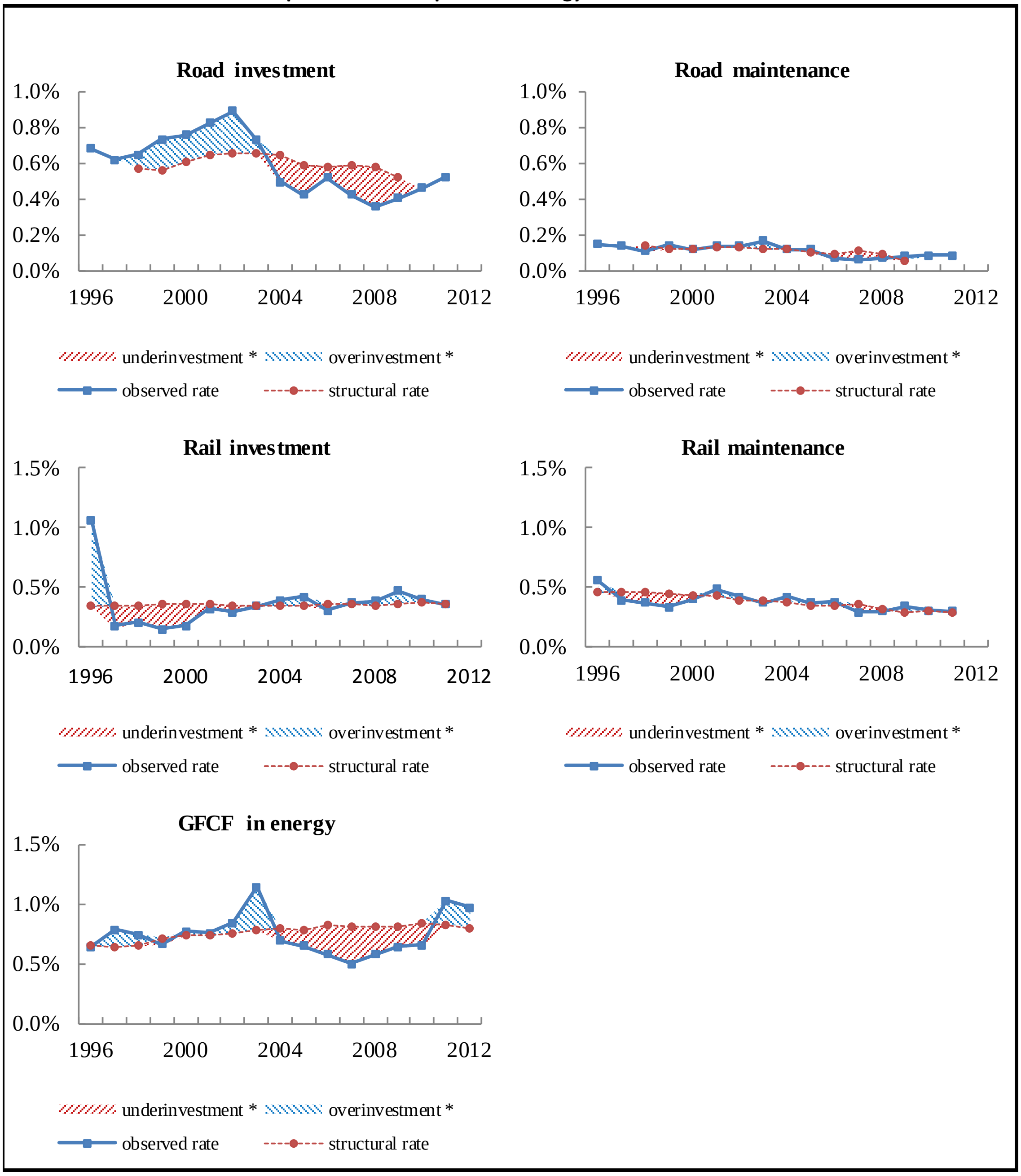


			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Luxembourg	114	112	111	110	:
		EU	119	122	128	134	:
	Levels	Luxembourg	3.5	3.5	3.4	3.4	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Luxembourg	114	104	110	107	100
		EU	119	112	117	115	115
	Levels	Luxembourg	13.6	12.4	13.2	12.8	11.9
		EU	5.7	5.4	5.6	5.5	5.5

			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Luxembourg	180	168	173	176	176
		EU	130	124	127	129	129
	Levels	Luxembourg	90223	84082	86690	88342	88186
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



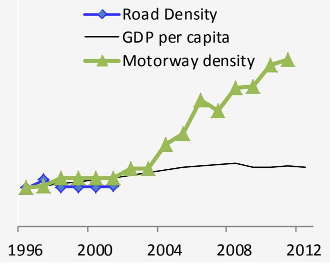
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

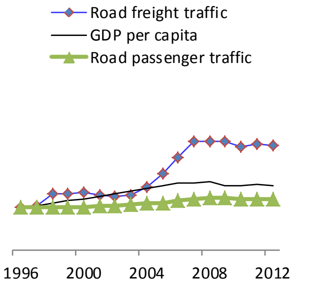
Source: Commission Services based on Eurostat and OECD

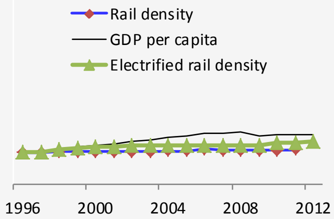
17. HUNGARY

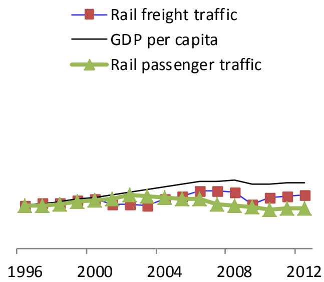
Inland transport and Electricity infrastucture : provision and use

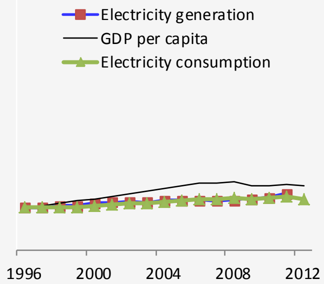
Index 1996 = 100

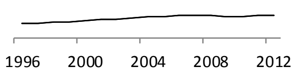








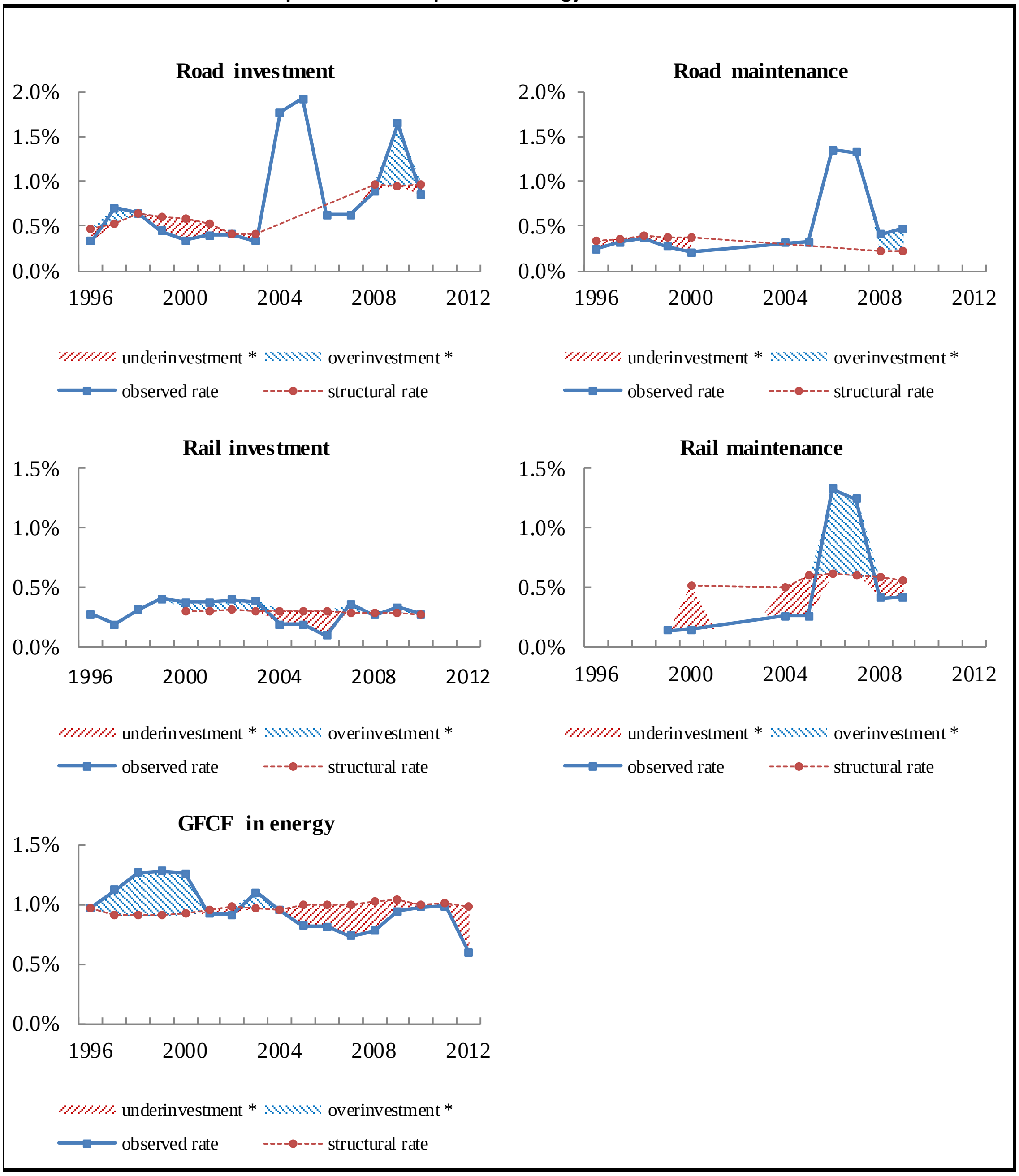




		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Hungary	:	:	:	:	:
	EU	108	108	107	106	90
Levels	Hungary	:	:	:	:	:
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Hungary	359	359	417	429	:
	EU	133	136	138	139	:
Levels	Hungary	127	127	147	152	:
	EU	137	139	141	142	:
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Hungary	257	255	243	250	245
	EU	140	126	130	128	124
Levels	Hungary	3560	3526	3367	3458	3397
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Hungary	122	123	119	118	119
	EU	114	115	113	113	110
Levels	Hungary	5376	5423	5252	5233	5254
	EU	9399	9515	9378	9314	9115
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Hungary	105	107	107	107	:
	EU	94	93	93	94	104
Levels	Hungary	778	787	788	792	:
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Hungary	120	122	128	131	133
	EU	98	103	106	104	113
Levels	Hungary	273	278	292	299	303
	EU	214	223	230	226	245
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Hungary	133	104	119	124	126
	EU	109	89	96	103	99
Levels	Hungary	983	765	880	913	929
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Hungary	99	97	92	94	95
	EU	114	112	112	114	114
Levels	Hungary	826	805	768	782	786
	EU	825	807	808	822	827
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Hungary	118	120	123	132	:
	EU	119	122	128	134	:
Levels	Hungary	0.9	0.9	0.9	1.0	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Hungary	123	119	123	124	119
	EU	119	112	117	115	115
Levels	Hungary	3.4	3.3	3.4	3.5	3.3
	EU	5.7	5.4	5.6	5.5	5.5
GDP per capita (EUR)						
index 1996 = 100	Hungary	161	151	153	155	153
	EU	130	124	127	129	129
Levels	Hungary	17577	16473	16647	16908	16670
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



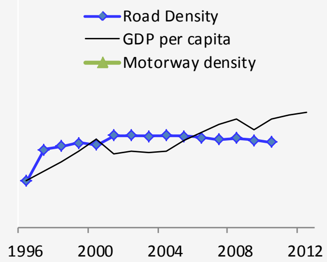
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

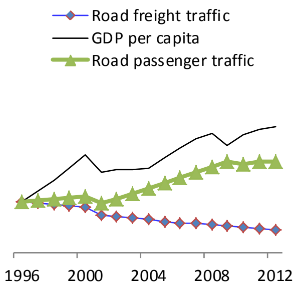
18. MALTA

Inland transport and Electricity infrastucture : provision and use

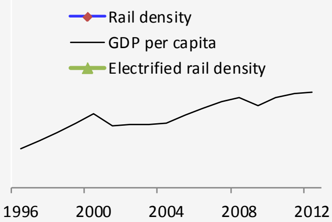
Index 1996 = 100



			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Malta	119	118	117	:	:
		EU	108	108	107	106	90
	Levels	Malta	12034	11944	11854	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Malta	:	:	:	:	:
		EU	133	136	138	139	:
	Levels	Malta	:	:	:	:	:
		EU	137	139	141	142	:

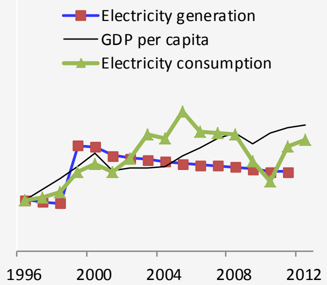


			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Malta	91	90	90	89	89
		EU	140	126	130	128	124
	Levels	Malta	613	608	604	602	599
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Malta	114	116	115	116	116
		EU	114	115	113	113	110
	Levels	Malta	5272	5354	5314	5373	5366
		EU	9399	9515	9378	9314	9115

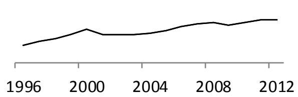


			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Malta	:	:	:	:	:
		EU	94	93	93	94	104
	Levels	Malta	:	:	:	:	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Malta	:	:	:	:	:
		EU	98	103	106	104	113
	Levels	Malta	:	:	:	:	:
		EU	214	223	230	226	245

			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Malta	:	:	:	:	:
		EU	109	89	96	103	99
	Levels	Malta	0	0	0	0	0
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Malta	:	:	:	:	:
		EU	114	112	112	114	114
	Levels	Malta	0	0	0	0	0
		EU	825	807	808	822	827



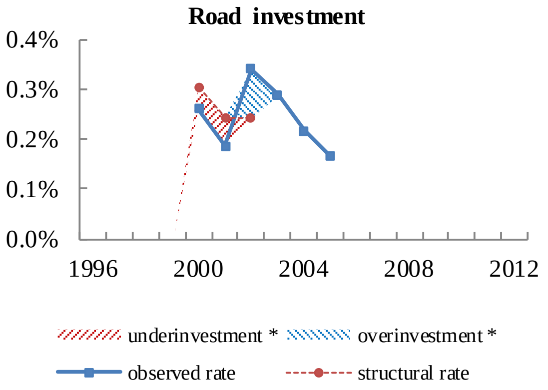
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Malta	113	112	111	111	:
		EU	119	122	128	134	:
	Levels	Malta	1.4	1.4	1.4	1.4	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Malta	126	115	108	121	124
		EU	119	112	117	115	115
	Levels	Malta	4.5	4.2	3.9	4.4	4.5
		EU	5.7	5.4	5.6	5.5	5.5

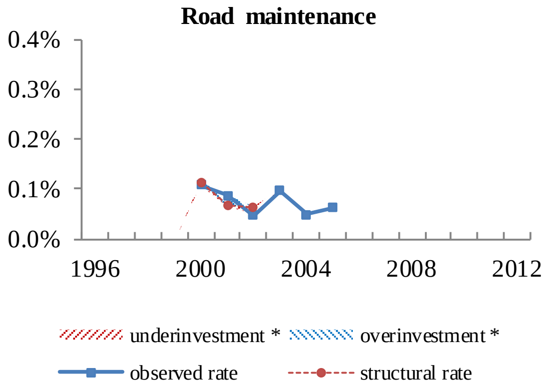


			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Malta	127	122	127	129	129
		EU	130	124	127	129	129
	Levels	Malta	22065	21297	22032	22406	22534
		EU	29331	27949	28532	29021	28957

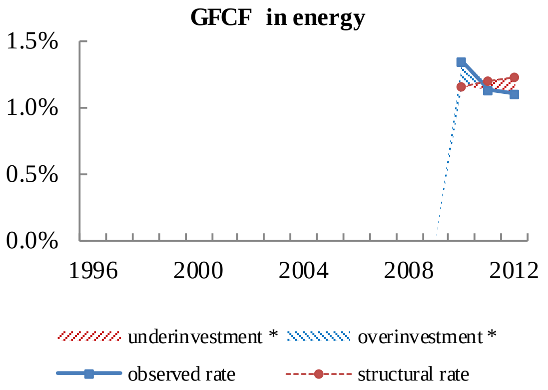
Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure





Rail network not available

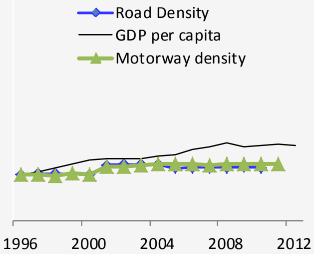
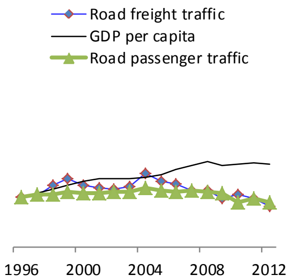
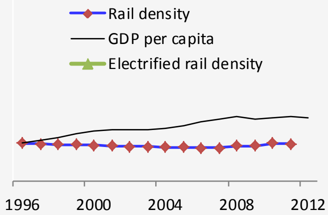
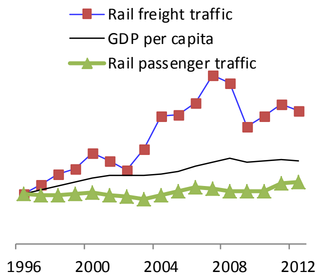
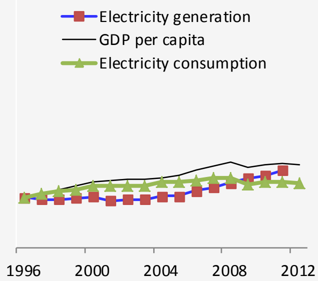
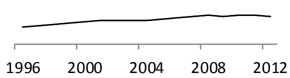


* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

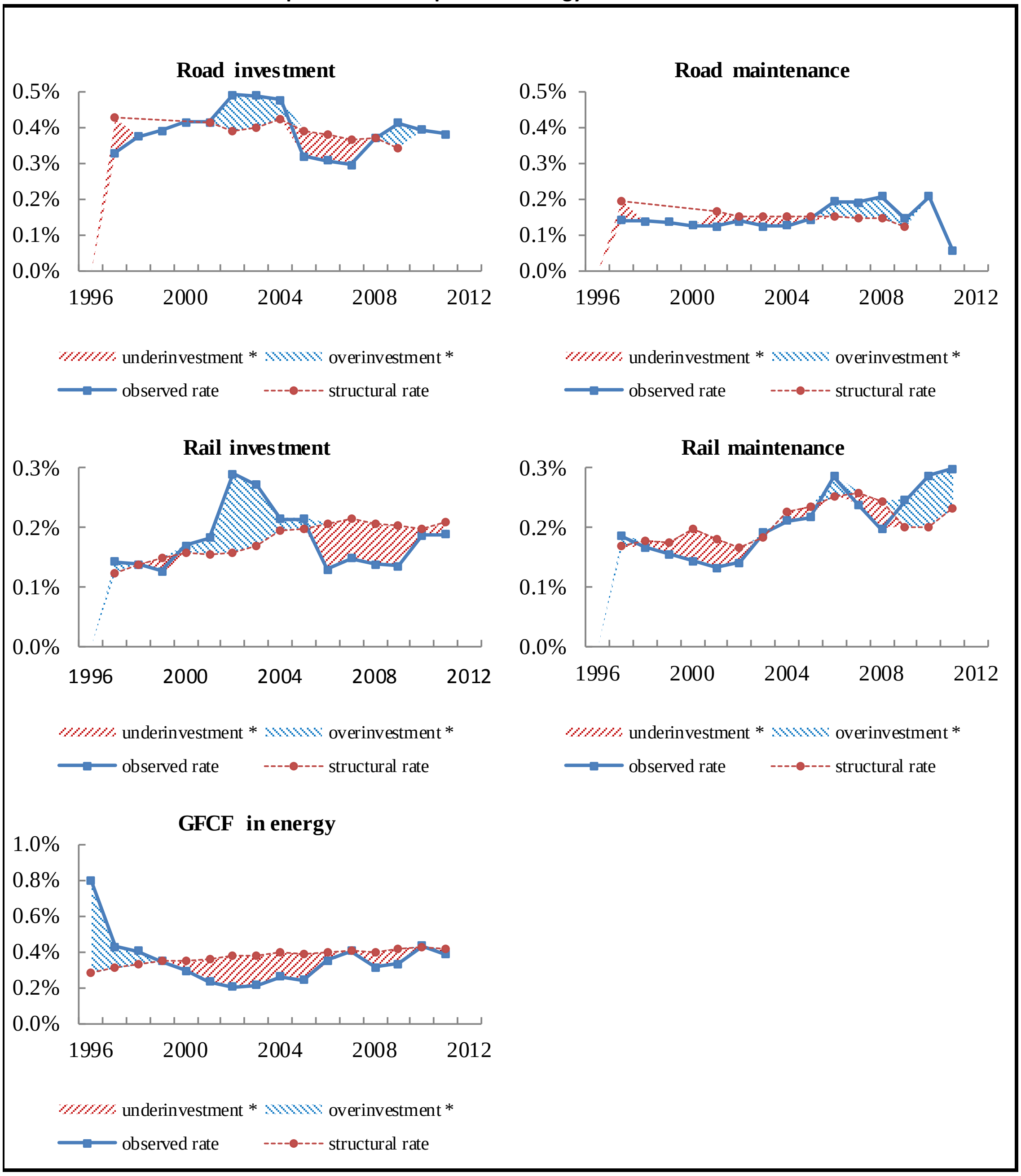
19. THE NETHERLANDS

Inland transport and Electricity infrastucture : provision and use

Index 1996 = 100			2008	2009	2010	2011	2012
	**Total road density (km of roads per mn inhabitants)**						
	index 1996 = 100	Netherlands	108	109	108	:	:
		EU	108	108	107	106	90
	Levels	Netherlands	7886	7941	7865	:	:
		EU	10064	10054	9984	9844	8391
	Motorways density (km of motorways per mn inhabitants)						
	index 1996 = 100	Netherlands	113	113	112	112	:
		EU	133	136	138	139	:
	Levels	Netherlands	161	161	160	160	:
		EU	137	139	141	142	:
	**Road freight traffic intensity (tonne km per capita)**						
	index 1996 = 100	Netherlands	106	98	102	99	90
		EU	140	126	130	128	124
	Levels	Netherlands	4764	4408	4572	4426	4053
		EU	3780	3385	3504	3455	3345
	Road passenger traffic intensity (passenger km by car per capita)						
	index 1996 = 100	Netherlands	105	104	95	98	95
		EU	114	115	113	113	110
	Levels	Netherlands	8960	8874	8151	8411	8153
		EU	9399	9515	9378	9314	9115
	**Total rail density (km of rail lines per mn inhabitants)**						
	index 1996 = 100	Netherlands	97	97	100	100	:
		EU	94	93	93	94	104
	Levels	Netherlands	176	176	182	181	:
		EU	440	434	435	443	489
	Electrified rail density (km of electrified rail lines per mn inhabitants)						
	index 1996 = 100	Netherlands	:	:	:	:	:
		EU	98	103	106	104	113
	Levels	Netherlands	131	131	137	136	:
		EU	214	223	230	226	245
	**Rail freight traffic intensity (tonne km per capita)**						
	index 1996 = 100	Netherlands	211	168	177	190	183
		EU	109	89	96	103	99
	Levels	Netherlands	426	338	357	383	368
		EU	885	724	782	836	805
	Rail passenger traffic intensity (passenger km per capita)						
	index 1996 = 100	Netherlands	103	103	102	111	112
		EU	114	112	112	114	114
	Levels	Netherlands	933	934	929	1009	1022
		EU	825	807	808	822	827
	**Electricity generation capacity (MW per mn inhabitants)**						
	index 1996 = 100	Netherlands	115	120	122	128	:
		EU	119	122	128	134	:
	Levels	Netherlands	1.5	1.6	1.6	1.7	:
		EU	1.6	1.7	1.7	1.8	:
	Electricity consumption (MWh per capita)						
	index 1996 = 100	Netherlands	120	114	116	116	115
		EU	119	112	117	115	115
	Levels	Netherlands	6.7	6.3	6.4	6.5	6.4
		EU	5.7	5.4	5.6	5.5	5.5
	**GDP per capita (EUR)**						
	index 1996 = 100	Netherlands	135	131	133	134	133
		EU	130	124	127	129	129
	Levels	Netherlands	42497	41132	41761	42155	41630
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



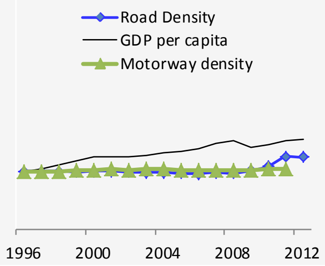
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

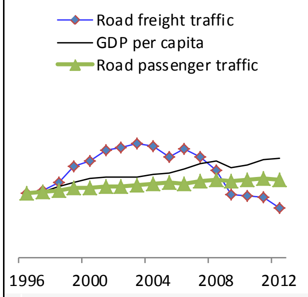
20. AUSTRIA

Inland transport and Electricity infrastucture : provision and use

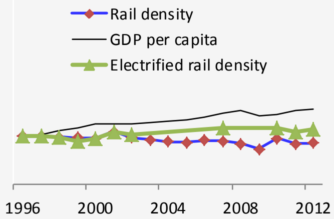
Index 1996 = 100



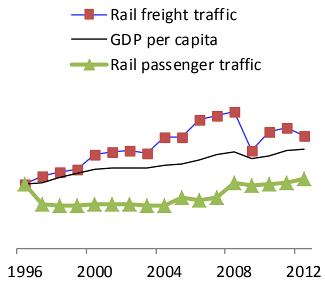
		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Austria	98	100	104	113	112
	EU	108	108	107	106	90
Levels	Austria	12949	13222	13721	14866	14762
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Austria	101	101	102	102	:
	EU	133	136	138	139	:
Levels	Austria	204	203	206	205	:
	EU	137	139	141	142	:



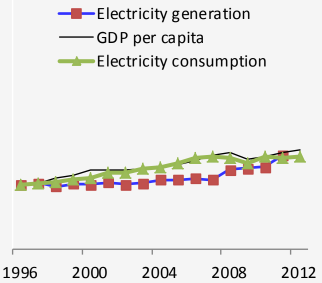
		2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Austria	118	100	98	97	89
	EU	140	126	130	128	124
Levels	Austria	4130	3488	3432	3408	3103
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Austria	111	110	111	112	111
	EU	114	115	113	113	110
Levels	Austria	8821	8719	8797	8889	8819
	EU	9399	9515	9378	9314	9115



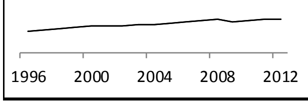
		2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Austria	92	87	98	92	93
	EU	94	93	93	94	104
Levels	Austria	658	620	698	657	662
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Austria	:	:	108	105	107
	EU	98	103	106	104	113
Levels	Austria	:	:	463	449	458
	EU	214	223	230	226	245



		2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Austria	157	127	142	145	138
	EU	109	89	96	103	99
Levels	Austria	2638	2132	2375	2429	2319
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Austria	101	99	100	101	105
	EU	114	112	112	114	114
Levels	Austria	1304	1278	1286	1299	1347
	EU	825	807	808	822	827



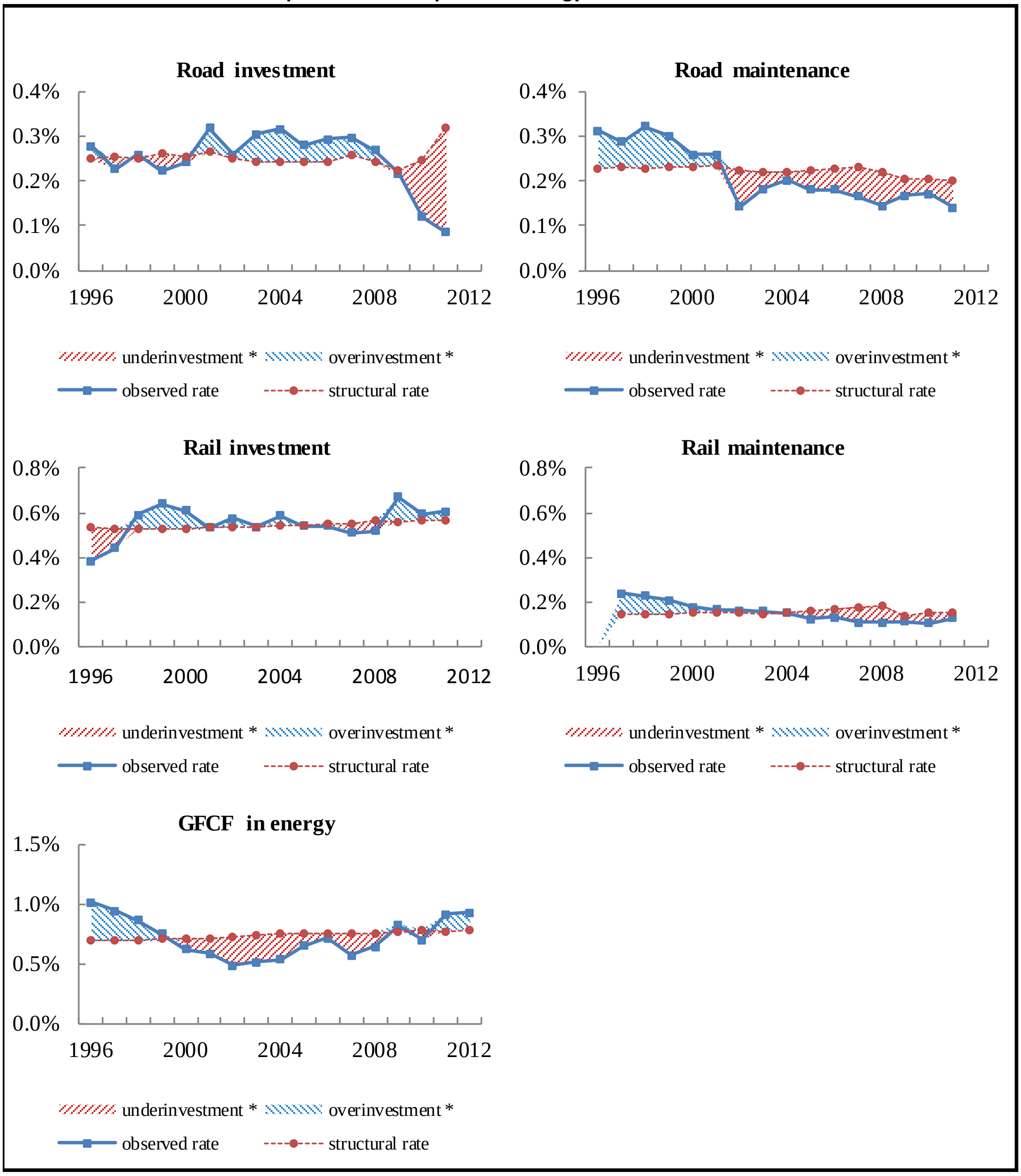
		2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Austria	112	114	115	124	:
	EU	119	122	128	134	:
Levels	Austria	2.5	2.5	2.5	2.7	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Austria	122	118	123	122	123
	EU	119	112	117	115	115
Levels	Austria	7.4	7.1	7.5	7.4	7.5
	EU	5.7	5.4	5.6	5.5	5.5



		2008	2009	2010	2011	2012
GDP per capita (EUR)						
index 1996 = 100	Austria	126	121	123	126	128
	EU	130	124	127	129	129
Levels	Austria	38516	36839	37506	38593	38956
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



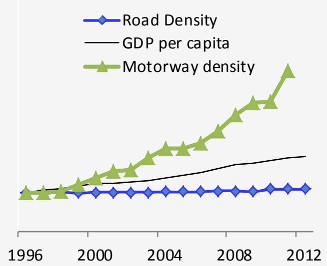
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

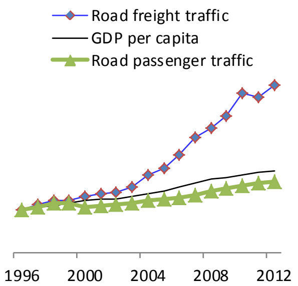
Source: Commission Services based on Eurostat and OECD

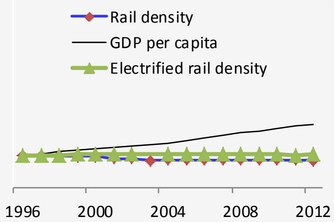
21. POLAND

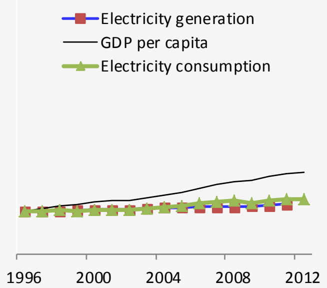
Inland transport and Electricity infrastucture : provision and use

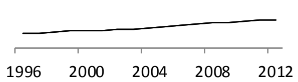
Index 1996 = 100







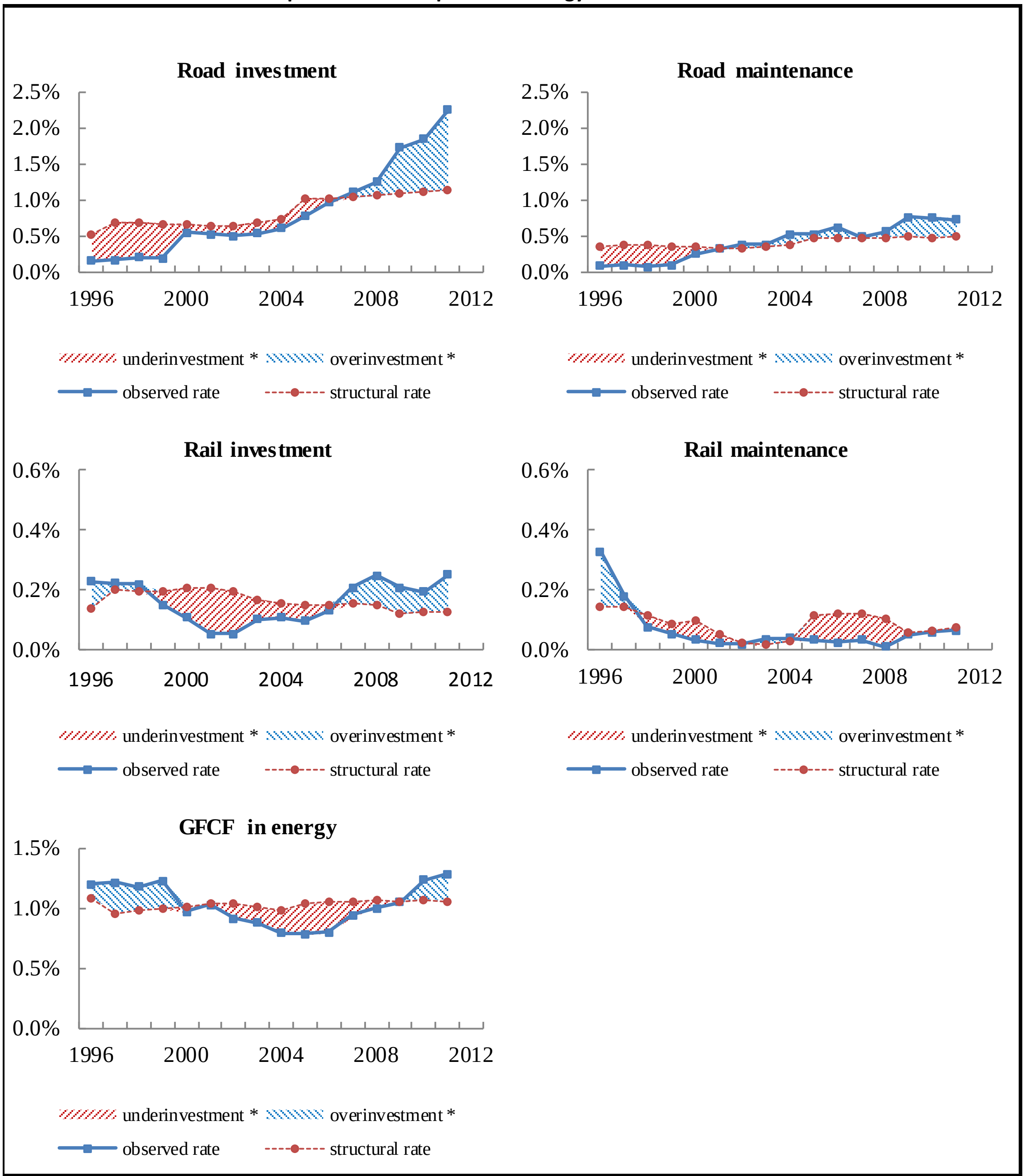




			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Poland	104	104	110	110	110
		EU	108	108	107	106	90
	Levels	Poland	10127	10094	10663	10728	10727
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Poland	300	333	336	416	:
		EU	133	136	138	139	:
	Levels	Poland	20	22	22	28	:
		EU	137	139	141	142	:
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Poland	296	324	377	368	394
		EU	140	126	130	128	124
	Levels	Poland	4327	4739	5524	5389	5769
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Poland	144	152	157	163	169
		EU	114	115	113	113	110
	Levels	Poland	4528	4793	4947	5134	5309
		EU	9399	9515	9378	9314	9115
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Poland	87	88	87	87	86
		EU	94	93	93	94	104
	Levels	Poland	530	534	530	525	521
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Poland	104	104	104	102	103
		EU	98	103	106	104	113
	Levels	Poland	313	314	312	308	309
		EU	214	223	230	226	245
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Poland	78	65	73	80	73
		EU	109	89	96	103	99
	Levels	Poland	1365	1139	1276	1395	1269
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Poland	103	95	92	92	90
		EU	114	112	112	114	114
	Levels	Poland	530	489	470	472	463
		EU	825	807	808	822	827
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Poland	111	113	114	117	:
		EU	119	122	128	134	:
	Levels	Poland	0.9	0.9	0.9	0.9	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Poland	126	120	127	129	129
		EU	119	112	117	115	115
	Levels	Poland	3.1	3.0	3.1	3.2	3.2
		EU	5.7	5.4	5.6	5.5	5.5
GDP per capita (EUR)							
	index 1996 = 100	Poland	172	175	182	190	194
		EU	130	124	127	129	129
	Levels	Poland	16204	16509	17149	17924	18272
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



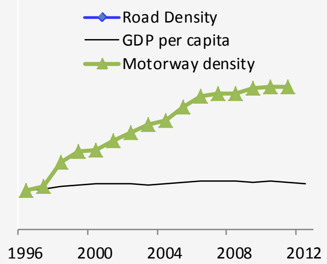
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

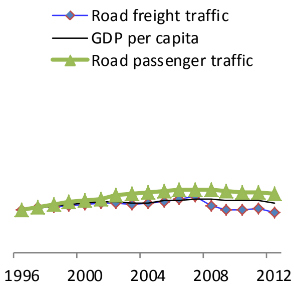
22. PORTUGAL

Inland transport and Electricity infrastucture : provision and use

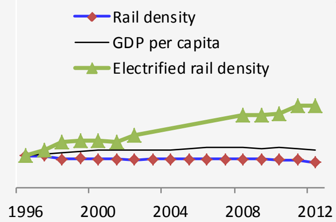
Index 1996 = 100



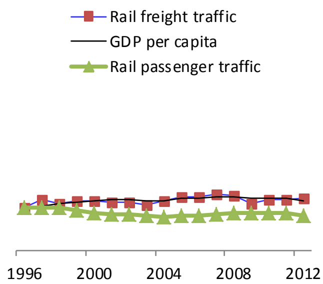
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Portugal	:	:	:	:	:
		EU	108	108	107	106	90
	Levels	Portugal	:	:	:	:	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Portugal	352	362	366	366	:
		EU	133	136	138	139	:
	Levels	Portugal	249	256	259	259	:
		EU	137	139	141	142	:



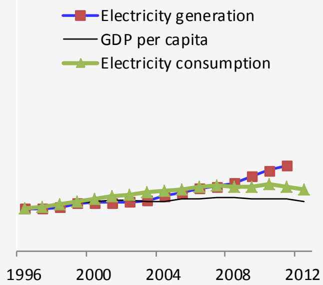
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Portugal	111	101	100	103	93
		EU	140	126	130	128	124
	Levels	Portugal	3704	3390	3345	3448	3124
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Portugal	148	146	142	141	140
		EU	114	115	113	113	110
	Levels	Portugal	8244	8142	7916	7868	7791
		EU	9399	9515	9378	9314	9115



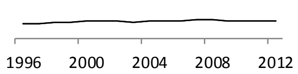
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Portugal	89	89	88	86	79
		EU	94	93	93	94	104
	Levels	Portugal	271	271	269	264	241
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Portugal	226	226	230	252	253
		EU	98	103	106	104	113
	Levels	Portugal	138	138	141	154	155
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Portugal	131	111	118	119	124
		EU	109	89	96	103	99
	Levels	Portugal	242	206	219	220	230
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Portugal	89	88	87	87	80
		EU	114	112	112	114	114
	Levels	Portugal	399	393	389	392	361
		EU	825	807	808	822	827



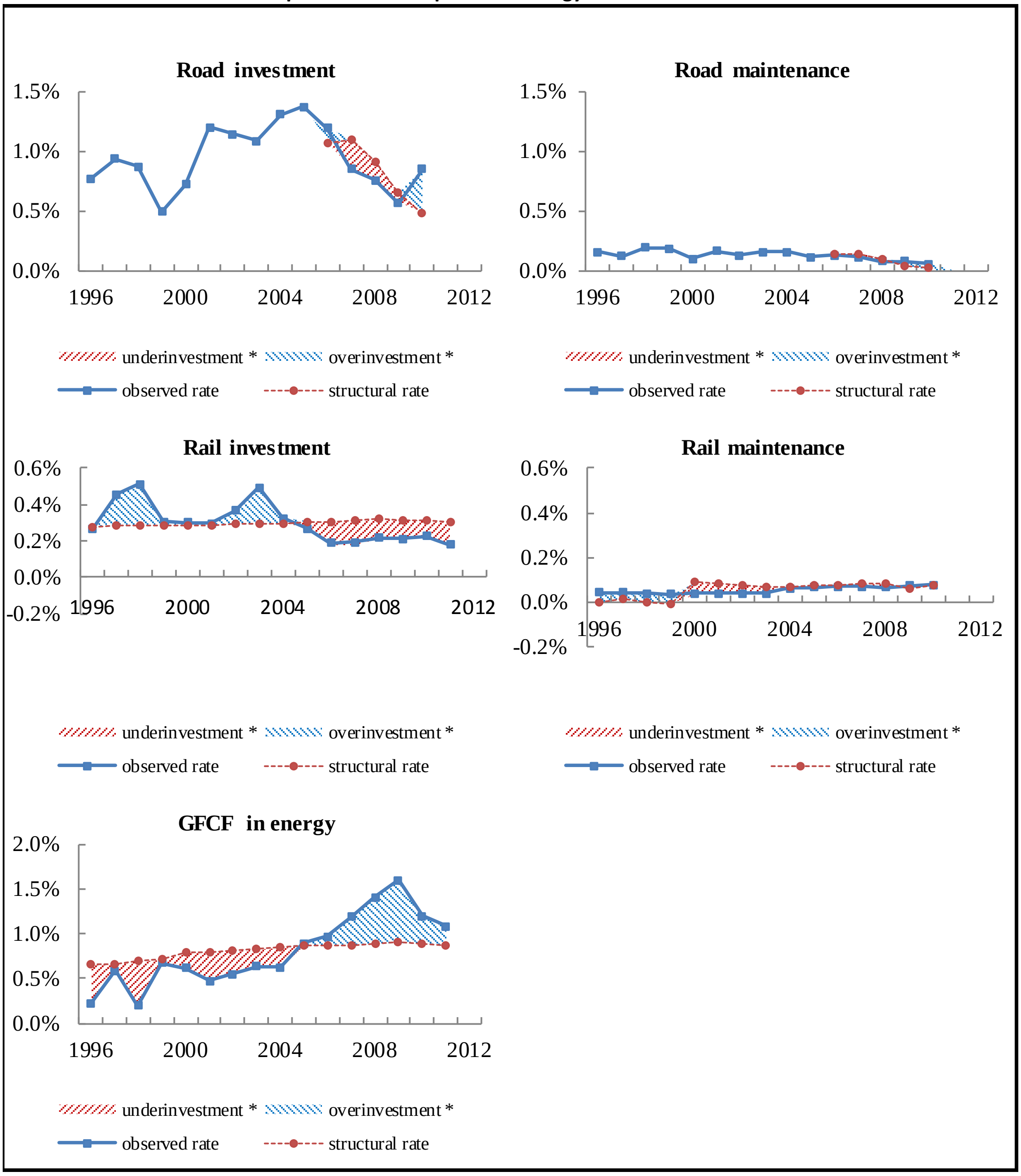
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Portugal	160	176	191	202	:
		EU	119	122	128	134	:
	Levels	Portugal	1.5	1.6	1.8	1.9	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Portugal	152	151	157	152	146
		EU	119	112	117	115	115
	Levels	Portugal	4.6	4.5	4.7	4.6	4.4
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Portugal	126	122	124	122	118
		EU	130	124	127	129	129
	Levels	Portugal	20890	20163	20553	20173	19522
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



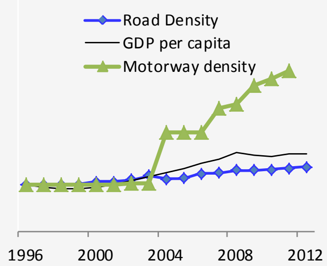
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

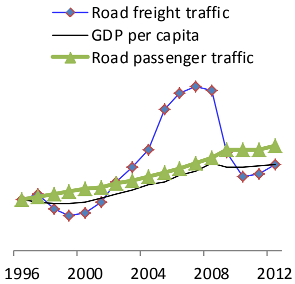
23. ROMANIA

Inland transport and Electricity infrastucture : provision and use

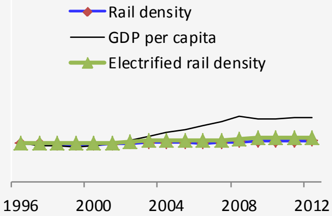
Index 1996 = 100



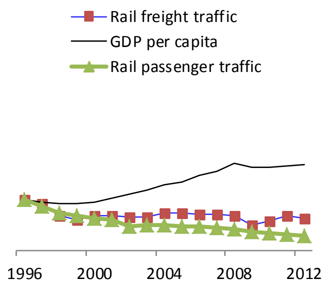
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Romania	132	132	134	137	139
		EU	108	108	107	106	90
	Levels	Romania	3993	4013	4059	4144	4217
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Romania	273	315	328	347	:
		EU	133	136	138	139	:
	Levels	Romania	14	16	16	17	:
		EU	137	139	141	142	:



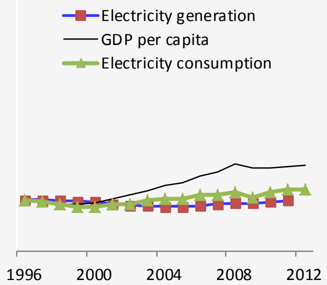
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Romania	313	192	146	149	169
		EU	140	126	130	128	124
	Levels	Romania	2732	1677	1276	1304	1476
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Romania	182	197	198	198	204
		EU	114	115	113	113	110
	Levels	Romania	3416	3694	3720	3712	3834
		EU	9399	9515	9378	9314	9115



			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Romania	104	105	106	106	107
		EU	94	93	93	94	104
	Levels	Romania	523	528	531	534	536
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Romania	112	114	115	116	117
		EU	98	103	106	104	113
	Levels	Romania	193	196	198	199	200
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Romania	69	51	57	68	63
		EU	109	89	96	103	99
	Levels	Romania	738	542	610	729	670
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Romania	42	37	33	31	28
		EU	114	112	112	114	114
	Levels	Romania	337	300	268	251	226
		EU	825	807	808	822	827

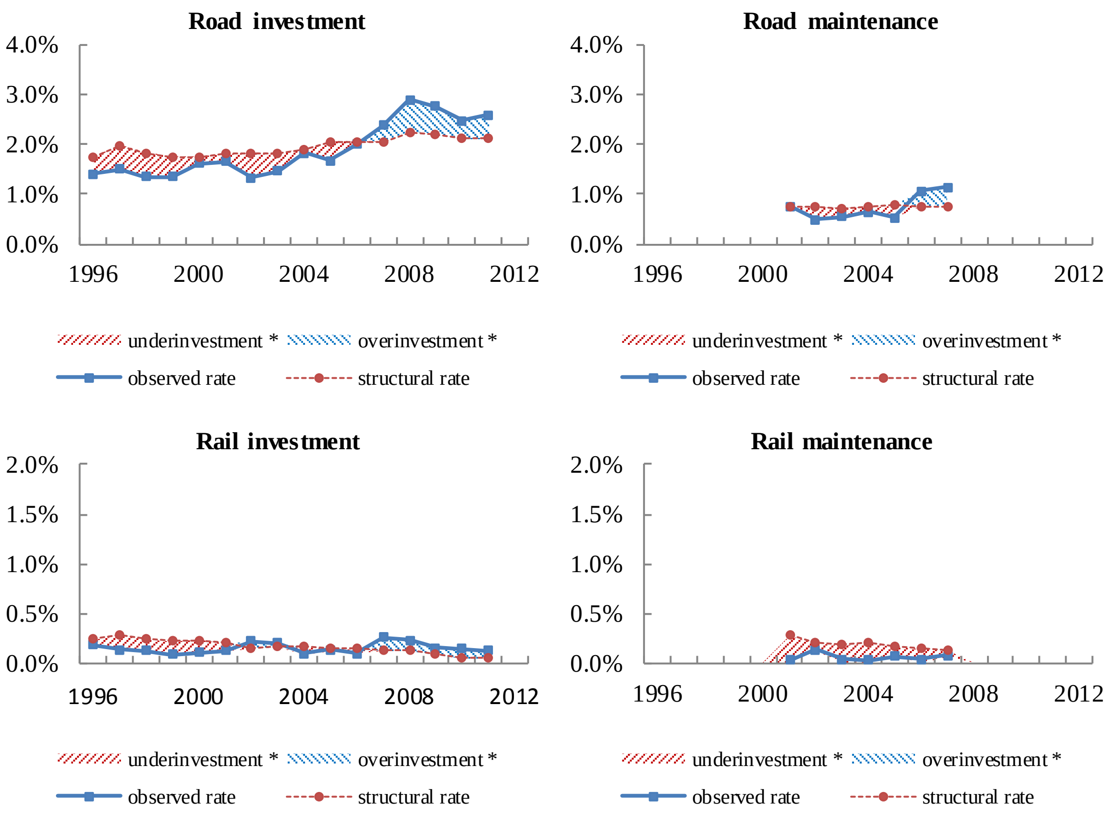


			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Romania	93	94	96	100	:
		EU	119	122	128	134	:
	Levels	Romania	1.0	1.0	1.0	1.0	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Romania	116	105	116	121	120
		EU	119	112	117	115	115
	Levels	Romania	2.0	1.8	2.0	2.1	2.1
		EU	5.7	5.4	5.6	5.5	5.5

			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Romania	171	164	163	167	168
		EU	130	124	127	129	129
	Levels	Romania	10944	10485	10422	10673	10772
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



GFCF in energy not available

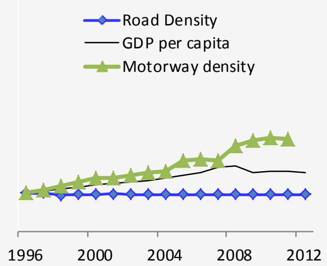
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

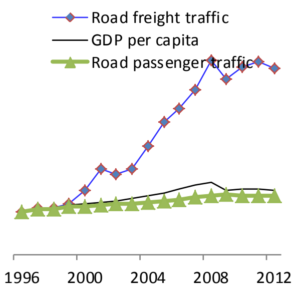
24. SLOVENIA

Inland transport and Electricity infrastucture : provision and use

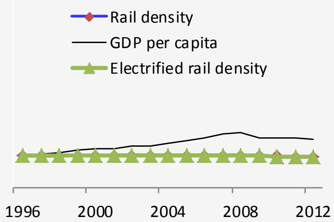
Index 1996 = 100



			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Slovenia	97	96	96	96	95
		EU	108	108	107	106	90
	Levels	Slovenia	19182	19153	19078	19044	18966
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Slovenia	222	236	242	241	:
		EU	133	136	138	139	:
	Levels	Slovenia	346	368	377	375	:
		EU	137	139	141	142	:

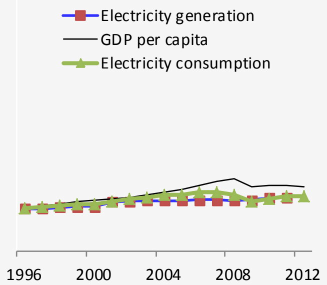


			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Slovenia	460	413	443	456	440
		EU	140	126	130	128	124
	Levels	Slovenia	8089	7263	7783	8018	7730
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Slovenia	138	142	140	139	138
		EU	114	115	113	113	110
	Levels	Slovenia	12375	12682	12524	12432	12310
		EU	9399	9515	9378	9314	9115

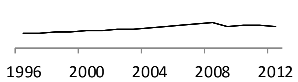


			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Slovenia	101	100	99	98	97
		EU	94	93	93	94	104
	Levels	Slovenia	611	604	600	590	588
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Slovenia	100	99	98	97	97
		EU	98	103	106	104	113
	Levels	Slovenia	250	247	246	244	243
		EU	214	223	230	226	245

			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Slovenia	137	108	130	143	132
		EU	109	89	96	103	99
	Levels	Slovenia	1751	1386	1671	1830	1688
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Slovenia	135	134	129	122	117
		EU	114	112	112	114	114
	Levels	Slovenia	415	413	397	377	361
		EU	825	807	808	822	827



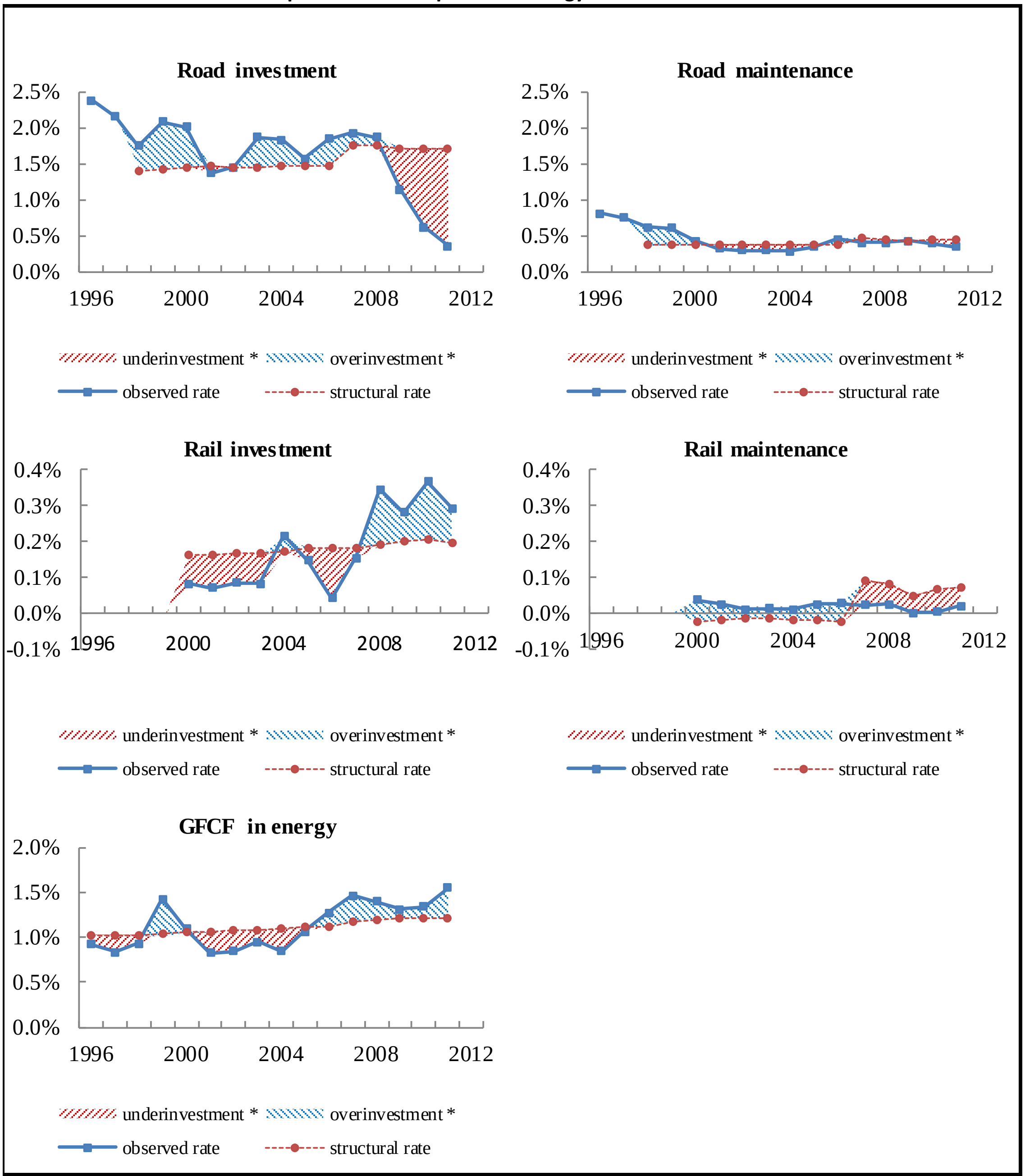
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Slovenia	119	120	124	127	:
		EU	119	122	128	134	:
	Levels	Slovenia	1.5	1.5	1.6	1.6	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Slovenia	134	116	123	129	128
		EU	119	112	117	115	115
	Levels	Slovenia	6.4	5.6	5.8	6.1	6.1
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	Slovenia	171	153	155	156	152
		EU	130	124	127	129	129
	Levels	Slovenia	27580	24600	24909	25086	24448
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



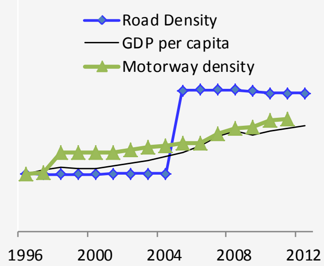
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

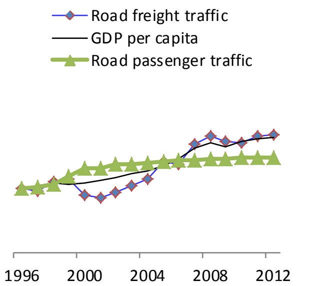
25. SLOVAKIA

Inland transport and Electricity infrastucture : provision and use

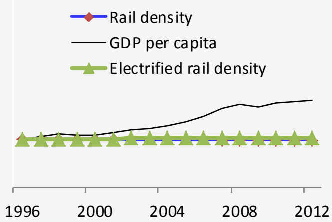
Index 1996 = 100



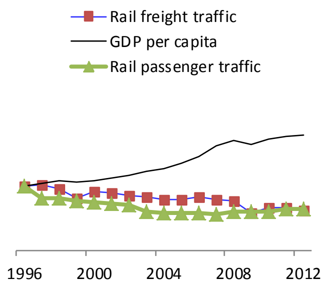
		2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)						
index 1996 = 100	Slovakia	244	242	239	239	238
	EU	108	108	107	106	90
Levels	Slovakia	8222	8152	8037	8042	8025
	EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)						
index 1996 = 100	Slovakia	178	181	193	194	:
	EU	133	136	138	139	:
Levels	Slovakia	71	73	77	78	:
	EU	137	139	141	142	:



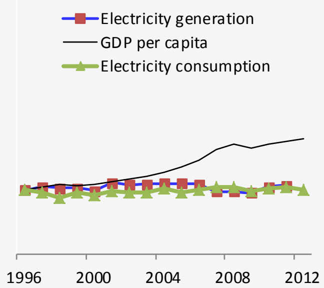
		2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)						
index 1996 = 100	Slovakia	184	174	173	183	186
	EU	140	126	130	128	124
Levels	Slovakia	5446	5147	5116	5411	5494
	EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)						
index 1996 = 100	Slovakia	146	146	149	149	149
	EU	114	115	113	113	110
Levels	Slovakia	4910	4909	4986	4986	4984
	EU	9399	9515	9378	9314	9115



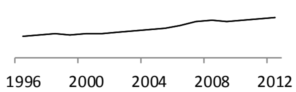
		2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)						
index 1996 = 100	Slovakia	98	98	98	98	98
	EU	94	93	93	94	104
Levels	Slovakia	674	673	672	672	672
	EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)						
index 1996 = 100	Slovakia	104	104	104	104	104
	EU	98	103	106	104	113
Levels	Slovakia	293	293	293	293	293
	EU	214	223	230	226	245



		2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)						
index 1996 = 100	Slovakia	77	58	67	66	63
	EU	109	89	96	103	99
Levels	Slovakia	1730	1294	1504	1476	1405
	EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)						
index 1996 = 100	Slovakia	61	60	61	64	65
	EU	114	112	112	114	114
Levels	Slovakia	427	421	428	451	455
	EU	825	807	808	822	827



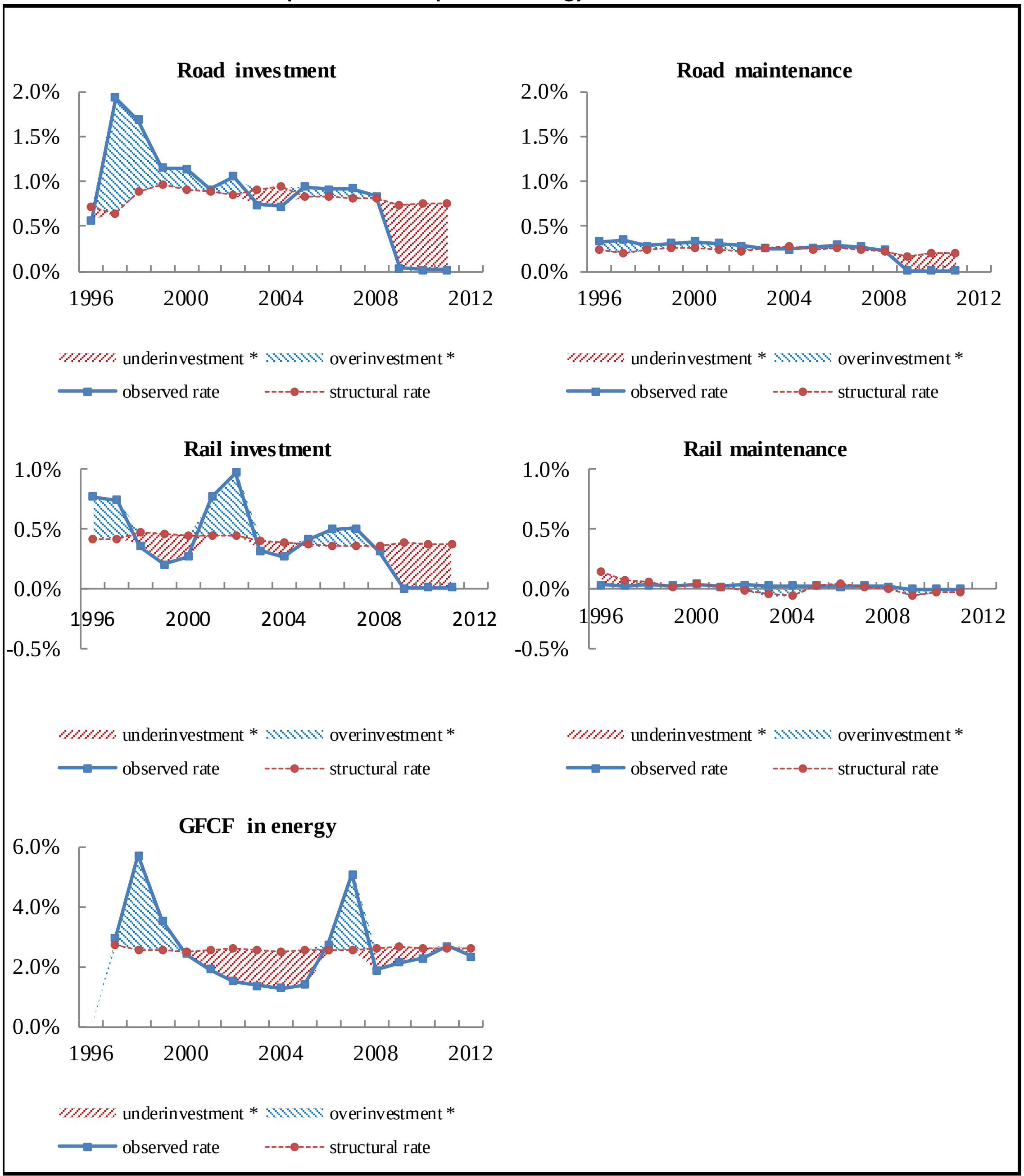
		2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)						
index 1996 = 100	Slovakia	99	96	105	108	:
	EU	119	122	128	134	:
Levels	Slovakia	1.4	1.3	1.5	1.5	:
	EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)						
index 1996 = 100	Slovakia	105	98	102	105	101
	EU	119	112	117	115	115
Levels	Slovakia	4.6	4.3	4.5	4.6	4.4
	EU	5.7	5.4	5.6	5.5	5.5



		2008	2009	2010	2011	2012
GDP per capita (EUR)						
index 1996 = 100	Slovakia	173	167	174	178	181
	EU	130	124	127	129	129
Levels	Slovakia	20791	19992	20894	21381	21766
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



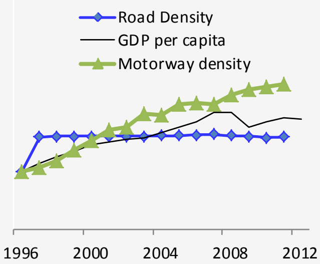
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

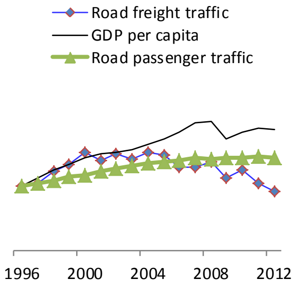
Source: Commission Services based on Eurostat and OECD

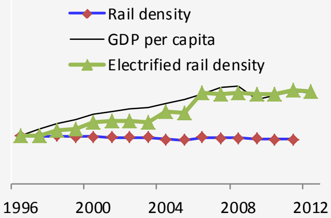
26. FINLAND

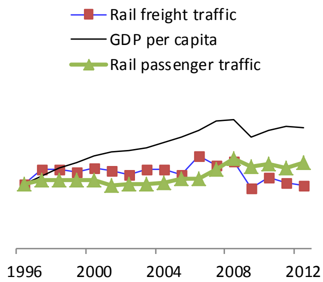
Inland transport and Electricity infrastucture : provision and use

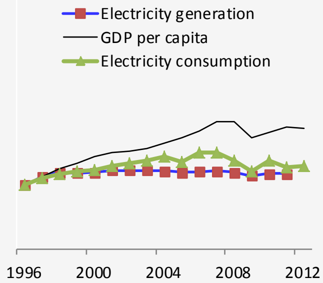
Index 1996 = 100

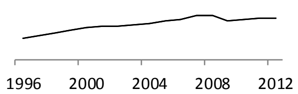








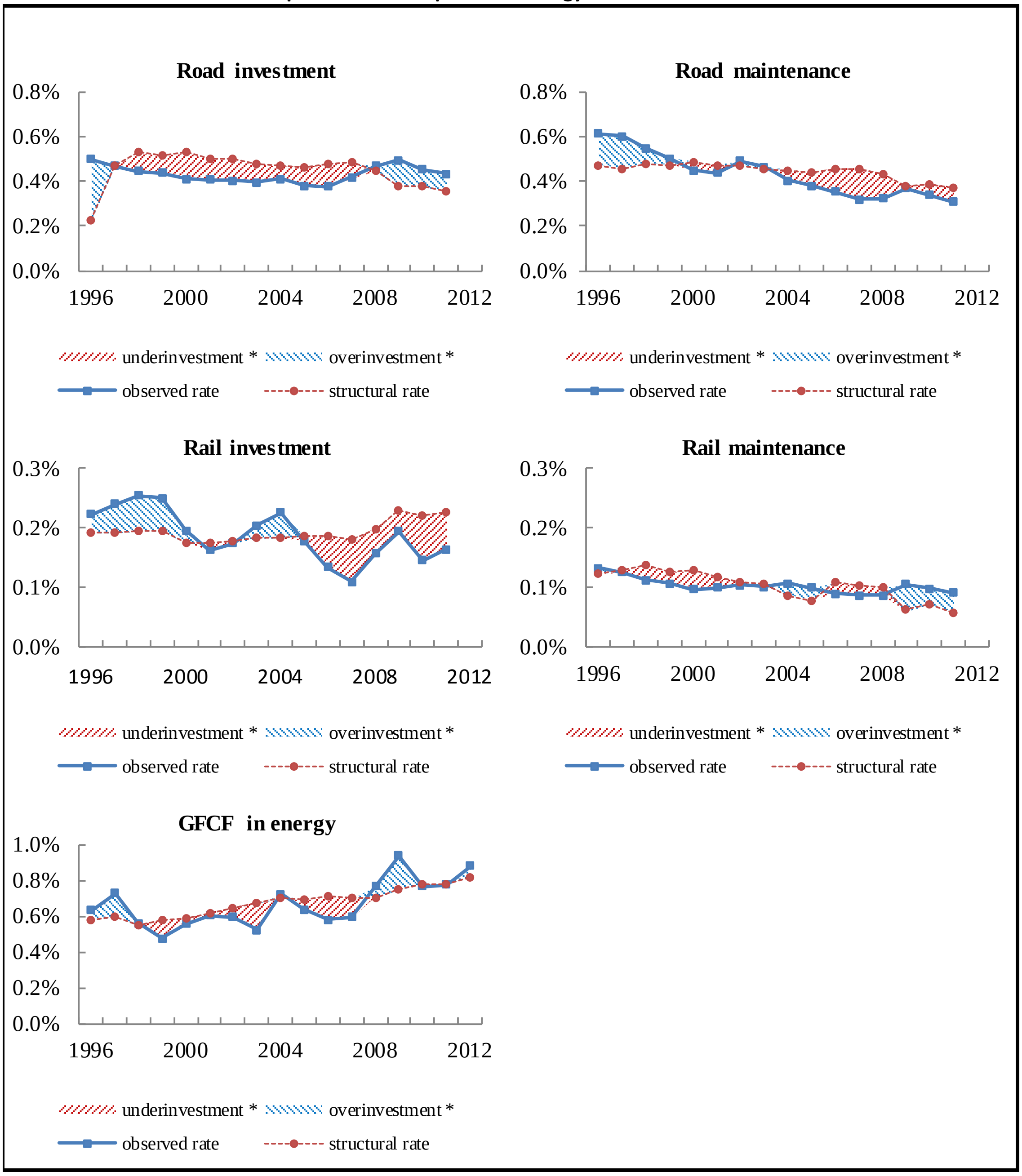




			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	Finland	131	130	129	130	:
		EU	108	108	107	106	90
	Levels	Finland	20116	19991	19779	19927	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	Finland	166	171	173	174	:
		EU	133	136	138	139	:
	Levels	Finland	139	144	146	147	:
		EU	137	139	141	142	:
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Finland	120	107	113	102	96
		EU	140	126	130	128	124
	Levels	Finland	5855	5220	5519	4998	4714
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	Finland	121	123	123	124	123
		EU	114	115	113	113	110
	Levels	Finland	11961	12078	12099	12184	12084
		EU	9399	9515	9378	9314	9115
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	Finland	98	97	97	97	:
		EU	94	93	93	94	104
	Levels	Finland	1117	1111	1106	1106	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	Finland	144	143	143	147	146
		EU	98	103	106	104	113
	Levels	Finland	579	576	574	590	587
		EU	214	223	230	226	245
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	Finland	118	97	106	102	100
		EU	109	89	96	103	99
	Levels	Finland	2033	1666	1822	1748	1717
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	Finland	120	114	116	114	117
		EU	114	112	112	114	114
	Levels	Finland	764	728	740	722	747
		EU	825	807	808	822	827
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	Finland	110	108	109	109	:
		EU	119	122	128	134	:
	Levels	Finland	3.1	3.1	3.1	3.1	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	Finland	120	111	120	115	115
		EU	119	112	117	115	115
	Levels	Finland	15.6	14.5	15.6	14.9	15.0
		EU	5.7	5.4	5.6	5.5	5.5
GDP per capita (EUR)							
	index 1996 = 100	Finland	151	138	142	146	145
		EU	130	124	127	129	129
	Levels	Finland	34760	31699	32765	33659	33381
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



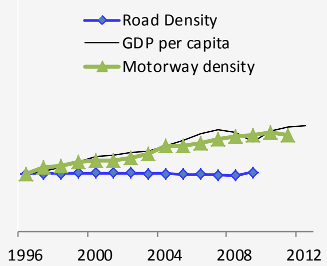
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

27. SWEDEN

Inland transport and Electricity infrastucture : provision and use

Index 1996 = 100

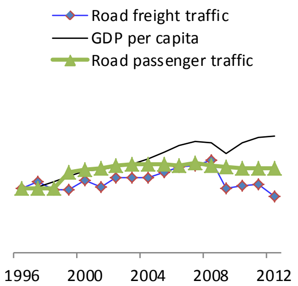


Total road density (km of roads per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	98	101	:	:	:
	EU	108	108	107	106	90
Levels	Sweden	15588	16060	:	:	:
	EU	10064	10054	9984	9844	8391

Motorways density (km of motorways per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	132	134	135	133	:
	EU	133	136	138	139	:
Levels	Sweden	202	204	206	204	:
	EU	137	139	141	142	:

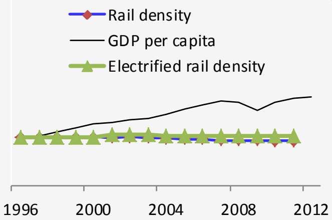


Road freight traffic intensity (tonne km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	122	100	103	104	94
	EU	140	126	130	128	124
Levels	Sweden	4614	3786	3883	3922	3531
	EU	3780	3385	3504	3455	3345

Road passenger traffic intensity (passenger km by car per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	118	118	116	116	116
	EU	114	115	113	113	110
Levels	Sweden	11785	11705	11557	11598	11558
	EU	9399	9515	9378	9314	9115

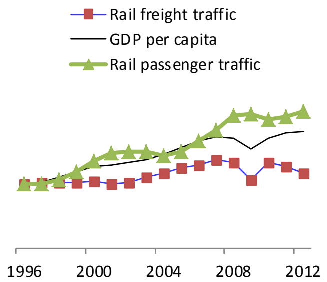


Total rail density (km of rail lines per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	97	97	96	96	:
	EU	94	93	93	94	104
Levels	Sweden	1201	1203	1195	1191	:
	EU	440	434	435	443	489

Electrified rail density (km of electrified rail lines per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	101	102	101	102	:
	EU	98	103	106	104	113
Levels	Sweden	857	860	853	862	:
	EU	214	223	230	226	245

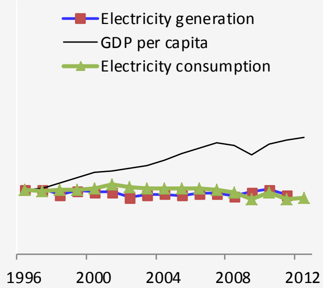


Rail freight traffic intensity (tonne km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	117	103	118	114	109
	EU	109	89	96	103	99
Levels	Sweden	2496	2203	2512	2428	2325
	EU	885	724	782	836	805

Rail passenger traffic intensity (passenger km per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	154	155	151	153	158
	EU	114	112	112	114	114
Levels	Sweden	1214	1223	1194	1209	1244
	EU	825	807	808	822	827

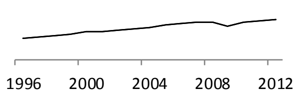


Electricity generation capacity (MW per mn inhabitants)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	96	99	101	97	:
	EU	119	122	128	134	:
Levels	Sweden	3.7	3.8	3.9	3.7	:
	EU	1.6	1.7	1.7	1.8	:

Electricity consumption (MWh per capita)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	98	93	99	93	94
	EU	119	112	117	115	115
Levels	Sweden	14.0	13.3	14.0	13.2	13.4
	EU	5.7	5.4	5.6	5.5	5.5

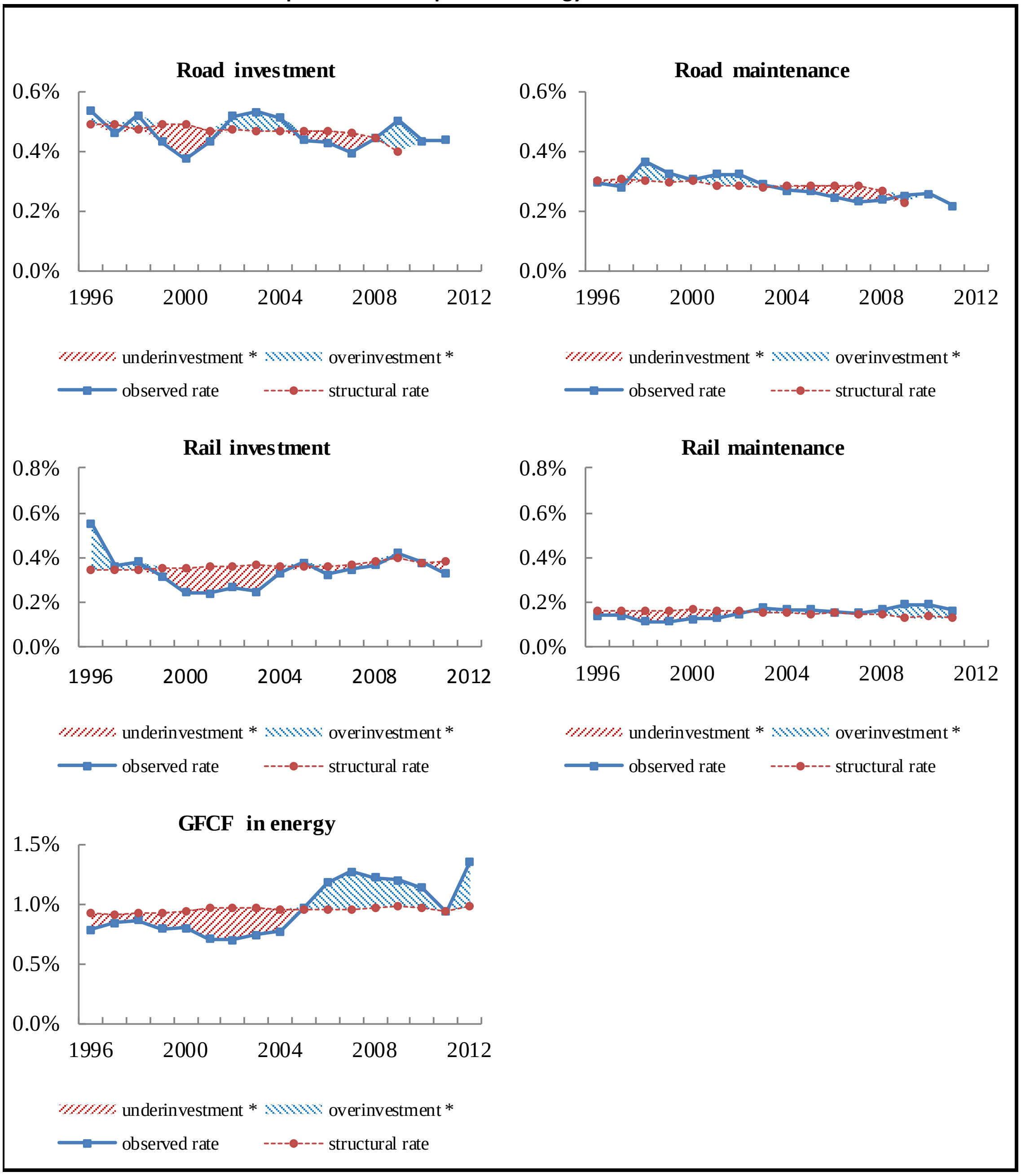


GDP per capita (EUR)

		2008	2009	2010	2011	2012
index 1996 = 100	Sweden	136	128	136	140	142
	EU	130	124	127	129	129
Levels	Sweden	36678	34477	36738	37815	38176
	EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



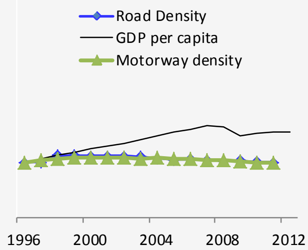
* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD

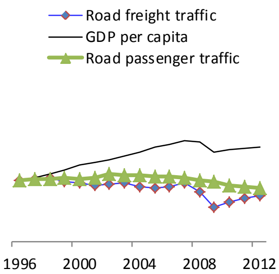
28. THE UNITED KINGDOM

Inland transport and Electricity infrastucture : provision and use

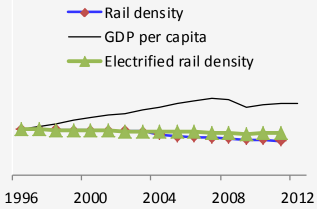
Index 1996 = 100



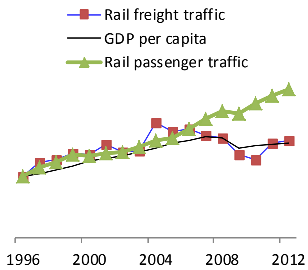
			2008	2009	2010	2011	2012
Total road density (km of roads per mn inhabitants)							
	index 1996 = 100	United Kingdom	101	102	101	100	:
		EU	108	108	107	106	90
	Levels	United Kingdom	6756	6764	6713	6660	:
		EU	10064	10054	9984	9844	8391
Motorways density (km of motorways per mn inhabitants)							
	index 1996 = 100	United Kingdom	102	101	100	100	:
		EU	133	136	138	139	:
	Levels	United Kingdom	60	59	59	58	:
		EU	137	139	141	142	:



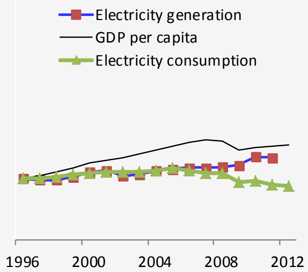
			2008	2009	2010	2011	2012
Road freight traffic intensity (tonne km per capita)							
	index 1996 = 100	United Kingdom	91	79	82	86	87
		EU	140	126	130	128	124
	Levels	United Kingdom	2603	2249	2347	2449	2497
		EU	3780	3385	3504	3455	3345
Road passenger traffic intensity (passenger km by car per capita)							
	index 1996 = 100	United Kingdom	101	99	96	95	94
		EU	114	115	113	113	110
	Levels	United Kingdom	10815	10655	10300	10178	10121
		EU	9399	9515	9378	9314	9115



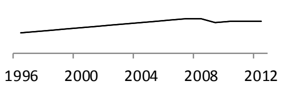
			2008	2009	2010	2011	2012
Total rail density (km of rail lines per mn inhabitants)							
	index 1996 = 100	United Kingdom	90	89	88	87	:
		EU	94	93	93	94	104
	Levels	United Kingdom	263	260	259	256	:
		EU	440	434	435	443	489
Electrified rail density (km of electrified rail lines per mn inhabitants)							
	index 1996 = 100	United Kingdom	96	95	96	96	:
		EU	98	103	106	104	113
	Levels	United Kingdom	85	85	86	85	:
		EU	214	223	230	226	245



			2008	2009	2010	2011	2012
Rail freight traffic intensity (tonne km per capita)							
	index 1996 = 100	United Kingdom	132	119	114	128	130
		EU	109	89	96	103	99
	Levels	United Kingdom	342	309	297	333	338
		EU	885	724	782	836	805
Rail passenger traffic intensity (passenger km per capita)							
	index 1996 = 100	United Kingdom	155	153	160	167	172
		EU	114	112	112	114	114
	Levels	United Kingdom	861	850	893	930	960
		EU	825	807	808	822	827



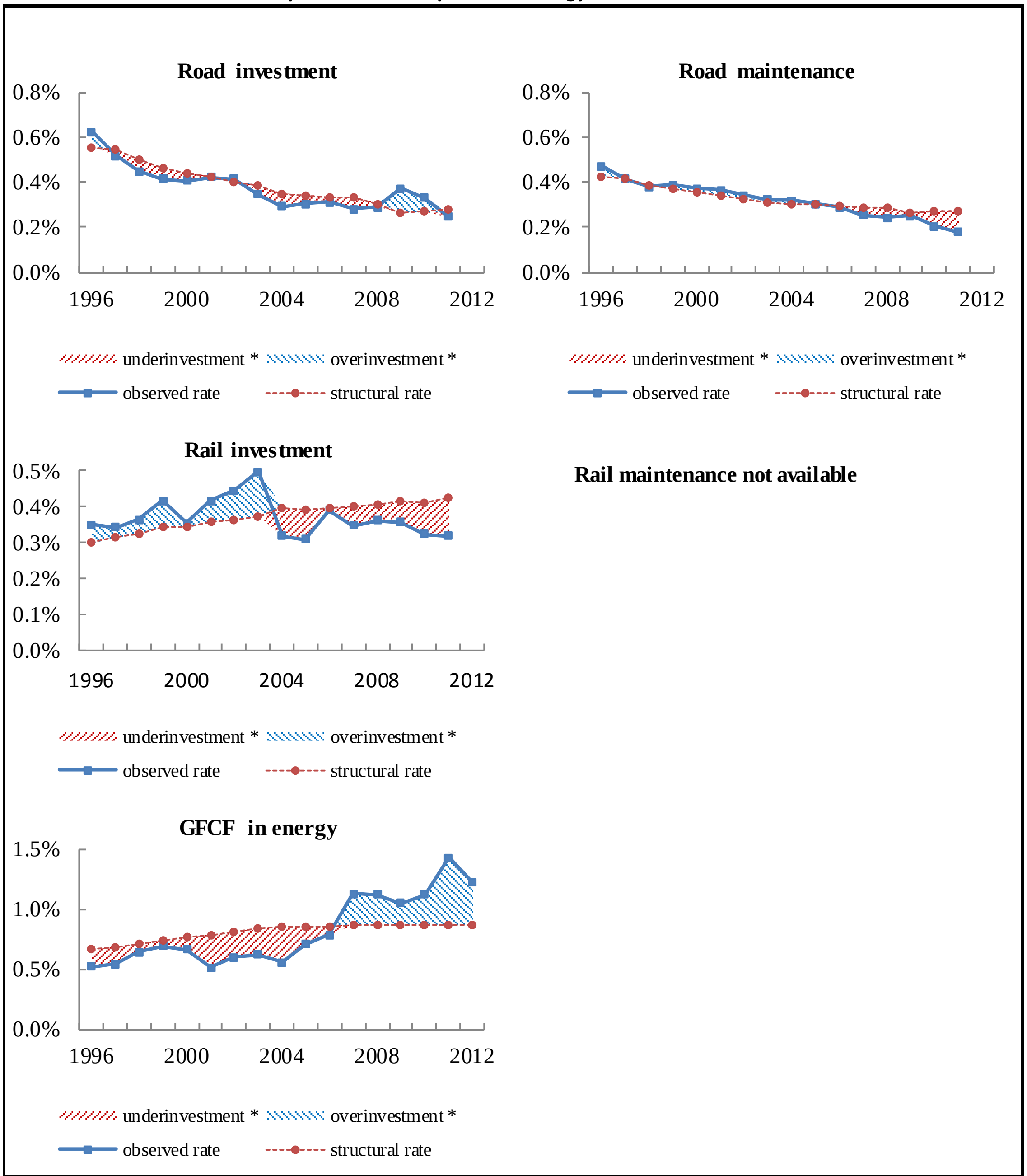
			2008	2009	2010	2011	2012
Electricity generation capacity (MW per mn inhabitants)							
	index 1996 = 100	United Kingdom	110	111	118	118	:
		EU	119	122	128	134	:
	Levels	United Kingdom	1.4	1.4	1.5	1.5	:
		EU	1.6	1.7	1.7	1.8	:
Electricity consumption (MWh per capita)							
	index 1996 = 100	United Kingdom	104	97	99	95	94
		EU	119	112	117	115	115
	Levels	United Kingdom	5.6	5.2	5.3	5.0	5.0
		EU	5.7	5.4	5.6	5.5	5.5



			2008	2009	2010	2011	2012
GDP per capita (EUR)							
	index 1996 = 100	United Kingdom	132	124	126	127	128
		EU	130	124	127	129	129
	Levels	United Kingdom	35477	33362	33897	34265	34456
		EU	29331	27949	28532	29021	28957

Source: Commission Services based on Eurostat

Investment and Maintenance pattern in Transport and Energy infrastructure



* Overinvestment and underinvestment correspond to the difference between the observed investment rate and a model-predicted rate which accounts for sectoral and macro-economic factors.

Source: Commission Services based on Eurostat and OECD