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Market Functioning in Network Industries - Electronic Communications, Energy and Transport

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Market Functioning in Network Industries

Electronic Communications, Energy and Transport

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ABBREVIATIONS

Countries

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
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
US	Unites States

Network industries and organisations (e-communications)

3G	Third Generation
4G	Fourth Generation
ARPM	Average Revenue per Minute
DAE	Digital Agenda for Europe
DSL	Digital Subscriber Line
FTTH	Fibre To The Home (NGA technology)
GSM	Global System for Mobile Communications
ICT	Information and Communication Technology
NGA(N)	Next Generation Access (Networks)
NRA	National Regulatory Authorities
RSPP	Radio Spectrum Policy Programme

Network industries and organisations (energy)

DC	Consumption band C for domestic customers (2500 kWh < Consumption < 5000 kWh)
IC	Consumption band C for industrial customers (500 MWh < Consumption < 2000 MWh)
PV	Photovoltaic

Network industries and organisations (transport)

IM	Infrastructure Manager
RU	Railway Undertaking

Other abbreviations

CEER	Council of European Energy Regulators
DSO	Distribution System Operator
EBITDA	Earnings before interest, taxes, depreciation, and amortization
EBIT	Earnings before interest and taxes
EDF	Electricité de France
EEG	Erneuerbare-Energien-Gesetz (Renewable Energy Act)
GDP	Gross Domestic Product
PSO	Public Service Obligation
RES	Renewable Energy Sources
SOEs	State-Owned Enterprises
TSO	Transmission System Operator

Graph/table unit

%	Percentage
Bn	Billion
COM	Index measuring the level of competition in the railway sector
GHz	Giga-Hertz
LIB	Index measuring the level of liberalization in the railway sector
MHz	Mega-Hertz
MWh	Megawatt hour

Currencies

EUR	Euro
CZK	Czech koruna

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EXECUTIVE SUMMARY

Network industries, such as electronic communications, energy, and transport, are of vital economic importance because the infrastructure and services that they provide underpin the functioning of modern economies. To improve the functioning of markets in these essential sectors, the EU has pursued a three-pronged strategy: to introduce competition into economically inefficient monopolistic structures; regulate infrastructure; and transform fragmented national markets into a larger, more efficient, integrated EU market.

The main objective of this report is to provide a comparative assessment of market functioning in EU Member States in the electronic communication, energy, and transport sectors. It assesses Member States' progress in market opening and competition and highlights potential market distortions that can hinder the proper functioning of these markets.

The first part of this report analyses how well national electronic communication, energy, and transport sectors are functioning, paying particular attention to the existence of market distortions and the progress that Member States have made towards liberalisation. The analysis shows that, overall, more progress has been made in the electronic communications sector than in energy or transport but the picture varies considerably across the EU. Over the last two years, however, sizeable improvements have been made to the regulatory and competitive environment in all sectors, although there remains room for further improvements as market concentration levels remain high in energy and transport and the uptake of high-speed broad band is still low in many Member States.

The second part of the report focuses on specific aspects of the three network industries under consideration.

The section on electronic communications delves into the economic impact of structural reforms designed to foster the deployment of wireless high-speed broadband in the EU through adequate, competition-enhancing, and investment-enhancing radio spectrum frequency allocation. Spectrum auctioning is found to be associated with lower bills for mobile phone users, perhaps because of its indirect competition-enhancing effect on market concentration. Modelling shows that lower mobile telephony prices improve GDP growth.

In the energy sector, a key problem in a number of countries is that electricity generators are losing money because regulated tariffs are set below costs, a situation known as a 'tariff deficit.' This problem affects not only electricity producers in Spain, Portugal and Greece, but also in France, Bulgaria, Malta, Romania and others. Power companies in Germany, Latvia, Hungary and Italy have also suffered from temporary loss-making periods. Tariff deficits have emerged as a result of the poor interaction between market liberalisation and state support for renewable energy and retail price regulation.

Empirical analysis of the main drivers suggests that enabling markets to function better could help avoid the emergence of permanent electricity tariff deficits. To improve electricity markets, energy regulators need to consider the full cost of regulated activities in the electricity system, which includes a variety of activities such as network operation, support for renewables and other Public Service Obligation (PSO) activities. Retail price regulation, very often implemented to protect vulnerable customers, can prevent electricity producers and operators from covering their costs and lead to tariff deficits in the electricity system. Thus, it is more economically efficient to support vulnerable consumers through the welfare system, or at least to limit regulated prices to selected groups. The cost of the support to various energy sources and/or customers' needs to be made explicit in the system and transparently allocated across consumers. If not, the risk is that costs will not be fully covered and losses will be generated, which might have a negative impact on public finances. The capacity of the market operators to access financing might also be hampered. Any financial support system for power generation needs therefore to be designed carefully to avoid both overcompensation and excessive costs. State support should also avoid distorting the electricity market and comply with EU state aid rules.

The section on transport focuses on railways. The EU has been pursuing policies to encourage competition between rail operators sharing the same railway lines. The process of market opening started in the freight sector but has more recently extended to the international passenger segment. The study finds that market entry to rail freight markets is free in all Member States and that the sector is generally more open than the sector for international passengers. The difference in the degree and timing of market opening between the freight and passenger sectors is reflected by the respective market share of the incumbent rail operators. While the share of the incumbents is still high in both sectors, it is particularly high in the passenger segment, where it is still 100 per cent in most countries.

An important aspect, in the context of market openness in the European rail sector, is the degree of independence between the companies managing railway infrastructure and those operating rail transportation services. By 2012, most EU Member States had separated their railway infrastructure manager from rail transport companies, however, seven Member States have railway sectors that are either fully vertically integrated or only partially separated. Empirical analysis confirms that market opening is an important driver of competition and indicates that the impact of market opening reforms on competition is stronger if vertical separation is implemented.

Part I

Market Functioning in e-Communication, Energy and Transport

1. ASSESSING COMPETITION DEVELOPMENTS IN E-COMMUNICATION, ELECTRICITY, NATURAL GAS AND TRANSPORT

This chapter draws upon the work done in European Commission (2013a) where an assessment of market functioning in network industries was presented on the basis of a set of indicators. Three network industries are covered: e-communication, energy (electricity and natural gas) and transport (rail, road, air, maritime).

1.1. ELECTRONIC COMMUNICATIONS

In terms of regulatory environment, electronic communications (hereafter, "e-Comms") markets are widely regarded as a successful example of liberalisation at least since the 1998 "First Telecoms Package", especially in terms of gradual achievement of lower prices, more competitive markets, and convergence of new technologies. A crucial role in this process has been played by sectoral regulators both at the national and EU level, particularly in specific regulated markets such as roaming and mobile interconnection.

Despite the mentioned progress on liberalisation, however, the analysis provided by European Commission (2013a) ([1]) identified differences among Member States, persistent over time and much more pronounced than in energy and transport, in terms of price performance, market structure, consumer's choice, and implementation of the relevant Regulatory Framework. On this basis, it was concluded that a full-fledged European internal market for e-Comms was far from achieved. Recently undertaken EU initiatives, first and foremost the package "*Connected Continent: Building a Telecoms Single Market*", aim to tackle this issue by contributing to foster a truly connected and competitive continent, and to enable sustainable digital jobs and industries ([2]) EU-wide.

This note draws upon the work done in European Commission (2013a), where a simple benchmarking exercise, based on a set of selected indicators mostly from the European Commission's *Digital Agenda Scoreboard 2012* (European Commission (2012a)), allowed the identification of e-Comms markets in the EU Member States deserving enhanced attention on specific issues due to their relatively weaker performance with respect to other Member States. The main reason to replicate this exercise, approximately after 18 months, lies in the possibility to provide an up-to-date assessment of the electronic communications markets in the EU, taking into account latest developments reflected, among others, in the new *Digital Agenda Scoreboard 2014* (European Commission (2014a)). This allows, in particular, to refer to the most recent figures on the previously selected e-Comms indicators, in order to draw conclusions not only on the basis of the Member States' relative positions in terms of their levels but also by comparing them with the data reported in 2012. The selection of the relevant "monitoring indicators" is thus fully consistent with that of the mentioned source, with the exception of a few minor modifications, introduced in order to be able to better account for some changed market conditions ([3]).

([1]) European Commission (2013a)

([2]) This package encompasses, on the one hand, a Recommendation on consistent non-discrimination obligations and costing methodologies; this seeks to promote competition and enhance the broadband investment environment both by introducing more homogeneous EU rules to price the LLU access together with stricter non-discrimination conditions, and by limiting price regulation on next generation access ("NGA") networks by the presence of sufficient competitive constraints. On the other hand, it includes a draft Regulation (currently under legislative process) complementing and modifying the current Regulatory Framework with the objective to remove bottlenecks and barriers to a genuine Telecoms Single Market; among its main pillars are net neutrality, more harmonized inputs such as radio spectrum and virtual access products, as well as incentives to progress towards a roaming-free e-Comms space.

([3]) For instance, with respect to European Commission (2013a), the regulatory environment indicator "transposition of the regulatory framework" and the mobile communications indicator "HSPA coverage" have been removed, as the transposition is now complete and the HSPA coverage is now close to 100% in all Member States, respectively.

Box I.1.1: Indicators assessing electronic communications

The assessment of electronic communications is based on the following indicators:

- *Regulatory environment indicators*, including: i) in terms of radio spectrum, the assignment to mobile operators of both the digital dividend (800MHz) and all other harmonised bands, given the Member States' commitment to assign at least 1200 MHz of spectrum to wireless broadband by 2015; ii) an overview of on-going procedures/exchanges regarding the independence and regulatory capacity of national regulatory authorities (NRAs); iii) an indicator of Member States' (non-)compliance with COM recommendations in Art 7a proceedings ([1]).

- *Mobile communications indicators*, including: i) the main mobile operator's market share; ii) the level of mobile termination rates; iii) the average revenue per minute of mobile voice communications ([2]); iv) the mobile broadband penetration.

- *Fixed broadband indicators*, including: i) the fixed broadband incumbent's market share; ii) the share of DSL lines (including VDSL) in total broadband lines and, among them, the share of full local loop unbundling (LLU) and shared access ([3]); iii) the average wholesale access charges for full LLU; iv) the fixed broadband penetration; v) the penetration and coverage of NGA; vi) the rural standard fixed broadband coverage; vii) the NGA rural coverage.

As reported in Annex Table A1.1, coloured labels are assigned to all Member States for each indicator, based, unless otherwise specified or having an alternative intuitive interpretation ([4]), on the following approach: "green" labels indicate above-median performers, "yellow" labels indicate below-median ones, and "red" labels are assigned to Member States whose figures for that indicator are beyond (below or above, depending on the reported direction of improvement) a reported "cut-off" that *de facto* splits the last sextile of their distribution.

([1]) This indicator highlights the Member States, whose NRAs either failed to follow (red label) or only partially followed (yellow label) a specific Commission Recommendation under Art 7a of the *Framework Directive* (all other countries are marked by a green label); overall, 8 countries (Austria, Germany, Estonia, Spain, Finland, Italy, Netherlands, and Poland) have received such a Recommendation so far, and only two (Spain and Poland) have followed it.

([2]) It is worth noting that, while all other indicators refer to end 2013 or 2014, the most recent figures for the ARPM refer to 2011, insofar as, after the 2013 issue, its reporting was discontinued from the Digital Agenda Scoreboard.

([3]) Differently to the previous exercise, the economic reading of these two indicators is now provided jointly in order to assign a single label. In fact, they are somehow inversely related, to the extent that the share of DSL lines provides an indication of the level of inter-platform competition, while the share of LLU/shared access among DSL lines an indication of the extent of intra-platform competition. This is why our methodological choice is to assign a green label to countries where at least one of the two indicators does not signal relative lack of that specific type of competition. Instead, a red label is assigned when, lacking adequate platform competition (share of DSL above 75%), the share of LLU/shared access is below 30%; last but not least, yellow labels are assigned to all "intermediate" cases, namely characterised by below-median inter-platform competition, coupled with relatively low (below 30%) intra-platform competition.

([4]) E.g., for the regulatory environment indicator "NRA's independence", "red" means "serious issues or on-going infringement proceedings", "yellow" means "clarifications requested by the Commission", and "green" means that the situation appears to be normal. Besides, for the regulatory environment indicator "800 MHz assigned", "red" means "serious problems", "yellow" means "delays in making available the digital dividend", and "green" means that the situation appears to be normal.

However, it is important to bear in mind that the joint reading of these indicators provides a partial picture of the state of play of EU e-Comms markets, in that the nature and timing of the collected indicators is sometimes unable to reflect some recent and specific market changes. The most prominent example is the ongoing consolidation in some European telecoms markets ([4]), raising the issue of the delicate trade-

([4]) For example, the European Commission has just approved (July 2014) the proposed acquisition in Germany of the Dutch operator KPN's mobile telecommunications business E-Plus by Telefónica Deutschland, conditional upon full implementation of a commitments package submitted by the latter to tackle some competitive concerns. Indeed, the

off, even more evident in the middle of the digital age and in the presence of emerging alternative platforms, between operators' investment incentives and the level of competition, often ensured through market regulation in a scarcely homogeneous manner across borders. While an assessment of these issues is beyond the scope of this exercise, they should be taken into careful account. All in all, this means that the reading of the provided indicators has to be contextualised in light of further country-specific information and coupled with in-depth economic analysis, so that no one-to-one relationship can be inferred between this benchmarking and, for instance, the presence of country-specific recommendations in the area of e-Comms: the objective of the exercise is rather to identify situations where further assessment might be in order.

Overall, in line with the conclusions of European Commission (2013), significant differences can still be traced among Member States with regard to most "monitoring indicators": for instance, the coefficient of variation of full LLU access prices further increase EU-wide from 26% to 28%, corresponding to a price disparity ([5]) close to 150%. This seems to confirm, once again, the existence of room for improvement in terms of deepening of the European Digital Single Market, starting from a genuine internal market for electronic communication networks and services. Looking at the average trends in the EU-28 ([6]) with respect to the previously reported figures (referring to 2010-2011), marked improvements appear to have characterised all areas under scrutiny:

- in terms of regulatory environment, the transposition of the framework has been completed by all Member States and most on-going investigations/infringements concerning NRAs' independence have been resolved, with the exception of four countries; moreover, significant progress has been registered in the assignment of radio spectrum to mobile operators, especially the digital dividend: still, in some Member States lack of progress is justified by country-specific circumstances provided in the *acquis* (e.g. BG), and the Commission Services are monitoring developments in countries where the derogation deadlines have recently expired or are approaching ([7]); six Member States have not yet fully complied with a specific Commission Recommendation under Art 7a of the Framework Directive;

- as for the mobile market, it is worth noting that the main operators' market shares have only slightly decreased (from 37% to 35% on average), that mobile broadband penetration increased by some 44% (up to 62.4%), and that mobile termination rates dropped by close to 53% (down to EUR 1.8 cents);

- also in fixed broadband markets, the incumbents' market shares have only slightly decreased, but lower shares of DSL lines (by close to 5%), higher shares of LLU/shared access among them (by close to 6%), as well as slightly lower access charges for full LLU (by some 3%) all seem to point to a general improvement in both inter-platform and intra-platform competitive conditions; infrastructure-wise, rural standard coverage increased by some 14.5% (up to close to 90%) and NGA coverage by more than 23% (up to some 62%), whereas fixed broadband penetration increased by close to 8% (up to some 30%), with an impressive contribution from NGA networks, whose penetration soared, between January 2012 and January 2014, by almost 150% (from 3.3% to 8%).

Overall, these market evolutions appear to signal gradual progress in all Member States towards the *Digital Agenda for Europe* targets, although marked differences remain across countries and across markets, no least in terms of speed of improvement. Last but not least, the hereby adopted benchmarking approach also allows to intuitively identify a number of Member States, whose relative performance appears to be poorer than the others in the policy areas under scrutiny, and where specific market conditions might thus deserve enhanced attention.

merger brings together the third and the fourth largest mobile network operators (MNOs) in Germany, and leads to a market structure with three MNOs of a similar size.

([5]) These indicators of variability are defined as in European Commission (2013).

([6]) The figures for 2012 refer to the EU27, before Croatia's accession, but the approximation is reasonable.

([7]) Namely, Spain, Hungary, Malta, Poland, and Romania.

This is based on an elementary counting of the "flashing" red and yellow labels, assigned to them for each of the selected indicators in each of the three broad e-Comms areas. Namely, Austria, Malta, Netherlands (and, to a lesser extent, Belgium, Bulgaria, Cyprus, Germany, Estonia, Spain, Croatia, Hungary, Italy, and Romania) "flash" in terms of regulatory environment; Cyprus, Luxembourg, Malta, Romania, and Slovenia "flash" in terms of mobile communications; Austria, Cyprus, Croatia, Italy, Luxembourg (and, to a lesser extent, Bulgaria, Greece, and Poland) "flash" in terms of fixed broadband. As already mentioned, this "horizontal" assessment, based on common comparable indicators across all Member States, could be usefully complemented by a more thorough consideration of the specific characteristics of each national market.

1.2. ELECTRICITY AND NATURAL GAS

According to European Commission (2013a) the improvement of market functioning and competition in energy markets are key elements in improving economic efficiency and maximising the positive contribution of this sector to the economy as a whole. Several areas were highlighted, including the level of competition in wholesale and retail markets, the regulatory environment (primarily vertical separation and the regulation of end-user prices), interconnection capacities and the resilience of the gas system. In addition, public ownership was also analysed in the context of other types of market malfunctioning. Public ownership was not considered to be an inefficiency in itself; only in case it coincided with other signs of market malfunctioning – such as dominant position of the incumbent, price regulations, lack of vertical separation – it was considered a factor that can further distort the functioning of the market.

In the annex, table A1.2 provides an update of the summary table presented in European Commission (2013a) showing the overall competitive situation and market functioning of electricity and gas markets in EU Member States.

The reading of the table can be made at two levels: (i) by Member States and (ii) by market segments across Member States.

The overall competitive situation and market functioning across Member States continues to show wide heterogeneity. This implies that the full implementation of EU legislation regarding the internal energy market has not yet been achieved. This is problematic, because it impedes the proper functioning of the internal energy market. Hence, it can create bottlenecks in terms of access to the market, of infrastructure interconnection and in the variety of services offered by operators.

The combination of public ownership with high market shares, low cross border interconnection and price regulation was identified in European Commission (2013a) as a potential source of market malfunctioning. Looking at the latest available data, this seems to be the case in Bulgaria, Cyprus, Estonia and Malta in the electricity market; and it is also the case in Bulgaria, Estonia, Greece, Poland and Slovakia in the gas market. ([8])

Looking at the developments in the last two years, some improvement in the level of market competition ([9]) in the electricity sector is visible. This can be seen from a fall in the number of Member States highlighted with red as problematic. The improvement is more modest in electricity generation, and more pronounced in electricity retail markets. In contrast, the scoreboard shows an actual increase in the incumbents' market shares in wholesale gas markets, while a modest improvement is visible in retail gas markets. There are also several promising developments, however, in retail gas markets that are not visible in the scoreboard. These include a convergence in prices on European gas hubs, price formation in Europe gradually moving away from oil-indexation towards more gas-on-gas competition and diversification of gas supplies especially in the Western part of the continent.

There is also some progress in the regulatory environment of energy markets in recent years. While the certification procedure of the unbundling of transmission networks is still an ongoing process, there has been notable

([8]) It is worth noting that Estonia has phased out price regulations but shows weaknesses in other aspects of market functioning.
([9]) See box I.1.1 for an explanation of the applied indicators.

Box I.1.2: **Indicators assessing electricity and natural gas markets**

The assessment of electricity and natural gas markets is based on the following indicators:

- *Market competition:* including 1) market shares of largest electricity generator and of the largest company bringing gas, 2) cumulative market shares of the main largest retailers in electricity and gas markets holding more than 5% of the market.
- *Regulatory environment:* including 1) unbundling regime and certification in electricity and gas markets, 2) the existence of price regulations for households and industry in electricity and gas.
- *Share of public ownership* in the largest electricity generator and of the largest company bringing gas.
- *Infrastructure requirements of a functioning internal market:* including 1) net interconnection transfer capacity in electricity, 2) resilience of the gas system.

improvement in the elimination of end-user price regulation in the recent years. Several Member States have undertaken reforms to liberalise energy prices, and some reforms are still ongoing. The updated scoreboard indicates that there are only three Member States (Hungary, Latvia and Malta) that still apply price regulation for non-household consumers in either electricity or gas markets. This represents a significant improvement compared to the previous report, which showed 10 such countries. Price regulation in the household segment is still more widespread in the EU. There is currently 10 Member States that still apply it in either electricity or gas markets, but this also represents a marked improvement from the 15 countries highlighted in previous report (European Commission (2013a)). This is an encouraging sign as price liberalisation is expected to promote competition in retail markets. In addition, in some cases where the costs of the electricity system have increased, or where the level of regulated prices has been substantially decreased, price regulation might be a driver of the emergence of a tariff deficit (see chapter 2 in part II).

At the same time, progress has been rather slow in increasing cross-border electricity interconnection capacities. This is a key element to a well-functioning internal energy market and it has been identified as one of the main priorities of the EU agenda. Arguably the completion of these projects needs time and the two-year time horizon of this analysis is too short to see major improvements in this area. While progress in building new infrastructure takes time, there are some promising signs in the integration of wholesale electricity markets (not visible in the scoreboard) as the cross-border flows of electricity has been growing more recently despite an overall decrease in electricity consumption.

1.3. TRANSPORT

The transport sector is composed of different segments – railways, road, air and maritime – which are characterised by very different regulatory regimes on the EU level ([10]). EU legislation has achieved different levels of market opening across these transport modes with road and air being the most advanced. The pace of implementation also differs across transport modes which imply that market functioning and competitive outcomes show marked differences across transport modes.

In the annex, table A1.3 provides an update of the summary table presented in European Commission (2013a) showing the overall competitive situation and market functioning of transport markets in EU Member States.

([10]) European Commission (2013a).

Box I.1.3: **Indicators assessing transport markets**

The assessment of transport markets is based on the following indicators:

- *Railways:* including 1) market shares of the largest freight and passenger operator, 2) the level of public ownership of the same operators, 3) unbundling of infrastructure management from service provision, 4) the use of competitive tendering in public service obligations.
- *Road transport:* including 1) the level and evolution of cabotage penetration, 2) the level and evolutions of the international activity of domestic hauliers (considering cabotage and cross-border activity).
- *Air transport:* including 1) the market shares of the national flag carrier, 2) public ownership in the national flag carrier.
- *Ports:* including 1) the assessment of port facilities based on WEF indicators on the perception of port facilities.

Despite considerable legislative action at the EU level, railway markets remain relatively closed in many Member States. The freight rail sector, which was liberalised at EU level in 2007, is characterised by more competition, while the passenger segment, where only international routes are liberalised under EU law, is still largely dominated by domestic incumbents. There has been some modest improvement in the competitive situation in freight as evidenced by a fall in the market shares of the incumbent in several countries, including in Bulgaria, Germany, Spain, France, Hungary and Slovakia. Progress in passenger services has been more modest, with, Estonia, and Romania showing the most significant improvement in the competitive situation in this segment. Both the freight and the passenger segments are still characterised by high level of public ownership in most Member States.

Regarding the regulatory framework of railway markets, the functional separation of infrastructure management from service provision has been implemented – or it is currently in progress – in most Member States. It is only Ireland that still applies the full vertical integration regime. Regarding public service obligations (PSO), there has been only limited progress in the use of competitive tendering with 13 Member States still directly awarding PSO concessions.

An overall assessment of the six indicators on railways in the scoreboard indicates that rail market opening and market functioning is lagging behind in Austria, Belgium, Czech Republic, Spain, Lithuania, Finland, Luxembourg, Ireland, Slovenia and Slovakia.

In road transport, the international haulage of goods has been progressively liberalised in the EU. Cabotage is allowed on a temporary basis since 1998. In 2010, the rules have been somewhat clarified. Nowadays, there are still some practical restrictions and cabotage penetration can still be considered as rather low. The indicators of the scoreboard indicate that there has only been a very modest increase in cabotage penetration in the last two years. The performance of Member States is also highly uneven with a few good performers, while most of the countries are lagging behind. Looking at the international activity of domestic hauliers, i.e. the sum of both cabotage and cross-trade, a modest increase is visible at the EU level. However, there is wide heterogeneity among Member States with many actually reporting a fall in the international activity of their hauliers possibly due to the crisis. ([11])

([11]) In particular following the lifting in 2009 and 2012 of special restrictions on cabotage which had applied for 5 years to hauliers from most of the countries that joined the EU in 2004 and 2007, there has been some uptake in cabotage activities in the EU. Hauliers from these countries are also performing particularly strongly in cross-trade

Table I.1.1: **Progress in Market Functioning and Competition in Network Industries**

	Progress achieved in market functioning	Further efforts needed
E-communications (*)	BE, BG, CZ, DE, DK, EE, EL, ES, FI, FR, HU, IE, LT, LV, PL, PT, SE, SK, UK	AT, CY, HR, IT, LU, MT, NL, RO, SI
Energy (**)	AT, BE, CZ, DE, DK, ES, FI, FR, HU, IE, IT, LT, LU, LV, NL, PT, RO, SE, SI, UK	BG, CY, EE, EL, LT, MT, PL, SK
Railways (***)	BG, CY, DE, DK, EE, FI, FR, HU, IT, LV, MT, NL, PL, PT, RO, SE, UK	AT, BE, CZ, ES, LT, FI, LU, IE, SI, SK

(*) The MS in the column "Further efforts needed" are those " flashing" in at least one of the three broad policy areas for which Table I.A1.1 provides a set of monitoring indicators.
(**) The MS in the column "Further efforts needed" are those with performance highlighted in red in at least four of the indicators in either electricity or gas for which Table I.A1.2 provides a set of monitoring indicators
(***) The MS in the column "Further efforts needed" are those with performance highlighted in red in at least five of the indicators in railways for which Table I.A1.3 provides a set of monitoring indicators
Source: European Commission

Air transports are characterised by a high level of competition. Market opening on the EU level has been successful and has brought about significant gains to consumers in terms of service and affordability. ([12])

There is still considerable heterogeneity in the perceived performance of ports across the EU with relatively modest changes in perceptions taking place in the last two years ([13]).

1.4. CONCLUSIONS

Well-functioning, competitive markets in network industries (e-communications, energy and transport) that are integrated at the EU level are crucial to maximise the benefits of these sectors to the economy. The EU has pursued an active agenda to open up these markets to EU-level competition. The progress of this market opening process in the various markets is heterogeneous. While market opening has been more pronounced in e-communications, energy and transport markets are lagging behind.

Looking at the developments in the last two years, there has been some improvement both in the regulatory environment and in the competitive situation in energy and transport markets. There is still scope for further improvement (table I.1.1) , however, as evidenced by relatively high concentration levels in many Member States.

1.5. REFERENCES

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European Commission (2014b), "*Fourth report on monitoring development of the rail market*", COM(2014) 353.

activities. In addition it also needs to be mentioned that cabotage activity depends not only on the regulatory framework but also on other factors such as geographical location, commercial decision based on market conditions etc.

([12]) However global air transport market is still restrictive and mainly based on bilateral air transport agreements.

([13]) Due to limitations on data availability regarding the performance of ports, the analysis this sector is constrained to an indicator assessing port facilities based on surveying users of those facilities published by the World Economic Forum.

European Commission (2014c), "*State of the Union Road Transport Market*", COM(2014) 222.

Table I.A1.1: **Summary table of eComms indicators per Member States (latest data available between 2013 and 2014**

	Regulatory environment					Mobile communications				Fixed broadband									
	Framework Transposed	800MHz spectrum assigned (*)	Spectrum compliance (all other bands: 965MHz) (iii)	Compliance in Art 7a proceedings (**)	NRA's independence (***)	Main mobile operator's market share - end 2013 (*confidential data* in italics are replaced by end-2012 Screen Digest ones)	Mobile interconnection charges (Euro cents) 2014	Average revenue per minute of mobile voice (Euro cents) 2011 (i)	Mobile broadband penetration 2014	Incumbent's market share (excluding resale) 2014	Share of DSL lines (VDSL included) 2014 (****)	LLU and shared access lines as a % of total DSL	Full LLU wholesale access charge (Euros) 2013	Fixed BB penetration 2014	NGA penetration 2014	NGA coverage (end 2013)	Rural standard fixed BB coverage (end 2013)	NGA rural coverage (ii)	
AT			74.05%			43.4%	0.80	7.94	64.7%	58.0%	57.6%	11.5%	5.9	26.5%	4.3%	70.2%	95.5%	15.5%	**AT**
BE			71.73%			*39.9%*	1.18	13.81	45.7%	43.0%	45.6%	1.8%	9.8	34.3%	23.8%	98.3%	99.6%	74.9%	**BE**
BG			41.01%			41.1%	1.18	4.45	50.8%	23.0%	**18.1%**	**n.a.**	8.5	19.5%	12.0%	67.7%	59.8%	0.2%	**BG**
CY			32.12%			67.1%	1.73	7.57	41.7%	66.0%	**82.4%**	**14.2%**	9.8	26.4%	0.4%	77.0%	100.0%	45.0%	**CY**
CZ			51.38%			40.4%	1.01	10.41	52.2%	31.0%	**34.9%**	5.8%	8.2	26.5%	11.3%	63.7%	91.2%	4.0%	**CZ**
DE			100.00%			*32.3%*	1.85	8.81	45.1%	43.0%	80.9%	**37.9%**	11.1	34.9%	6.7%	74.8%	94.9%	21.3%	**DE**
DK			68.39%			42.4%	0.90	9.12	107.4%	59.0%	59.9%	13.7%	9.6	41.1%	17.4%	82.6%	91.3%	13.1%	**DK**
EE			97.56%			42.0%	1.29	5.99	91.0%	59.0%	**41.2%**	0.0%	6.8	28.6%	11.6%	73.9%	87.2%	58.3%	**EE**
EL			57.72%			*50.1%*	1.19	6.72	36.3%	43.0%	99.8%	**56.4%**	8.8	26.3%	0.4%	26.9%	97.8%	0.0%	**EL**
ES			73.58%			35.7%	1.09	13.28	73.4%	47.0%	76.8%	**40.1%**	9.4	26.0%	6.4%	64.9%	94.3%	23.1%	**ES**
FI			75.44%			39.2%	2.80	6.09	123.5%	na	**61.2%**	**n.a.**	15.7	31.0%	12.3%	72.1%	63.5%	7.0%	**FI**
FR			60.62%			34.2%	0.80	12.68	48.0%	40.0%	90.6%	**50.7%**	10.5	38.2%	3.2%	41.0%	97.1%	16.2%	**FR**
HR			33.84%			46.4%	1.68	n.a.	65.8%	57.0%	**84.6%**	**23.4%**	5.8	21.7%	n.a.	33.3%	76.8%	0.0%	**HR**
HU			51.30%			45.4%	2.37	6.00	26.4%	43.0%	**32.9%**	1.8%	7.0	24.2%	8.6%	75.7%	84.2%	17.9%	**HU**
IE			73.06%			38.1%	2.60	10.16	67.7%	38.0%	64.3%	10.9%	10.5	26.3%	9.2%	54.0%	92.7%	5.7%	**IE**
IT			64.87%			31.8%	0.98	6.94	66.3%	50.0%	98.4%	**34.1%**	9.7	23.3%	0.6%	20.8%	87.7%	0.0%	**IT**
LT			79.90%			39.6%	1.04	1.90	48.9%	51.0%	**21.0%**	0.0%	5.3	28.2%	15.0%	96.7%	91.0%	55.3%	**LT**
LU			52.33%			52.4%	8.55	14.64	79.5%	71.0%	**81.8%**	**14.7%**	13.3	33.1%	8.7%	94.3%	100.0%	94.1%	**LU**
LV			97.41%			32.4%	1.57	3.46	62.9%	56.0%	**30.1%**	0.0%	6.8	24.4%	14.7%	92.0%	44.1%	29.1%	**LV**
MT			46.22%			48.5%	2.07	13.29	57.8%	48.0%	48.5%	0.0%	12.0	34.1%	16.5%	100.0%	100.0%	92.5%	**MT**
NL			66.84%			*49.8%*	1.86	14.66	64.3%	42.0%	**46.5%**	**18.8%**	7.4	40.9%	24.1%	97.6%	100.0%	97.2%	**NL**
PL			74.82%			29.8%	1.03	4.65	79.3%	28.0%	**38.9%**	0.0%	5.6	19.7%	8.9%	49.0%	75.5%	8.0%	**PL**
PT			73.84%			46.3%	1.27	7.59	37.2%	50.0%	**43.2%**	**12.5%**	10.0	24.6%	13.8%	84.4%	98.9%	36.2%	**PT**
RO			68.17%			42.8%	3.07	2.18	40.7%	28.0%	**27.5%**	0.0%	7.3	18.9%	12.7%	65.9%	78.2%	24.6%	**RO**
SE			93.31%			38.8%	1.02	8.22	110.3%	38.0%	**43.6%**	**29.1%**	12.3	33.2%	19.3%	71.2%	91.8%	8.9%	**SE**
SI			57.62%			49.3%	3.24	10.63	42.1%	37.0%	**48.1%**	**18.9%**	9.1	26.5%	9.9%	73.8%	74.3%	45.5%	**SI**
SK			74.45%			42.3%	1.30	9.06	50.1%	36.0%	**39.1%**	0.0%	5.4	20.7%	6.0%	58.0%	82.4%	4.2%	**SK**
UK			69.17%			*31.1%*	1.01	9.67	88.9%	33.0%	**79.7%**	**55.6%**	9.7	34.1%	10.5%	81.8%	99.3%	26.0%	**UK**
EU28			**67.17%**			**35.0%**	**1.80**	**9.06**	**62.4%**	**41.8%**	**72.2%**	**38.6%**	**9.4**	**29.8%**	**8.0%**	**61.8%**	**89.8%**	**18.1%**	**EU28**
Improvement			Above			Below	Below	Below	Above	Below	Below	Above	Below	Above	Above	Above	Above	Below	
Median			68.8%			41.6%	1.28	8.22	60.4%	43.0%	48.5%	13.1%	9.3	26.5%	10.5%	72.9%	91.5%	19.6%	
Cut-off			50.0%			49.0%	2.50	13.00	42.0%	50.0%	(combination of low ranks)		12.0	22.0%	4.5%	50.0%	75.0%	4.0%	

above median
below median
below cut-off

Unless otherwise stated, the proposed cut-off identifies as "red" the Member States in the last sextile of the distribution and "yellow" those below the median

(*) "red" means "serious problems", "yellow" means "delays in making available the digital dividend", "green" means "normal"

(**) "red" means "no compliance" and "yellow" means "partial compliance" with an Art 7a Commission Recommendation, "green" means "normal"

(***) "red" means "serious issues or on-going infringement proceedings", "yellow" means "clarifications requested by the Commission", "green" means "normal"

(****) a joint reading of this indicator and the following one is provided (see footnote 7)

(i) France: According to the corresponding communication regulation authority (ARCEP), revenues decreased significantly between 2011Q1 and 2013Q4 (24%), while volumes increased by 35% over the same period.

(ii) Please note that impact of most recently implemented policy initiatives might not be reflected yet in the indicator scores.

(iii) Cyprus: Please note that the National Spectrum Regulator in Cyprus has offered to the market almost all available spectrum (93.26%). However, two auction procedures were cancelled because no applications for participation were submitted. Hence, the authorization of this spectrum was not completed and the spectrum compliance percentage has fallen to 32.1%.

Source: DAS, ECO, Commission Services

Table I.A1.2: **Summary Table of the Competitive Situation in Electricity and Gas**

	ELECTRICITY							GAS						
	Generation: share >80% 2012	Public ownership of the first generation producer (> 50%) 2010 (*)	Certification for effective unbundling (EU) 2013 (**)	Retail: cumulative share >80% (< or = 3 retailers) 2012	Price Regulation Non-household 2013	Price Regulation Household 2013	Net transfer Capacity as a % of peak load > EU average 2011 (***)	Entity bringing gas into the country: share >80% 2011	Public ownership of the first producer/supplier (> 50%) 2010 (*)	Certification for effective unbundling (EU) 2013 (**)	Retail: cumulative share >80% (< or = 3 retailers) 2012	Price Regulation Non-household 2013 (****)	Price Regulation Household 2013 (****)	Resilience of the gas system (>100%) 2012 (***) (*****)
AT	56.60	51,0	ITO/OU	85.00			58.58		31.50	ITO/ISO	66.00			161
BE	65.82	0,0	OU	81.10			32.18	80.40	0.00	OU	88.36			208
BG		100,0	ITO	92.50			21.01	99.80	100.00	ITO	91.30			41
CY	100.00	100,0		100.00			0.00	No gas market						
CZ	68.00	70,0	ITO	69.20			26.61	87.40	0.00	ITO	82.00			269
DE	28.40	0,0	OU/ITO	45.50			22.04	30.08	0.00	OU/ITO	28.47			180
DK	37.00	76,0	OU				69.15		76.00	OU				140
EE	88.00	100,0	OU	81.60			65.92	100.00	0.00	OU	89.00			89
EL	77.00	100,0	ITO				17.90	88.60	65.00	ITO/OU	100.00			95
ES	23.80	0.00	OU	88.80			7.25	48.15	0.00	OU/ISO	83.60			117
FI	25.20	51,0					31.42	100.00	24.00		85.00			102.4
FR	86.00	84,0	ITO	79.00			10.39	59.00	35.00	ITO	75.00			130
HU	47.10	100,0	ITO	67.93			71.25	32.91	22.00	ITO	83.79			105
IE	55.00	95,0	Other	97.00			9.20	42.27	96.73	ITO	97.30			141
IT	26.00	31,2	OU	44.00			12.40	47.08	30.30	OU/ITO	53.28			106.1
LT	30.40	100,0	OU	96.00			158.45	43.60	0.00	OU	98.10			27.4
LU	81.80	25,0		90.80			99.25		25.00		94.20			44.24
LV	89.00	100,0	ISO	99.80			226.57	100.00	0.00		100.00			153.85
MT	100.00	100,0		100.00			0.00	No gas market						
NL		0,0	OU	74.00			19.54		51.00	OU	73.00			162
PL	16.44	62,0	OU	79.88			0.00	94.82	72.00		90.73			102
PT	37.20	4,0	OU	93.20			19.47	84.09	8.00		88.07			101.5
RO	26.70	80,0	ISO	66.36			14.51	41.69	100.00	ISO	82.65			124.5
SE	44.00	100,0	OU	34.50			31.33	100.00	0.00	OU	97.05			12
SI	55.20	100,0	ITO	96.40			110.77	90.00	39.00	ITO	84.20			76.1
SK	78.91	34,0	OU	81.85			78.38	61.75	51.00	ITO	88.65			206.4
UK	51.70	0,0	OU	85.80			5.19	31.00	0.00	OU	75.60			108.6
EU average	55.81			80.43			44.77	69.65			83.14			120.12
Improvement	Above	Above	(**)	Above	Yes	Yes	Below	Above	Above	(***)	Above	Yes	Yes	Below
Median	55.00	-	-	83.43	-	-	22.04	80.40	25.00	-	86.53	-	-	-
Threshold	80.00	50.00	-	80 and 3 retailers	Yes	Yes	44.77	80.00	50.00	-	80 and 3 retailers	Yes	Yes	100.00

exemption
Ongoing reforms/procedures

High
Medium
Low

(*) exclude possible golden shares. These figures are not updated in view of the forthcoming study on SOEs.
(**) ITO: independent transmission operator; ISO: independent system operator, OU: ownership unbundling.
In green, certified; in red, procedures not started.
(***) exemptions from certain market opening rules on the basis of artcile 49 of the Gas Directive 2009/73/EC
related to 'emergent and isolated markets' - EE, FI, LV, LT, MT, CY. Exemptions on the baiss of article 44 of the Electricity directive 2009/72/EC.
(****) Data refers to 2013, however, non-household gas prices in France have been liberalised as of 2014, while household gas prices in Ireland have been liberalised as of 2014.
(*****) Source: DG ENER. Resilience of the gas sector based on article 9 of regulation 994/2010. N-1 formula which describes the ability
of the technical capacity of the gas infrastructure to satisfy total gas demand.

Source: Commission Services

Table I.A1.3: **Summary table of Market opening in Transport**

	RAILWAYS							ROAD					AIR			PORTS
	Market share of incumbent freight operator > 80% 2012	Market share of incumbent passenger operator > 80% 2012	Public ownership of the first freight operator (>50%) 2010	Public ownership of the first passenger operator (>50%) 2010	Unbundling with infrastructure manager 2012 (*)	PSO - Use of competitive tendering 2012 (**)		Cabotage Penetration rate 2012	Cabotage Pentration rate - Evolution 2007-2012 (in pp)	International activity of domestic hauliers 2012	International activity of domestic hauliers - Evolution 2007-2012 (in pp)		Market share of flag carrier >50% 2013	Public ownership of flag carrier > 50% 2014		Assessment of port facilities 2012 (***)
AT	82.4	94.3	100.0	100.0			AT	4.8	2.3	9.9	-4.7	AT	45	0.0	AT	4.9
BE	86.6	99.4	100.0	100.0			BE	7.2	3.9	7.8	-2.5	BE	25	0.0	BE	6.3
BG	63.5	100.0	100.0	100.0			BG	0.1	-0.2	41.7	28.7	BG	23	0.0	BG	3.7
CY	No rail market						CY	-	-	-	-	CY	10	94.0	CY	5
CZ	86.3	97.1	100.0	100.0			CZ	0.6	0.0	22.2	4.7	CZ	25	52.0	CZ	4.6
DE	71.4	90.0	100.0	100.0			DE	3.2	1.8	2.0	-1.3	DE	38	0.0	DE	6
DK	73.0	90.0	2.0	100.0			DK	2.6	0.4	6.3	3.0	DK	34	14.0	DK	5.8
EE	70.0	44.0	100.0	100.0			EE	0.8	0.8	24.5	10.2	EE	30	90.0	EE	5.6
EL	n.a.	n.a.	100.0	100.0			EL	0.4	-0.3	0.1	-0.5	EL	19	0.0	EL	4.2
ES	83.3	100.0	100.0	100.0			ES	0.5	-0.3	2.9	1.8	ES	12	0.0	ES	5.8
FI	100.0	100.0	100.0	100.0			FI	0.3	0.1	0.8	0.0	FI	60	56.0	FI	6.3
FR	68.0	n.a.	100.0	100.0	(2)		FR	3.8	1.3	0.3	-0.3	FR	34	16.0	FR	5.4
HU	68.2	97.1	0.0	100.0			HU	0.5	0.5	29.1	10.3	HU	n.a.	n.a.	HU	4
IE	100.0	100.0	100.0	100.0	(3)		IE	0.1	-1.3	6.1	1.6	IE	42	25.0	IE	5.3
IT	75.9	91.7	100.0	100.0			IT	1.2	0.5	0.6	-0.5	IT	18	0.0	IT	3.9
LT	100.0	100.0	100.0	100.0			LT	0.3	0.2	41.5	1.5	LT	n.a.	n.a.	LT	5.2
LU	100.0	n.a.	100.0	100.0			LU	0.6	-0.7	52.4	-14.3	LU	68	23.0	LU	5.5
LV	77.4	88.3	100.0	100.0	(1)		LV	0.2	0.1	25.8	-1.1	LV	65	100.0	LV	4.8
MT	No rail market						MT	-	-	-	-	MT	41	98.0	MT	5.7
NL	64.0	95.0	6.0	100.0			NL	1.4	0.2	11.4	-0.6	NL	44	0.0	NL	6.8
PL	67.1	48.6	100.0	100.0			PL	0.1	0.1	16.8	1.7	PL	26	68.0	PL	3.5
PT	83.4	90.4	100.0	100.0			PT	0.7	0.4	15.7	6.0	PT	31	100.0	PT	5
RO	46.3	79.4	50.0	100.0			RO	1.0	0.8	13.8	13.6	RO	22	97.0	RO	2.6
SE	n.a.	n.a.	100.0	100.0			SE	2.2	0.1	1.1	-0.3	SE	25	21.0	SE	5.9
SI	90.5	100.0	100.0	100.0			SI	0.5	0.4	37.2	11.4	SI	72	70.0	SI	5.2
SK	88.2	96.6	100.0	100.0			SK	1.9	1.0	41.3	10.1	SK	n.a.	n.a.	SK	4
UK	46.4	9.8	0.0	0.0			UK	0.7	-0.4	0.2	0.0	UK	18	0.0	UK	5.8
EU average	77.9	86.3						2.2	1.0	9.4	3.4		34.7			
Improvement	Above	Above	Above	Above				Below	Below	Below	Below		Above	Above		Below
Median	77.4	95.0	-	-	-	-		0.7	0.3	11.4	1.5		36.5	-		5.2
Cut-off	80.0	80.0	50.0	50.0	-	-		2.2	1.0	9.4	3.4		50.0	50.0		5.1

ongoing privatisation

High
Medium
Low

(*) In red, legally independent IM owned by a holding company which also owns and controls a railway undertaking; in orange, IM integrated in a structure responsible for transport operations.
Separate (institutionally independent) body in charge of essential functions; in green, IM institutionally independent from any railway undertaking.
(**) in red, direct negotiation only; in orange, direct negotiation and competitive tendering; in green competitive tendering only
(***) WEF indicators on the perception of ports facilities with 7 for well-developed and 1 for underdeveloped. In red, scores below the mean (5.2). In green, scores above EU average.
(1) Latvia has a legally independent IM owned by a holding company which also owns and controls a railway undertaking but with strong guarantees of organisational and decision-making independence in relation to the railway undertaking
(2) In 2013 the French competition authority provided the French government with an opinion concerning a bill on railway reform which would result in the setting up of a public railway group, incorporating both IM and rail operator.
(3) In Ireland the IM is still fully integrated in a structure which is also responsible for the transport operations. The exemption of unbundling rules for Ireland expired in March 2013.

Source: Commission Services

Part II

Thematic Analysis

1. THE ECONOMIC IMPACT OF RADIO SPECTRUM REFORMS

1.1. INTRODUCTION ([14])

The economic relevance of electronic communications and, more broadly, of all digital networks and services, goes well beyond their mere sectoral size and, in light of their role as general purpose technology, encompasses a series of positive spill-overs upon the whole productive system. For instance, insofar as they provide the infrastructure for the progress towards a genuine knowledge-based economy, digital networks and services are critical to ensure that technological developments and capital deepening stimulate innovation in SMEs and large industries alike, and eventually translate into productivity gains also in more traditional sectors.

This part makes a contribution to the policy debate on how to spur "digital growth" in Europe by assessing the economic impact of a specific type of digital structural reforms, namely reforms aimed to foster the development of high-speed wireless broadband through efficient assignments of right of use on radio spectrum frequencies. This policy area is analysed, in the first place, by hypothesizing and testing through micro-econometric analysis a specific "transmission channel", i.e. the direct impact of the chosen reform variable on intermediate economic outcomes, such as prices. In the second place, the price shocks estimated on the basis of the actually observed change in the reform variable (as a proxy for the reform effort) are fed into QUEST III to simulate macroeconomic impacts on GDP. The importance of analysing these reforms lies in the possibility to shed some light on the economic impact of furthering specific aspects of the Digital Single Market.

1.2. MAIN RESULTS

Both the recently amended Regulatory Framework and the Digital Agenda for Europe define a clear policy framework for a wide and efficient allocation of radio spectrum frequencies to mobile providers, which is a major reform effort already undertaken by most Member States in the very recent past and still ongoing.

There are several reasons why making spectrum frequencies available to mobile operators should affect the final prices of mobile services. On the one hand, spectrum auctioning could reduce these prices by affecting market concentration in the sector: indeed, the experience of EU spectrum auctioning indicates that national regulators often foresee "reserved" spectrum blocks, explicitly meant to allow the entry of new providers, or attach "competition-enhancing conditions" to the granted rights of use. On the other hand, as new spectrum bands are typically auctioned to allow the roll-out of new technologies, their diffusion and uptake might well reduce the equilibrium price of services still provided over older technologies, also through demand-side effects.

The (scarce) previous literature on this topic either focuses on the efficiency of different auction designs or is rather country-specific ([15]). The chosen estimation approach (see Box II.1.1) suggests that progress in spectrum auctioning is associated with lower sectoral retail prices, through two simultaneous effects: i) an *indirect effect* mediated by lower market concentration; ii) a *direct effect* on top of the previous one and in a longer time-frame, which could be potentially explained by the impact of technological innovation undertaken over newly available frequencies. Namely, an increase by 10 pps in the constructed index of spectrum progress is found to be associated with a decrease in mobile prices by some 5.7% (see Table II.1.1).

([14]) This part is based on Lorenzani D. and J. Varga, "*The Economic Impact of Digital Structural Reforms*" (European Economy – Economic Papers 529|2014), namely its Chapter about spectrum reforms. A similar summary of the same Chapter was prepared for European Economy 5|2014 "Market Reforms at Work in Italy, Spain, Portugal, and Greece".

([15]) See, e.g., Hazlett, Ibarguen and Leighton (2007); Tiedemann (2009); Prasad and Sridhar (2009).

Box II.1.1: Methodology for the economic assessment of spectrum policies

Lorenzani and Varga (2014) carried out econometric analysis on a panel dataset, built by the Commission Services on the basis of the Digital Agenda Scoreboard and European Communications Office data, covering the EU-27 and the period 2006-2013 (or less, depending on availability). The explanatory variable, "measuring" MS' reform effort in making frequencies available to mobile operators, is an innovative index of "cumulative progress in spectrum assignment". This index is computed, at Member State level, as the weighted average of band-specific indices of cumulative progress in the assignment of spectrum in five harmonised bands relevant for mobile communications (800MHz, 900MHz, 1.8GHz, 2GHz, and 2.6 GHz), relative to the total amount available in that band. Weights are proportional to the observed average unit price of each spectrum band, assumed to reflect its quality, scarcity, and thus relevance for competition. The estimated model comprises the two following equations, all in first differences (L indicates a first lag) ([1]):

$$HHI_{it} = a_1 + a_2 I(spectrum)_{it} + a_4 X_{it} + a_5 D_t + \varepsilon_{it} + \omega_i$$

$$P_{it} = b_1 + b_2 L.I(spectrum)_{it} + b_3 L.HHI^*_{it} + b_4 Y_{it} + b_5 D_t + \varepsilon_{it} + \omega_i$$

Where HHI is a quasi-Herfindahl index of sectoral market concentration, ranging from 0 to 1 (highest concentration); I(spectrum) is the mentioned index of spectrum compliance; P is the mobile retail price, proxied by the ARPM indicator in the Digital Agenda Scorebaord, i.e. the annual ratio of mobile voice revenues to total outgoing retail minutes of voice communication; X and Y are vectors of control variables, including, e.g., mobile penetration and rural population in line with previous literature; D is a vector of time dummies controlling for common cyclical or regulatory shocks; ω are fixed-effects in panel specifications for country-specific time-invariant factors.

The method employed to estimate these equations simultaneously is a two-step IV approach: in a first step, the impact of spectrum progress over market concentration is estimated; a second step then estimates the impact on retail prices of both spectrum progress and the expected concentration, conditional on the actual spectrum progress, as predicted from the first step (indicated by the asterisk).

([1]) See Lorenzani D. and J. Varga (2014), The Economic Impact of Digital Structural Reforms: http://ec.europa.eu/economy_finance/publications/economic_paper/2014/ecp529_en.htm

Table II.1.1: **Effect of spectrum auctioning on mobile communications retail prices**

Dependent variable	Reform indicator/ explanatory variable	Simulated change in reform indicator/ explanatory variable	(Preliminary) effect on dependent variable	Comments
Changes in sectoral concentration (measured by a quasi-Herfindahl index for the mobile sector)	Progress in spectrum compliance across 5 harmonised bands	Increase by 10 percentage points	Decrease by 1.4% - 1.6%	There is some evidence that this relationship is stronger in less recent years of the sample
Changes in sectoral retail price (measured as average revenue per minute of mobile voice communications)	Progress in spectrum compliance across 5 harmonised bands	Increase by 10 percentage points	Decrease by some 5.7% (direct impact and indirect one through changes in sectoral market concentration)	This impact takes place with a lag

Source: Own calculations based on DAS 2014 and ECO data

Table II.1.2 below reports: i) the actually observed spectrum progress in all Member States between 2007 and 2013; ii) the additional effort needed to reach an ideal policy target consisting in having all spectrum bands assigned to mobile communications (which corresponds to a unit value of the used "compliance indicator"); iii) based on the estimated elasticity, the corresponding decrease in mobile prices (due to both the direct and indirect effect) associated with both the actually observed and the further potential effort; iv) in the three final columns, the simulated

Table II.1.2: **Effect of spectrum auctioning on mobile communications retail prices and GDP**

Country	Pursued spectrum progress 2007-2013	Gap to close in spectrum 2013 progress	Achieved sectoral price reduction (direct + indirect effect)	Furtherpotential sectoral price reduction (direct + indirect effect)	Long run GDP impact from already observed reform effort	Long run GDP impact from further potential reform effort	Long-run overall GDP impact (QUEST simulation)
AT	0.12	0.43	6.7%	21.9%	0.08	0.11	0.18
BE	0.13	0.48	7.3%	24.1%	0.10	0.14	0.24
BG	0.15	0.54	8.5%	26.9%	0.12	0.28	0.41
OY	0.01	0.63	0.3%	30.8%	0.02	0.28	0.30
CZ	0.11	0.50	6.4%	25.3%	0.09	0.19	0.28
DE	0.59	0.00	29.2%	0.0%	0.12	0.01	0.13
DK	0.52	0.01	26.2%	0.6%	0.13	0.01	0.13
EE	0.37	0.28	19.1%	14.8%	0.15	0.10	0.25
EL	0.24	0.47	12.8%	23.8%	0.20	0.29	0.49
ES	0.44	0.01	22.7%	0.6%	0.32	0.01	0.33
Fl	0.20	0.41	11.0%	21.2%	0.08	0.11	0.19
FR	0.44	0.02	22.8%	1.4%	0.18	0.01	0.20
HU	0.12	0.48	6.6%	24.5%	0.08	0.13	0.21
IE	0.60	0.06	29.4%	3.2%	0.15	0.02	0.17
rr	0.54	0.05	26.9%	2.9%	0.26	0.03	0.29
LT	0.58	0.03	28.6%	18%	0.16	0.02	0.19
LU	0.56	0.06	27.7%	3.4%	0.17	0.03	0.20
LV	0.20	0.42	11.1%	21.5%	0.14	0.21	0.35
MT	0.15	0.51	8.2%	25.7%	0.07	0.13	0.21
NL	0.54	0.00	27.0%	0.0%	0.15	0.01	0.16
PL	0.22	0.43	11.9%	22.3%	0.11	0.15	0.26
PT	0.55	0.12	27.4%	6.6%	0.29	0.06	0.35
RO	0.56	0.09	28.0%	5.3%	0.36	0.07	0.42
SE	0.62	0.02	30.2%	1.4%	0.17	0.01	0.19
Sl	0.12	0.55	7.0%	27.2%	0.08	0.17	0.25
SK	0.13	0.55	7.1%	27.2%	0.09	0.19	0.28
UK	0.43	0.02	22.3%	1.0%	0.15	0.01	0.16
EU27	0.43	0.13	22.3%	7.1%	0.17	0.04	0.21

Source: Own calculations based on DAS 2014 and ECO data.
Note: Columns 2 and 3 report, respectively, the achieved progress over 2007-2013 (in p.p.) in spectrum compliance, measured by the constructed "spectrum compliance index", and the gap to close to achieve a unit compliance, i.e. full assignment of spectrum frequencies for all considered harmonised bands. Columns 4 and 5 report the % reduction in mobile prices (measured by the Digital Agenda Scoreboard "average revenue per minute" indicator) associated, on the basis of the estimations carried out in Lorenzani and Varga (2014), with the observed spectrum progress in column 2 and to the potential spectrum progress up to full compliance in column 3, respectively. Columns 6, 7 report the long-run GDP impacts (in % increase over the baseline) corresponding to the mobile price shocks reported in columns 4 and 5, respectively, as simulated on the basis of the QUEST III dynamic stochastic general equilibrium model. Column 8 sums the impacts of columns 6 and 7 and reports the total long-run GDP impact associated with both the actually observed and the further potential spectrum progress.

economy-wide long-run GDP impacts, as obtained through *QUEST III*, corresponding to these price shocks related, respectively, to the observed reform effort, the further potential reform effort, and the total reform effort.

Overall, the EU-average spectrum progress actually observed between before and after the crisis ([16]) amounts to slightly more than 40 pps, with marked differences among Member States: based on our estimates, this reform effort is associated with an average decrease in mobile prices by some 22%. The actually observed mobile price reduction over 2007-2011 (based on Digital Agenda Scoreboard available data) was close to 38% EU-wide: given that the EU-wide spectrum progress observed over the same period (around 18 p.p.) is estimated to be associated with a decrease in mobile prices by close to 10%, this suggests a contribution by spectrum reforms to about one fourth of the total mobile price reduction.

On the other hand, if all Member States fully assigned their still available spectrum across the considered harmonised bands, thus reaching a cross-band compliance of 100% (as it is currently the case, e.g., for Germany and The Netherlands), this would be associated with further potential price reduction by 7%. The economy-wide GDP impacts corresponding to these policy shocks amount to 0.17% of GDP over the baseline in the long run for the already observed reform efforts and to 0.21% in the long run when also further reform effort is taken into account. The simulated long-run macroeconomic impacts range between

([16]) The impact refers to the period 2007-2013 and should actually be considered fully observed by half-2014, due to the assumed lag structure in the model.

0.13% of GDP in Germany and 0.49% of GDP in Greece over the baseline.

1.3. REFERENCES

Lorenzani D. and J. Varga (2014), "*The Economic Impact of Digital Structural Reforms*", European Economy, Economic papers 529|2014

2. ELECTRICITY TARIFF DEFICIT: THE ROLE OF THE FUNCTIONING OF RETAIL ELECTRICITY MARKETS

2.1. INTRODUCTION

Since the 2000s, electricity tariff deficits have emerged both as an issue for public finances and for the financial performance of energy companies. A tariff deficit implies that a deficit or debt is built up in the electricity sector, often in the regulated segments of transmission or distribution system operators, but in some cases also in the competitive segments, e.g. in incumbent utilities. A deficit is accumulated due to the fact that the regulated tariffs which should cover the system's operating costs, including e.g. Public Service Obligations (PSOs) and support to renewables, are either set too low or not allowed to increase at a pace that cover rising production or service costs. As these deficits accumulate due to government regulation of tariff or price levels, they have been recognised as contingent liabilities of the State in a few Member States. However in some other Member States, they appear as losses on the financial statements of energy companies.

More fundamentally, the electricity tariff deficits might be a symptom of dysfunctioning of electricity markets. The structure and the functioning of the EU electricity market have changed considerably in the last 10-20 years. It has moved from national electricity markets with vertically integrated monopolistic firms, to a more competitive and integrated market with a separation between regulated, i.e. transmission and distribution, and generation and retail activities. As a consequence, the regulatory framework for this market has changed considerably, including with the last legislative package in 2009. Despite these evolutions, some Member States are still applying retail price regulation for households and/or SMEs.

If regulated retail prices do not allow the cost of operations to be recovered, which leads to tariff deficits, they send wrong price signals to the utilities operating on the market. They discourage new entrants and limit competition on the market. They also adversely affect new investment as they reduce the future revenues of the utilities and increase the regulatory risk related to investment. They also fail to provide the right signal to consumers, which risk resulting in over-consumption of a cheap service.

The objective of this chapter is to define and identify the different cases of electricity tariff deficits in EU-28 ([17]). It analyses and assesses various drivers that can explain the emergence of a tariff deficit. The first step includes determining the existence of a tariff deficit in the various Member States on the basis of common criteria, while an econometric analysis is carried out as a second step to identify the drivers of the emergence of a tariff deficit. The chapter is organised as follows. This introduction is followed by the second section, which defines the concept of tariff deficits and describes how they have been tracked in the concerned Member States. Section three describes common patterns across the Member States. The relevant determinants and drivers of the emergence of a tariff deficit and the role of electricity market functioning are discussed in section four. Concluding remarks follow in section five.

2.2. TARIFF DEFICIT: IDENTIFICATION AND ASSESSMENT

The energy market has undergone a process of liberalisation since the 1990's. The process has aimed to separate the network activities, i.e. transmission and distribution, from generation and supply activities. This has mainly reflected concerns about the competition, in particular regarding an appropriate pricing of these services as well as fair access to the networks for new entrants. In this context, price formation of the retail price consists of different elements of the supply chain. Retail price has to reflect the costs of the various segments, but should also reflect the level of competition in the competitive market (generation, supply). As such, the presence of a tariff deficit is a sign of dysfunctioning in at least one of the segments of the electricity market.

([17]) This chapter is based on the Economic Paper n°534. In addition, Box II.2.3 discusses and assesses if the functioning of the generation and network markets also contribute to the emergence of a tariff deficit.

2.2.1. Electricity tariff deficit: definition and scope

An electricity tariff deficit can be defined as follows: a shortfall of revenues in the electricity system, which emerges when the tariffs for the regulated components of the retail electricity price are set below the corresponding costs borne by the energy companies.

The end-user price of electricity consists of three main components, which are determined in different ways. The first component, wholesale electricity price, is mainly determined on organised markets, in which electricity is traded among generators, industrial customers and retailers. The price is settled according to the marginal cost in each trading interval. The second component, transmission and distribution network charges, relate to the regulated part of the electricity sector. Methodology applied to remunerate electricity transmission and distribution activities are usually based on a regulatory asset base, which remunerate operators based on a cost structure of efficient operators plus a margin. The third component of the electricity price is taxes and levies. Levies are associated with the financing of individual policies or objectives, e.g. renewable policy, fuel storage, energy efficiency etc.

Tariff deficits relate to the regulated components of the electricity price. Separately from regulating the remuneration of network operators and energy companies, the regulators or the relevant authorities of the Member States approve the tariffs corresponding to these regulated activities. These tariffs concern primarily network costs (transmission and distribution) and levies related to subsidies to renewable energy or to public service obligations. However, in some Member States, where the end-user price regulation still is applied, the regulated components might also cover the cost of competitive activities, including wholesale cost and retail margins.

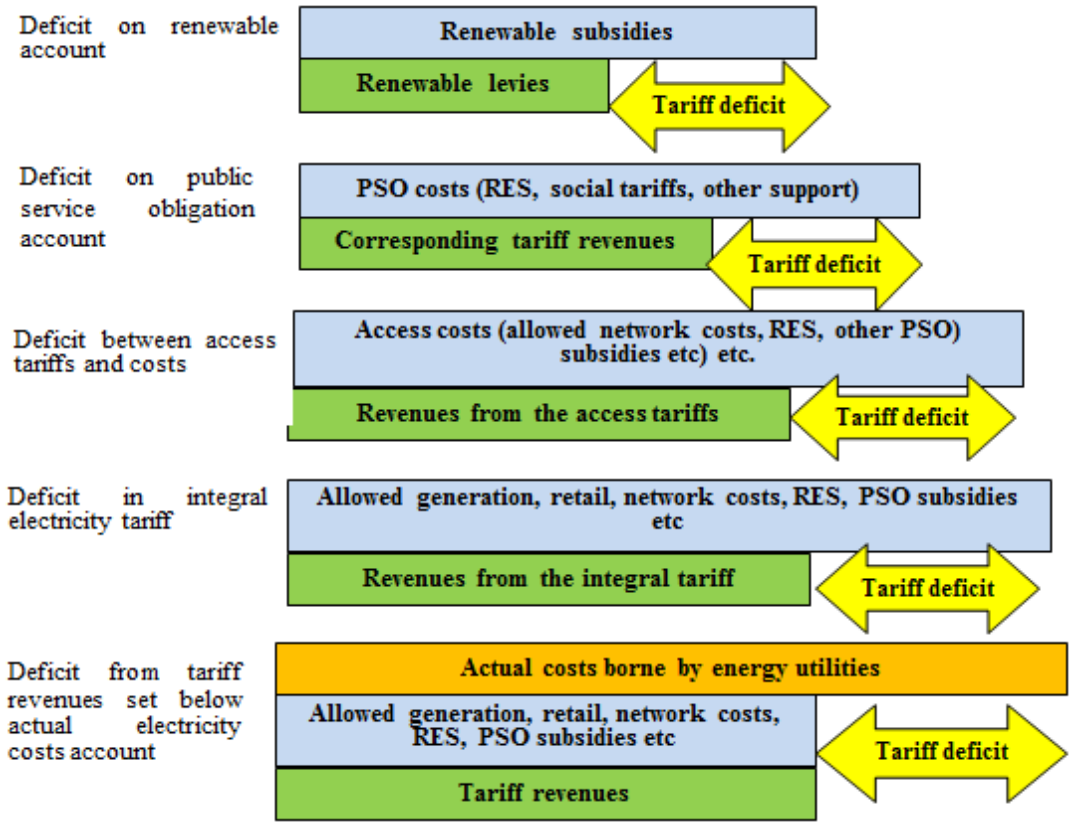
Normally, the tariffs should be set in line with the principle of tariff sufficiency so that they sufficiently cover the allowed remuneration of the electricity companies. However, if for some reasons (see Box II.2.1) tariff revenues in a given year differ from the allowed remuneration, a tariff deficit can emerge.

The scope of electricity tariff deficits differs widely from one country to another (see Graph II.2.1). Some Member States have the deficit on the renewable energy account, when the tariff revenues are not sufficient to cover the costs – for instance, when the aggregated costs for subsidies to renewable energy are rising so fast that the tariffs do not match them. In other countries, tariff deficit may cover public service obligations, the network costs, or the "access costs" which include network costs plus the costs of electricity subsidies (to renewables, to capacity payments, to the provision of electricity to remote or isolated areas etc.).

The scope of tariff deficit may even be broader in the countries which have regulated retail electricity prices. In some of these countries, integral electricity tariffs may not be sufficient to cover the energy prices, taxes, levies and the allowed remuneration of network operators. In this situation, the tariff deficit will be the difference between the integral tariff and the sum of these costs, as recognized by the authorities.

Yet another situation exists in some Member States, where the tariffs do not cover the corresponding costs, but when the authorities or regulators do not recognize this fact and do not remunerate the utilities fully. The result is accumulated losses in the electricity companies, usually electricity generators or distributors. This situation usually concerns state-controlled energy incumbents, but also foreign utilities which have invested in energy networks. This is an important imbalance of the energy system and should also be considered as an example of tariff deficit in a broad sense (see e.g. World Bank, 2013). These cases are therefore included in our quantitative analysis (Section 2.4).

Graph II.2.1: **Examples of the scope of electricity tariff deficits**



Source: Commission Services

It is important to distinguish temporary tariff deficits from more permanent ones. Temporary tariff deficits may emerge in case of discrepancies between the electricity system costs implied in the forecasts (for instance the costs of support to renewables, PSOs and/or network costs) and the actual costs. Discrepancies may also emerge on the revenue side, for instance when revenues are lower than expected due to lower electricity demand. Determining ex-ante the tariff levels which would ensure cost recovery is not an easy task. Energy system costs are affected by wholesale electricity prices, the variability of demand and supply, the supporting schemes, price levels in the neighbouring countries etc. It is difficult to predict these costs when setting tariffs for the year ahead, and some temporary tariff deficits is a normal issue. However, these deficits should be taken into account when the tariffs are set for the following year.

However, in some cases such temporary discrepancies were so big that the authorities decided not to reflect them in the tariffs in the following years. This has led to a build-up of tariff deficits; the cumulated tariff deficits are frequently called tariff debts.

2.2.2. Tracking the existence of a tariff deficit in Member States: data scoping

Identifying where an electricity tariff deficit exists in EU Member States is highly complex and has proven difficult. There is a lack of published information on primary (databases) or secondary (press) sources, and this could be one reason why research-based evidence on this topic is limited. In addition, it requires knowledge of tariff setting mechanisms, as well as of the functioning of electricity markets in order to be able to identify tariff related problems.

Box II.2.1: **Why are not tariffs sufficiently adjusted, with tariff deficits as a result?**

Normally, electricity prices should be set in line with the principle of tariff sufficiency: they should be set at a level that sufficiently covers the relevant costs borne by electricity utilities.

However, in some countries, the authorities considered it not possible to increase the regulated tariffs to a level that fully corresponded to quickly rising electricity costs. The recourse by Member States to tariff deficits reflects their fears about potential damages from rising electricity prices, both for households and for the industry.

Electricity is considered as an important item of households' spending. However, according to the recent Eurostat's Households Budget Survey, carried out in 2012, electricity represented only 2.8% of consumption expenditure of an average EU household. The share of electricity in households' budgets ranged from 1.2% in Greece to 5.6% in Slovakia, also exceeding 4% in Sweden, the Czech Republic, Croatia and Portugal. The share of electricity bills is much higher among the people with the lowest income.

The importance of rising electricity bills and their political sensitivity seems to be larger than its share of households' budgets suggests. This may be due to the fact that demand for energy is inelastic in comparison to the other goods: consumers have little choice but to endure higher electricity prices for lighting, household appliances and in some cases heating of their homes.

For industry, rising electricity prices affect production costs and thus their external competitiveness. The competitive impact of electricity prices is especially high for sectors and countries with higher share of energy intensive industry. The EU manufacturing sector has so far largely responded to energy price increases through sustained energy intensity improvements, thereby maintaining its relatively favourable position in terms of energy efficiency. In addition to price regulation, some Member States apply exemptions and rebates from taxes and renewable changes for energy intensive industries, and/or provide them with free carbon allowances. The issue of rising energy prices and its impact on competitiveness needs to be monitored further in view of future market and policy developments.

For all these reasons, some Member States have tried to prevent rising electricity prices by keeping the regulated components of electricity prices below the corresponding cost level, which led to the emergence of tariff deficits. Some temporary mismatches obviously also played a role.

The reluctance to allow the tariffs to fully reflect the electricity cost also have other drawbacks apart from creating deficits in the electricity sector, which ultimately will fall on public and private finances or final consumers. As the tariffs are set below costs, the end user will meet a too low price and energy companies will not be able to recover their operational cost, as well as their capital expenditures. As a result, the price will not provide the correct incentives for the consumer to adjust his demand and undertake investment in energy efficiency measures, while energy companies will be discouraged to invest in the future due to low returns on their current investments. Hence, it will result in higher consumption of electricity than what would have been the case with a cost-reflective price and the security of supply might be potentially at risk from the absence of essential investments or even worse from the companies default. Moreover, tariffs are often not increased in order to protect vulnerable households from price rises. As the too low tariffs are applied across all (or a broad set) of consumers, directly targeted income support through the welfare system would be a more cost-efficient way for the government to protect and support the most vulnerable consumers of electricity.

For this reason, the quantification of tariff deficit in EU Member States from primary sources was not possible. **To overcome these data challenges, a sequential process has been followed**, which comprises a preliminary phase of scanning the existing literature (criterion 1), along with the analysis of companies' financial data (criterion 2). In particular, following the definition of the problem in section 2.2.1, the required data were collected by national reports published in the Council of European Energy Regulators (CEER), in press releases and other publicly available

reports, as well as by ORBIS database. All these data were combined in order to identify cases of tariff deficits over the years 2007-2012. Particular emphasis was put on issues related to the profitability of regulated companies. The criteria for identifying the cases of tariff deficits were the following:

- **Criterion 1:** Evidence based on public available reports

National reports from the Council of European Energy Regulators (CEER) are probably the best available source of information regarding the evolution of the regulation of national electricity markets. These reports cover a wide range of thematic areas in the electricity and natural gas markets and present the main developments in regulation and performance of these two markets. Specifically, they focus on retail and wholesale prices of electricity and natural gas, including the access to the networks. The availability of electricity produced from renewable energy sources and the compliance with the consumer rights laid down in Directive 2009/72/EC and Directive 2009/73/EC are also covered, as well as analysis of possible barriers to the well-functioning of national electricity and natural gas markets. In addition to this, press releases and other public reports have been taken into account in this process. However, this information was considered as indicative and needed to be confirmed in order to fully assess whether a tariff deficit exists.

- **Criterion 2:** Monitoring regulated companies' financial positions

Three possible areas were identified for identifying deficits after a careful reading of the national reports, along with the overall functioning and the tariff setting mechanism in place in each electricity market. These include the renewables levy, the public service obligations and the overall regulated prices. For this reason, it was decided to monitor the financial performance of the regulated electricity companies in the transmission, distribution or trade segments (NACE 3512, 3513, 3514) to the extent possible based on the data available in the ORBIS database for each country and electricity activity. Complementary data were also retrieved from publicly available annual reports. The data collected include information about the profit and losses after taxes of electricity companies and their assets for the period 2007-2012. Based on these data, these criteria indicated the existence of tariff deficit when companies displayed losses or abrupt loss of profitability (-30%) on a yearly in regulated activities, such as transmission and distribution ([18]) but also in the trade activities.

The overall assessment process chosen for identifying electricity tariff deficits in EU concluded, based on the available information retrieved by national reports and other relative sources, that:

- for six out of the twenty seven Member States (Germany, Greece, Spain, France, Italy, Portugal) ([19]), there is evidence of a tariff deficit ([20]) over a time period which varies significantly across these countries.

- for another five Member States (Bulgaria, Latvia, Hungary, Malta, Romania), there are evidence of possible electricity tariff deficits based on the financial performance of the regulated companies. For instance, in Latvia the national operator in the distribution and transmission activity, respectively, reported continued losses, and the same situation was observed in Malta for the national integrated electricity company (ENEMALTA). ([21]) For the other of these five

([18]) In general, transmission and distribution companies are responsible for managing the accounts related to levies and charges, including renewable, cogeneration, fuel subsidies, PSOs etc.

([19]) Given the difficulty to find information at this stage of the analysis, Croatia was not included.

([20]) Both the German energy regulator (national report, 2010) and transmission system operators (TSOs) claimed that in 2010 and 2012 there were deficits in the EEG account. In Spain (national reports, 2011 and 2013), Greece (national report, 2011 and 2012 and European Commission (2013d)), Portugal (national reports, 2008 and 2013) and Italy (national report, 2013) their energy regulators stated that there is an accumulated deficit on the accounts for compensating renewables producers. Likewise, the French energy regulator supported that there is an accumulated tariff deficit on the account of the Contribution to the Public Electricity Service (CSPE) since 2002.

([21]) In Bulgaria the three largest distribution companies owe a combined 347.6 million lev ($247 million) to state-owned National Electricity Co. (NEK), in disbursements for subsidies to renewable and combined heat and power generators since 2010. In Romania and Hungary based on the information from the press it was spotted that some distribution and retail companies, respectively, displayed either losses or relative low profits compare to their assets.

countries, either losses or relative low returns on assets were recorded. ([22])

2.3. TARIFF DEFICIT IN MEMBER STATES: COMMON PATTERNS

2.3.1. Scope of tariff deficit

Section 2.2 presented the data scoping carried out from secondary sources and describes substantial differences in the size, scope and other features of tariff deficits in Member States. These differences can be summarized in the following table.

Based on this table and on the more detailed overview of electricity tariff deficits provided below, the cases of tariff deficits in Member States can be divided into four main groups.

Spain and Portugal have the highest tariff deficits, with their cumulative value of 2.2% to 3% of GDP. While the scope of these deficits differs between these two countries, in both of them the authorities have formally recognized the right of the affected utilities to recover the corresponding amount. They have also set up securitisation schemes that turn these credit rights of the utilities into fixed-income securities. ([23]) Both countries aim to avoid any new tariff deficit and to address the existing tariff debt.

The tariff debts of France and Greece are relatively low (0.2-0.4% of GDP), but in both countries the respective accounts (renewable account in Greece, public service obligations account in France) have remained unbalanced in the recent years despite tariff increases. In both countries, the deficits are recognized by the authorities and measures ([24]) have been taken to eliminate them in the near future.

Italy and Germany have recorded temporary deficits on the renewable account. These deficits have emerged due to differences between the forecasted and actual costs for the renewable electricity production. Due to the large subsidies to renewables in these countries, the size of these temporary deficits is not negligible. These shortfalls should in principle be financed by increased surcharges in the following period, thereby preventing a deficit to be accumulated. In Germany, a deficit of EUR 2.6 bn (0.1% of GDP) was recorded on the renewable account in 2012. This deficit was almost fully recovered through higher tariffs in 2013. In Italy, a report of the national energy regulator ([25]) acknowledged that a deficit on the renewable account (A3 account) has built up in the 2009-2012 period. The cumulated deficit was estimated at over EUR 1.5 bn (0.1% of GDP) at the end of 2012, and was eliminated through higher tariffs in 2013.

Bulgaria and **Malta** have shortfalls of revenues in the electricity system because the regulated integral electricity tariffs for consumers (especially for households) are too low to cover the corresponding costs borne by the utilities. The situation in **Hungary** has become similar due to the recent substantial decreases of the regulated electricity prices for households. The situation in **Romania** concerns mainly the electricity distribution for which the regulated tariffs are not sufficient to cover the corresponding costs. In these countries, the authorities and regulators only partially recognize the existence of these deficits and have no intention to remunerate the utilities at a level that recover their costs. The result is accumulated losses in the electricity companies, usually electricity generators or distributors. This situation normally concerns state-controlled energy incumbents, but in some cases also foreign utilities which have invested in energy networks. The

([22]) Lithuania was not included in the sample. According to the Lithuanian energy regulator, the losses observed in in the AB LESTO company are a result of the methodology (cost plus) used and assumptions made when setting its tariffs. In particular, the regulator didn't take into account the book value of the assets after the revaluation process, but the regulatory asset base, as well as the new value of depreciations and other expenses. Hence, the revenues collected by the tariffs were lower than the OPEX and for this reason AB LESTO displayed losses. In 2015, the methodology to calculate the electricity price regulation model is expected to change.

([23]) Further to these actions, Spain has recently passed a new law (L24/2013) concerning the economic sustainability of the electricity system. This law has introduced a new remuneration scheme for renewable production and network activities. For more information see Economic Paper n°534.

([24]) The Greek government passed a new law that introduces a package of measures, the so called "new deal" in order to effectively address the deficit by 2015. In France, as well, the central government committed itself to discharge the debt by 2018, and the CSPE (contribution to the electricity public service) debt is now part of the public debt. For more information see Economic Paper n°534.

([25]) (Italian) Regulatory Authority for Electricity and Gas (2013).

Table II.2.1: **Electricity tariff deficit - comparison between Member States**

		ES	PT	EL	FR	IT	DE	BG	MT	RO	HU	LV
Cumulated tariff debt, % of GDP, 2013		3	2.2-2.6	0.4	0.2	0.1*	0.01	1-1.5**	N.A.	0.1*	N.A.	N.A.
Cumulated tariff debt, EUR billion, 2013		30	3.7-4.4	0.7	4	1.5*	0.2	0.4-0.6**	N.A.	0.15*	N.A.	N.A.
Scope of the tariff deficit	- on RES account			✔		✔	✔					
	- on PSO account				✔							
	- of access costs	✔										
	- of integral tariff		✔					✔				
	- tariff below costs				✔			✔	✔	✔	✔	✔
Deficit recognized by the authorities or energy regulator?		✔	✔	✔	✔	✔	✔					
Deficit cumulative (i.e. not settled in the following period)?		✔	✔	✔	✔	✔		✔	✔	✔		

Note: *2012, ** World bank
Source: Commission Services

situation is further complicated by lack of accounting standards for regulated utilities, lack of cost benchmarking, poor transparency, as well as by market distortions such as cross subsidies and purchase power agreements. In **Latvia,** the national transmission system operator and the major electricity distribution company reported continued losses until 2010-2011, which might indicate the existence of a tariff deficit in these activities. However, both these companies have returned to profits since 2011-2012.

2.3.2. Main features of Member States with tariff deficits

The previous sections of this paper have identified Member States where tariff deficits have emerged, and have described their scope and size. These Member States have some common characteristics, which may indicate possible drivers of tariff deficits. One of the difficulties with this analysis is, however, the fact that the size and the time period when tariff deficits were recorded differ between Member States ([26]).

Some of the countries with tariff deficits were particularly hard hit by the economic crisis, but not to the same extent and not for the whole period. In comparison to the EU average, the fall in GDP was particularly severe in Greece in 2010-2012, but also in Portugal in 2011-2012, in Spain in 2010-2012, and in Bulgaria in 2009. In France, GDP growth was above EU average over the same period. On the other hand, some Member States with severe contraction of GDP in this period, such as Estonia or Ireland, did not display electricity tariff deficits.

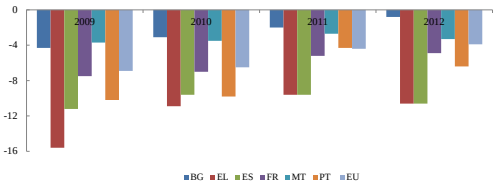
Graph II.2.2: **GDP changes in the EU and selected member States (percent change on preceding year, 2009-2012)**

Source: Commission Services based on AMECO database

Public finances have deteriorated more in the countries with tariff deficits than on average in the EU, with the exception of Malta and Bulgaria. General government deficit was extremely high in Greece and Spain in 2009-2012 and in Portugal in 2009-2010, i.e. close to or even exceeding 10% of GDP. This has led to a mounting debt-to-GDP ratio, which reached 157% in Greece, 124% in Portugal, 91% in France and 86% in Spain in 2012, against an EU average of 87%.

([26]) This sub-section covers six countries with the most evident tariff deficit: Spain, Portugal, Greece, France, Bulgaria and Malta.

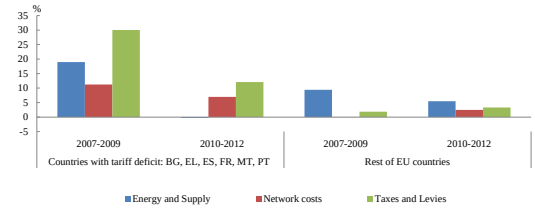
Graph II.2.3: **Net lending (+) or borrowing (-) of the general government in the EU and selected member States (as a percentage of GDP, 2009-2012)**



Source: Commission Services based on AMECO database

As regards the electricity market, one common feature of the six countries with tariff deficits analysed in this section is that they have regulated electricity retail prices. All six Member States regulated electricity end-user prices for households in 2012, with the share of households with regulated price ranging from 59% to 100%. France and Malta also regulated electricity end-user prices for industry in 2012. The price evolution of these countries follows a different pattern compared to other Member States. In particular, the increase in taxes and levies for these countries has been lower during the period 2010-2012, compared to the previous period (2007-2009). This implies that this price component might not reflect the higher cost of the support schemes induced by the increasing penetration of RES during the same period (Graph 2.4).

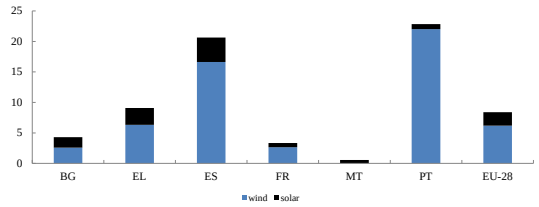
Graph II.2.4: **Average compound annual growth rate for Households in selected member States and the Europe, 2007-2012**



Source: Eurostat

As regards the development of renewable electricity generation, Spain and Portugal are among the three Member States with the highest share of wind and solar power in their electricity mixes. The share of these technologies may matter for the tariff deficits as their deployment have required subsidies. On the other hand, the share of these technologies in Greece is close to the EU average, while in France, Bulgaria and Malta the share was below EU average.

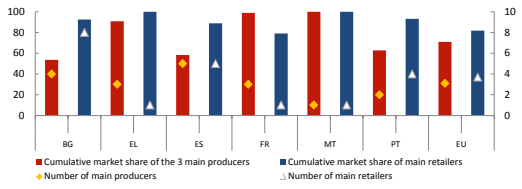
Graph II.2.5: **Share of wind and solar energy in electricity generation, 2012**



Source: Commission Services

Finally, the level of competition and concentration of the wholesale and retail electricity market varies across the countries with tariff deficits. The retail market concentration in Greece, Spain, Malta, Bulgaria and Portugal (measured, for instance, by the cumulative market share of the main retails) is above EU average. In general, higher levels of concentration in the generation market are associated with higher levels of concentration in the retail market (except in France).

Graph II.2.6: **Number of main electricity producers* and retailers* and their cumulative market share, 2012**



*producers and retailers are considered as "main" if they produce and sell, respectively, at least 5% of the total national electricity consumption. The cumulative market share of producers concerns the three biggest.
Note: 2012 data for Greece are available from CEER.
Source: Eurostat, CEER

An econometric analysis aiming at identifying the possible drivers of tariff deficits is presented in section 2.4.

Box II.2.2: **Methodology**

In order to estimate the likelihood of having an electricity tariff deficit, a binary panel model was employed based on the theoretical considerations and findings presented in the previous sections. The probability of having a tariff deficit is explained by a set of covariates, x_{it}, that consider the effects of macroeconomic country-level factors, energy policy related characteristics and other external factors. Having studied and estimated several models (probit, logit and extreme value alternatives), the chosen logit panel model is shown in Eq. (1).

$$y_{it}^{*} = X_{it}\, b + e_{it}, \quad i=1,\ldots 27,\ t=2007,\ldots 2012 \qquad (1)$$

Where y is a binary variable that takes the value 1 if there is a tariff deficit in country (i) and year (t) and zero otherwise. This is based on the data scoping presented in section 2.3.2. The vector x_{it} includes a set of observed regressors ([1]) which might be driving the occurrence of an electricity tariff deficit. The error term e_{it} is assumed to be normally distributed with zero mean and a constant variance. The model was estimated using annual data for EU-27 and for the period 2007-2012, based on a random effect specification, ([2]) in order to account for unobserved time invariant heterogeneity across countries. In this case the error term is given by:

$$e_{it} = a_i + u_{it}, e_{it} \sim iidN, a_i \sim iidN(O, \sigma_{\alpha}^2)$$

According to theory, a logit estimation hypothesize that the probability P of the occurrence of an event is determined by the following function:

$$P_i = f(Y_i) = \frac{1}{1 + e^{-Y_i}}$$

The marginal effect of Y on the probability, which will be denoted f(Y), is given by the derivative of this function with respect to Y:

$$f(Y_i) = \frac{dP}{dY} = \frac{e^{-Y}}{(1 + e^{-Y_i})^2}$$

As in all binary models, the marginal effect of any variable is not constant. It depends on the value of the function f(Y), which in turn depends on the values of each of the explanatory variables. To obtain a summary statistic for the marginal effect, the same procedure is used as in a simple logit analysis, i.e. the marginal effect is calculated based on the mean values of the explanatory variables.

([1]) See table II.2.A.5 in annex for data description.
([2]) Random effects Panel Logit Model (REM) is appropriate when there are cross sectional differences or heterogeneity and this hetereogeneity is assumed to be not correlated with the regressors of the model.

2.4. DETERMINANTS OF ELECTRICITY TARIFF DEFICIT

In this section an empirical analysis is presented, aiming at identifying the possible drivers of tariff deficits. Although there is literature on the occurrence and persistence of electricity tariff deficit in some Member States (mainly Spain) ([27]), the determinants of the electricity tariff deficits have so far received relatively little attention by researchers and policy makers. This section analyses the role played by a number of relevant explanatory variables such as the macroeconomic conditions, existing energy policies, as well as

([27]) Maranon and Morata, 2011; Mendoza, 2013; Robinson, 2013.

institutional and external factors. In particular, the following variables ([28]) were chosen to be included in the empirical analysis:

- **GDP growth:** Economic growth is considered a major driver of electricity demand, which in turn constitutes an important factor in the tariff setting mechanism itself. Regardless of the preferred cost allocation methodology, demand is used to determine the costs per unit transmitted or distributed electricity. During the economic crisis, the projections regarding future demand have turned out to be too optimistic when the consumption of electricity has declined due to fall in economic activity. As a result, the predetermined tariffs have turned out to be insufficient to recover the system's cost, which to a large part consist of fixed/regulated costs. This has in turn resulted in a need to increase the tariffs is subsequent years. Thus, in some Member States this have led to temporary deficits, while in others it has resulted in more permanent deficits, as authorities have been reluctant to raise tariffs sufficiently to keep pace with falling demand. ([29]).

- **Government debt or deficit (as a share of GDP):** To address increasing public deficits and debts in Europe and elsewhere, governments have focused on fiscal consolidation. This has a potential impact on the likelihood of a tariff deficit as the Member States have less fiscal space to cope with a potential deficit in the electricity sector, while with a better fiscal position the deficit can possibly be addressed through the public budget. This has happened in some Member States. For example, in 2012, distribution charges in Czech Republic increased due to extra costs induced by renewable support. Due to a subsidy of CZK 11.7 bn from the national budget, the increase in the electricity price required to match the increase in cost was reduced.

- **Consumption under regulated prices ([30]):** This variable is a proxy for price regulation. It signals the effects that preferential regulated tariffs can have on the market functioning. In this regard, a higher share of consumption under regulated prices that do not reflect the underlying costs will contribute to the likelihood of a tariff deficit occurring and its persistence, especially in the retail segment of the market. This is particularly true when governments have turned to price regulation decisions that set electricity prices below the corresponding costs. In order to capture political intervention in the energy regulatory decision-making process, especially in the price setting, two additional variables ([31]) were included in the analysis. The first one reflects the effectiveness of the government and the second one the quality of regulation. It is expected that lower values of these variables will be associated with a higher propensity of an electricity tariff deficit as a political influence in the tariff setting will be tend to hold prices artificially at a level below the corresponding costs.

- **Renewables penetration:** The actual production of renewable electricity is one of the key elements for calculating the total cost of the subsidies to renewables. Thus, the share of renewable electricity is used as a proxy to captures the effect of the increasing costs for the subsidisation of renewable electricity in the system.

- **Retail Competition:** This variable indicates whether retail prices reflect the cost of production and distribution. In other words, it is used to assess whether price regulation, where it is applied, is distortive or not. Artificially low regulated tariffs (or prices) are generally considered as barriers to entry because they prevent new companies to compete in liberalised market segments and thus prevent them from entering the market on equal terms. Consequently, the higher the competition in the market, the lower is the expected probability of having a tariff deficit.

([28]) See table II.2.A.5 in annex for data description.
([29]) Robinson, 2013.
([30]) This variable is calculated as the product of the consumption of household customers in the country supplied under regulated end-user prices and the share of household consumption in the total consumption in the country.
([31]) World Bank Indicators on governance. See table II.2.A.5 in annex.

Table II.2.2: **Share of countries facing an electricity tariff deficit over the period 2007-2012**

Year	2007	2008	2009	2010	2011	2012
# of countries having an electricitity tariff deficit	4	4	7	10	10	11
Share of electricity consumption in the EU-28 (%)	26%	26%	43%	60%	41%	61%

Source: Commission Services

- **Crude oil prices:** This variable influences one key component of the electricity tariffs through the evolution of wholesale cost: the energy and supply component. As the prices of gas, and to some extent coal, used as inputs to generate electricity are linked to crude oil price, the wholesale cost will closely follow the development of the crude oil price. As the wholesale cost represents in many cases more than 90% of the total electricity supply cost (which in turn accounts for around 50% of the total retail price), it is expected to increase retail electricity tariffs.

Taking into account the data scoping of section 2.2, Table II.2.2 displays the number of countries facing a problem, and the corresponding share of Member States in EU electricity consumption. The figures indicate that the number of countries facing a tariff deficit problem increased considerably after 2009 reaching eleven in 2012. These countries represent more than 60% of EU-28 electricity consumption in 2012.

Table II.2.3 reveals the differences in the explanatory variables across countries with an electricity tariff deficit and the rest of the countries. The macroeconomic variables differ substantially across the two groups implying that economic crisis had a larger impact on countries with electricity tariff deficits. Another striking difference is the fact that in the countries with an electricity tariff deficit, the number of main retailers is around half of the number in countries without this problem. This might explain the differences in the cost reflectiveness of their tariffs. Similarly, the penetration of renewables between the two groups varies significantly, as well as the variables that represent the share of consumption under regulated tariffs, the effectiveness of the government and the quality of regulation. The crude oil price, in contrast, presents the lowest gap.

The empirical results ([32]) confirm most of the theoretical considerations. A good economic environment reflected by GDP growth and sustainable fiscal positions appears to decrease the likelihood of an electricity tariff deficit. In general, higher demand and consumption levels facilitate the recovery of the total energy costs (through appropriate tariffs). The governments also have more space to cope with potential revenues shortfalls in electricity tariffs.

In addition, the share of renewables production increases the likelihood of an electricity tariff deficit. Higher share of renewables are likely to be associated to higher costs of support schemes. When combined with a larger share of consumption under regulated prices, it can generate a higher propensity for electricity tariff deficits. This is why retail competition matters, as a large number of suppliers indicates a well-functioning market with cost-reflective tariffs that cover both the increasing cost of supporting schemes and oil price hikes.

([32]) For detailed information on the empirical results, their discussion and the accuracy of the models chosen see Economic Paper n 534.

Box II.2.3: **Assessing the role of generation and network activities**

The analysis on the electricity tariff deficit focus on retail electricity markets for several reasons. First, competitive retail markets are necessary to ensure that end-user prices reflect the real costs. In many countries, competition in retail markets remains low, with markets dominated by a few large operators. Second, state intervention in the form of retail price regulation, support to renewables and PSOs affect the level of retail prices. Third, retail prices are directly linked to prices on other market segments such as wholesale markets and networks activities (besides levies and taxes). As a result, the market functioning and the regulatory performance of generation and network activities will impact the retail activity operations.

On a well-functioning and competitive wholesale market, producers are expected to earn back their costs. Regulation of wholesale prices could result in mismatches between regulated revenues and real costs. A highly concentrated market, with few operators in the generation segment, could hinder competition and result in higher wholesale prices. Hence, these conditions on the market will be reflected in the final retail prices. Similarly, TSOs and DSOs should operate the network with a view to facilitating competition, ensuring security of supply and improving quality of service in the most efficient way. The monopolistic nature of these network activities requires that regulated charges are sufficient to recover their (opportunity) costs in an appropriate manner, in order to continue investing in their businesses.

The role of the wholesale and network activities has been investigated. As data availability is limited, a few additional variables have been included. Market competition in the generation activities is tested. More competition on the market is expected to improve the liquidity of the wholesale market and reduce rent seeking behaviour. The proportion of unbundled TSO and DSO is also included in the empirical estimate. Unbundled operators are expected to provide a fair access to infrastructures for all market operators while setting network charges in a cost reflective way.

Table 1: **The probability of an electricity tariff deficit (1)**

	Non-linear coefficients					
VARIABLES	[a]	[b]	[c]	[d]	[e]	[f]
Macroeconomic factors						
Government Deficit to GDP (%)	1.440***	1.349***	1.263***	1.572***	1.524***	1.491**
GDP (%)	-0.976***	-0.731***	-0.803***	-0.780***	-0.276	-0.559*
Energy Sector Related Factors						
Share of RES (%)	0.325***	0.332***	0.153**	0.321***	0.326**	0.315**
Concentration ratio of the 3 largest generators (%)	0.213**	0.061				
Wholesale Competition (# producers)			-1.039	-0.430		
Retail Competition (# retailers)		-1.727**		-2.030***	-2.286**	-2.246*
Proportion of the country's TSOs that are ownership-unbundled (%)					-0.023	
Proportion of the country's DSOs that are legally-unbundled (%)						-0.027
External Factors						
Crude Oil Price	0.304***	0.260***	0.279***	0.298***	0.181*	0.207**
Institutional Factors						
Consumption under regulated tariffs (%)	0.214*	0.189	0.184*	0.236*	0.069	0.178
Constant	-51.311***	-31.136***	-28.824***	-28.657***	-21.140*	-24.611***

Note: *, **, *** Indicates significance at 10%, 5% and 1% confidence level.
(1) Based on logit regression model.
Source: Commission Services

The results in Table 1 ([1]) partially support the theoretical considerations presented above. Wholesale competition diminishes the probability of an electricity tariff deficit. This impact is, however, statistically significant only when the retail competition variable is excluded from the analysis. It implies clearly that there is a relationship between these two variables. Moreover, the variables representing the proportion of the country's TSOs and DSOs that are ownership and legally unbundled, respectively, are not statistically significant.

([1]) The coefficients were estimated based on the methodology employed in the Economic Paper n 534 and in particular based on specification (1) (see table 4.4).

Table II.2.3: **Descriptive statistics between countries with and without an electricity tariff deficit**

	Countries without an electricity tariff deficit				Countries with an electricity tariff deficit			
variable	mean	sd	min	max	mean	sd	min	max
Government Deficit to GDP (%)	3.22	4.52	-5.30	30.60	5.28	3.57	-2.00	15.70
Government Debt to GDP (%)	50.51	27.38	3.70	117.40	73.26	38.56	9.00	170.30
GDP (%)	9.89	7.53	-2.60	34.10	5.66	7.35	-13.30	22.10
Share of RES (%)	20.90	18.12	0.06	75.91	25.48	18.16	0.00	66.63
Retail Competition (# retailers)	4.08	1.97	1.00	9.00	2.60	1.95	1.00	8.00
Crude Oil Price	64.55	14.38	44.65	86.85	68.23	15.30	44.65	86.85
Consumption under regulated tariffs (%)	21.45	11.62	0.00	37.96	26.80	9.86	0.00	38.92
Governement Effectiveness	1.27	0.61	-0.36	2.36	0.83	0.50	-0.31	1.58
Quality of Regulation	1.35	0.39	0.52	1.92	0.99	0.29	0.50	1.58

Source: Commission Services

2.5. CONCLUSIONS

The analysis in this chapter shows that a tariff deficit is found in several Member States, accounting for more than 50% of the EU28 electricity consumption in 2012. Hence, the drivers or causes to the deficits are broader than just a bad economic situation. Several factors related to the design of the electricity markets are found to have a positive influence on the prevalence of a tariff deficit.

First of all the determination of prices on the electricity market plays a major role. Regulated retail prices, for example through integrated tariffs or through price caps, limit the possibility of the electricity companies to cover their full production and services cost. The result is the emergence of losses, and hence a risk to accumulate a deficit in these firms.

Price formation is influenced by the functioning of the whole electricity supply chain. For this reason, it is important that each segment – generation and retail – operates in a competitive way and that prices are in line with costs. At the same time, the regulated activities - transmission and distribution – need to allow fair competition between suppliers and to get enough incentive to invest in infrastructure.

Yet another important issue is the regulatory set up with independent regulators, which should determine the tariffs so that the cost sufficiency criterion is met. In view of the economic crisis, rising fuel costs and rising renewable support costs, regulators appear not to have proven sufficiently independent from political considerations to ensure cost recovery of the electricity system.

A high share of renewable energy has also proved to have a positive influence on the likelihood of a tariff deficit. This reflects the existence of support systems for renewable electricity, which in some cases have proven costly. As the deployment of renewables has been more rapid than expected (in some cases, due to overcompensation following unforeseen cost reductions), the costs related to these systems have increased fast to large sums. As a result, it has proved difficult for the regulatory authorities to raise tariffs and prices to ensure that the support costs are duly covered in the energy system. The result is losses and deficits of some of the actors in the system.

Analysing these different dimensions, it appears as the emergence of the tariff deficits can be traced back to the combination of the on-going liberalisation process with state intervention in the market. The liberalisation process has aimed at separating the various steps of the supply chain, e.g. supply, transmission, distribution and retail. Each of these steps should carry their own costs, with regulated tariffs set for the monopolistic network activities. This has, however, been combined with other forms of state intervention, which look different across Member States. In some cases, it relates to a large share of renewable electricity, where regulators have been tasked to allocate the cost of the support through regulated price components for some customers. In other cases, price regulation extends beyond the regulated activities to the competitive activities due e.g. to service obligations. As prices are set below costs for broad categories of customers losses are generated in energy companies and/or network operators.

Going forward, the analysis points at the following implications for the future policy:

- The independence and powers of the national energy regulators needs to be ensured both in theory and practice. This is important in order for the regulator to focus on the recovery of the full costs of the regulated activities in the electricity system, including e.g. network operation, support system to renewables and other PSO activities.

- Retail price regulation, very often implemented to protect vulnerable customers, tends to prevent electricity producers and operators to cover their costs, and risk generating deficits in the electricity system. Thus, it is important to primarily address vulnerable consumers through the welfare system and/or limit the price regulation to very selective segments of the households sector.

- The cost of the support to various energy sources, e.g. renewable energy, and/or customers, e.g. for social reasons, need to be made explicit in the system and transparently allocated across consumers. If not, the risk is that costs will not be fully covered and losses generated.

- Support systems, e.g. to renewable electricity, needs to be designed carefully and in line with the Energy and Environment State Aid guidelines ([33]) and the Commission's guidance ([34]) to avoid both overcompensation and exploding costs, and should be compatible with a proper functioning of the electricity market.

2.6. REFERENCES

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([33]) European Commission (2014c),
([34]) European Commission (2013c),

ANNEXES TO II.2

Annexes

Table II.2.A.1: **Mapping Electricity Tariff Deficits in EU based on National Reports from CEER**

Country	2007	2008	2009	2010	2011	2012
BE						
BG				?	?	?
CZ						
DK						
DE						
EE						
IE						
EL						
ES						
FR						
IT						
CY						
LV						
LT						
LU						
HU						?
MT						
NL						
AT						
PL			?			
PT						
RO				?	?	?
SI						
SK						
FI						
SE						
UK						

	Tariff Deficit (National Reports, CEER)
?	Indication
	No indication

Source: Commission Services

Table II.2.A.2: **Mapping Electricity Tariff Deficits in EU based on Financial Statements**

Country	2007	2008	2009	2010	2011	2012
BE						
BG				**Losses**	**Losses**	**Losses**
CZ						
DK						
DE						
EE						
IE						
EL						
ES						
FR						
IT						
CY						
LV	**Losses**	**Losses**	**Losses**	**Losses**	**Losses**	**Losses**
LT	NA	NA	NA	**Losses**	**Losses**	**Losses**
LU						
HU						**Losses**
MT	**Losses**	**Losses**	**Losses**	**Low profits**	**Losses**	**Losses**
NL						
AT						
PL						
PT						
RO				**Low profits**	**Low profits**	**Low profits**
SI						
SK						
FI						
SE						
UK						

Losses (Orbis&Annual Reports)
Tariff Deficit (National Reports, CEER)
No indication

Source: Commission Services

Table II.2.A.3: **Evidence Based Information for table A.1.**

Country	Evidence Based Information
BG	The three largest distribution companies owe a combined 347.6 m lev ($ 247 m) to state-owned National Electricity Co., also known as NEC, in disbursements for subsidies to renewable and combined heat and power generators, http://www.bloomberg.com/news/2014-03-19/bulgaria-moves-to-revoke-power-selling-licenses-of-cez-evn.html (National report (CEER), 2011-2013, p.7)
DE	Deficit in the EEG account (EUR 8.5 bn)-(National report (CEER), 2010, P.33-34), data available on TSOs website http://www.netztransparenz.de/de/EEG-Konten-Übersicht.htm show that there were deficits in EEG account in 2010 and 2012 (but matched by similar surpluses in 2011 and 2013)
EL	1) Deficit in the RES account, managed by the market operator: LAGHE (2011, p.54-55), 2) Deficit in the RES account, managed by the market operator: LAGHE (National report (CEER), 2012, p.29-30), 3) European Commission, DG Economic and Financial Affairs, The Second Economic Adjustment Programme for Greece – Second Review May 2013, European Economy. Occasional Papers. 148, page 43-45, http://ec.europa.eu/economy_finance/publications/occasional_paper/2013/pdf/ocp148_en.pdf
ES	1) Electricity tariff deficit (National report (CEER), 2011, p. 3), 2) Electricity tariff deficit (National report (CEER), 2012, p. 7), 3) Section of the report 2013 on electricity tariff deficit p. 58-63
FR	Accumulated tariff deficit on the account of the Contribution to the Public Electricity Service (CSPE) since 2002. Cumulative shortfall at the end of 2012: EUR 3.5 bn. Source: CRE http://www.cre.fr/documents/deliberations/proposition/cspe-2014 Gap between revenues collected by the tariffs and EDF's costs, estimated at 1.47B €. Source: CRE. Analyse de couts de production et de commercialisation d'EDF, 2013, http://www.cre.fr/documents/publications/rapports-thematiques/analyse-des-couts-de-production-et-de-commercialisation-d-edf
HU	http://www.budapesttelegraph.com/news/367/reduction_of_utility_prices_might_escalate_into_nationalization, http://www.eurofound.europa.eu/eiro/studies/tn1305028s/hu1305021q.htm. The economic crisis led to the government increasing taxes for electricity providers. They were first increased in 2011, to 8% of pre-tax profit for the 'rich' suppliers of energy and other strategic services, and in 2013 this rate was increased to 16%. This led to reduced profit for the main (multinational) suppliers. They wrote an open letter of protest in December 2011 to José Manuel Barroso, President of the EU Commission. In December 2012 the government introduced a so-called 'overhead reduction' of 10% for public utility costs of housing, which affects again the profit expectations of energy sector and might lead to job losses and wage developments.
IT	Deficit of the RES account (known as account A3) managed by the DSO. The deficit is estimated in 2012 at 1.5b € and it was generated between 2009-2012 (National report (CEER), 2013,p.24-25).
LV	The main electrcity distribution company Salades Tikls presented continued losses for the period 2007-2012.
MT	Enelmalta, the incumbent company has accumulated some 0.87 billion € (European Commission 2014e).
PT	Section on tariff deficit p. 49-50 of 2013 National report (CEER). 2012 deficit: 0.97 bn. Cumulated debt in 2012: EUR 2.8 bn
RO	Regulatory shortfall in electricity distribution tariff in 2012. Source: Expert Forum, The Romanian Energy Regulator ANRE Second Assessment, 2012, http://expertforum.ro/en/files/2012/10/ANRE-third-report-EN.pdf

Source: Commission Services

Table II.2.A.4: **Profit & losses after taxes (Thousands EUR) per electricity segment 2004-2012**

Country	Companies	Segment	2012	2011	2010	2009	2008	2007	2006	2005	2004
BG	Energo pro	3514	-172	6,243	-112	950	-2,810	-11,088	9,975	129,896	118,308
BG	EVN	3514	-39,900	5,738	4,112	-716	38	3,122	6,006	2,931	143,518
BG	NEK	3514	-48,060	35,060	52,086	4,342	20,757	17,331	16,445	29,283	9,616
DE	AMPRION GMBH	3512	197,800	82,100	119,200	66,100		5,100	36,900		
DE	TENNET TSO GMBH	3512	99,747	-32,671		206,467					
DE	50HERTZ TRANSMISSION GMBH	3512	226,400	51,600	126,600	6,400	-92,900	-127,900	47,000	9,600	53,500
DE	50HERTZ OFFSHORE GMBH	3512	16,892	8,304	3,616	1,128	84	20			
DE	STADTWERKE FLENSBURG GMBH	3512	-518	-3,565	8,095	-2,655	4,970	13,091	16,392	9,699	4,217
EL	ENERGY MARKET OPERATOR "LAGIE" S.A		-165,116	-109,803	-46,470	-65,215	14,030	12,226	-18,978	233	173
ES	E ON ESPANA SL	3513	-35,310	-1,098,497	-588,454	-36,146	-10,888				
ES	ENDESA DISTRIBUCION ELECTRICA SL	3513	787,536	870,972	1,537,968	264,380	477,921	530,592	157,969	293,029	295,016
ES	EON DISTRIBUCION SL	3513	37,078	65,464	34,700	21,020	5,685	16,314	6,052	4,575	9,794
ES	IBERDROLA ENERGIA SA	3513	249,041	376,143	392,103	243,746	179,194	10,999	14,235	-73,237	40,358
ES	UNION FENOSA DISTRIBUCION SOCIEDAD ANONIMA	3513	249,870	314,141		-176	-297	-410	-322	-242	-126
FR	ELECTRICITE RESEAU DISTRIBUTION FRANCE	3513	672,800	253,700	114,000	-18,000	209,000	363,461	-3	-3	-6
FR	EDF PRODUCTION ELECTRIQUE INSULAIRE SAS	3511		-14,500	-11,142	-135	634	-832	-4		
IT	A2A RETI ELETTRICHE SPA	3513	6,681	38,499	39,739	-912	25,689	3,683	14,516	7,845	6,162
LV	SADALES TIKLS AS	3513	-5,975	-21,491	-7,182	-16,336	-2,983	-13,440	-7		
LT	AB LESTO	3512	-13,258	-17,771	-17,876						
HU	EDF DEMASZ ZRT.	3514	30,803	6,512	31,996	15,794	45,621	-7,095	-4,073	4,002	
HU	MVM PARTNER ENERGY TRADING LTD.	3514	44,007	1,669	1,890	23,135	16,773	8,232	5,298	1,688	6,289
HU	E. ON ENERGY SUPPLIER LTD.	3514	-52,672	6,930	16,011	-23,899	28,238	13,640			
MT	ENEMALTA			-8,830	21,640	-45,213	-46,601	-7,096	2,536	-6,528	-7,471
PT	EDP SERVICO UNIVERSAL, S.A	3514	24,815	5,975	931	15,365	-54,561	-47,017			
PT	EDP COMERCIAL - COMERCIALIZACAO DE ENERGIA, S.A	3514	-7,945	-31,564	-8,246		-30,083	-46,793	-116,514	-80,394	-7,364
RO	ENEL DISTRIBUTIE MUNTENIA SA	3513	46,566	11,681	24,525	66,210	55,938	12,052			
RO	E.ON MOLDOVA DISTRIBUTIE SA	3513	16,321	1,850	38,961	13,398	8,882				
RO	SOCIETATEA COMERCIALA ENEL DISTRIBUTIE BANAT SA	3513	37,750	51,023	34,708	35,775	29,125	43,825			
RO	ENEL DISTRIBUTIE DOBROGEA SA	3513	19,673	15,603	6,226	5,828	19,357	7,929	13,492	28,750	3,605

Source: ORBIS

Table II.2.A.5: **Description of the variables included in the electricity tariff model**

Variable	Description	Unit	Source
GDP growth	Gross domestic product at market prices - Index (2005)	%	Eurostat
Government debt	The government debt is defined as the total consolidated gross debt at nominal value in the following categories of government liabilities (defined in ESA95): currency and deposits, securities other than shares excluding financial derivatives, and loans.	%	Eurostat
Government deficit	The government deficit is the net lending / net borrowing of general government as defined in the European system of accounts (ESA95), adjusted for the treatment of interest relating to swaps.	%	Eurostat
Consumption under regulated prices	This variable is calculated as the product of the consumption of household customers in the country supplied under regulated end-user prices and the share of household consumption in the total consumption in the country.	%	Eurostat, CEER/ACER
Effectiveness of the government	This variable reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.		World Bank
Quality of regulation	This variable reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.		World Bank
Renewables penetration	Share of gross electricity generated from Solar Thermal, Solar Photovoltaic and Wind in Total Gross Electricity Production	%	Eurostat
Concentration ratio generation	Cumulative capacity share of the 3 largest generation bompanies by net generating capacity	%	CEER/ACER
Wholesale competition	Number of whosale companies in the country	Number of companies	CEER/ACER
Retail competition	Number of retail companies in the country	Number of companies	CEER/ACER
Ownership-unbundled TSOs	Proportion of the country's TSOs that are ownership-unbundled	%	CEER/ACER
Legally-unbundled DSOs	Proportion of the country's DSOs that are legally-unbundled (%)	%	CEER/ACER
Electricity Retail Competition	Number of companies with more than 5% share of the retail market by volume	Number of companies	Eurostat
Crude oil prices	Annualised Crude Oil Brent prices (EUR)		EIA

Source: Commission Services

3. MARKET OPENING AND COMPETITION IN RAILWAYS: RECENT EVOLUTIONS IN MEMBER STATES

3.1. INTRODUCTION

Pro-competition regulation in product markets can help boost living standards. Many empirical studies have shown that competition can overall raise output per capita by increasing investment and employment as well as by encouraging companies to be more innovative and efficient, thereby lifting productivity. ([35]) Some of the main objectives of the liberalisation efforts in network industries have been to bring prices for consumers as close as possible to market prices and to improve the cost-efficiency of service provision so as to decrease the burden on public budgets. This should provide an efficient allocation of resources in the economy, avoid rent-seeking positions, and contribute to delivering diversified choices and an increased quality of services to consumers. ([36])

In railways, the EU, historically characterized by national rail monopolies, has been pursuing a policy of market opening aimed at introducing competition between railway undertakings over the same rail infrastructure. This approach differs from that taken in other parts of the world such as the US where integrated railways are competing on different networks. Since 2001, three railway packages have been adopted by the EU while a fourth railway package has been adopted by the European Commission in 2013 but not yet approved by the European Parliament and the Council. Together, these have shaped the ex-ante regulatory framework of the EU railway market. The process of market opening started in the freight segment and more recently extended to the international passenger segment and, once the Fourth Railway Package enters into force, to the domestic passenger segment. The transposition of the four existing railway packages is expected to translate into increased competition in the freight and passenger segments and in independence between infrastructure managers (IMs) and railway undertakings (RUs) ([37]).

The empirical literature on the effect of market openness on railway performance does not provide unidirectional conclusions. Competition appears to have a positive impact on railway performance ([38]), but findings on the impact of independence between infrastructure managers and railway undertakings on competition have been inconclusive.

This chapter aims to provide empirical insights into the link between the ex-ante regulatory dimension (i.e. the degree of market openness and the degree of independence of the infrastructure manager) and the ex post competition, measured in terms of *inter alia* the market share of the incumbent. Section 3.2 discusses the rationale and specificities of the opening of the rail market in the European Union. Section 3.3 and 3.4 provide overviews of the ex-ante regulatory framework and the performance of and competition in the railway sector in the EU Member States. Section 3.5 presents the results of an econometric analysis focused on the impact of vertical separation and its interaction with market openness on the degree of competition in the rail sector. Section 3.6 concludes.

3.2. MARKET OPENING IN THE EU RAIL SECTOR: RATIONALE AND SPECIFICITIES

During the last 20 years the EU has been very active in restructuring the European rail transport market and strengthening the position of railways vis-à-vis other transport modes. EU efforts have concentrated on three major areas which are all crucial for developing a strong and competitive rail transport industry: (1) opening of the rail transport market to domestic and foreign competition, (2) improving the interoperability and safety of national networks and (3) developing rail transport infrastructure ([39]). Each of these areas are furthermore key ingredients of a single European rail area and of a genuine EU internal market for rail.

The arguments to introduce competition, notably in freight, are valuable and include optimal cross-border services, quality differentiation as well as general quality improvement, larger scale

([35]) OECD (2014).
([36]) European Commission (2013b).
([37]) See footnote 2.

([38]) Measured in terms of cost efficiency
([39]) http://ec.europa.eu/transport/modes/rail/index_en.htm

for cost recovery and a decrease of rent seeking. ([40]) However, the positive effects of competition depend on the size of the market, on removing access barriers to service facilities, and on avoiding coordination failures.

3.2.1. Competition in the rail sector: different approaches

In other parts of the world, different approaches have been taken to organizing the rail market. **Those countries host some of the world's leading railways in terms of size, efficiency or maturity.** ([41]) Following important reform acts in 1980 and 1994, respectively, the USA and Canada have very pure forms of large, vertically integrated, liberalised, publicly listed and self-financing cargo railways on competing networks and non-integrated passenger railways operating in a difficult environment (very large distances, high affinity of population towards car). Japan, where privatisation took place in 1987, has a very pure form of vertically integrated, publicly listed and self-financing passenger railways. At the other side of the spectrum, China has a strongly growing rail system with one highly dominant system integrator that both regulates the industry and operates trains. Russia has a very large, vertically integrated cargo and passenger railway in the midst of a reform and privatisation process. These countries are more homogeneous in nature than the EU as a whole and have much larger markets than individual EU Member States. In the USA, Canada and Japan this allows for the co-existence of vertically integrated companies, each serving a specific part of the network.

3.2.2. Market opening of the rail sector: the EU approach

Since the beginning of the 2000s, the EU has been pursuing a policy of market opening aimed at introducing competition between railway undertakings over the same rail infrastructure. The legislative framework is established through *inter alia* four railway packages ([42]) (see Box II.3.1). The framework is based on a number of key elements:

- Market opening in the freight and international passenger markets
- Effective separation and independence of the infrastructure manager from the railway operators
- Interoperability of national rail networks
- Independence of regulators.

Competition at the service level requires non-discriminatory access to the infrastructure. In vertically integrated structures, regulation is necessary to ensure that, when taking important decisions concerning access to the network, the rail infrastructure manager acts impartially, without favouring the incumbent rail undertaking, to the detriment of new entrants. ([43]) In this respect, according to the EU approach and within the European context, the separation between infrastructure manager and railway operators is seen as the most straightforward way to ensure the impartiality of infrastructure managers, thus creating the right conditions for successfully opening the European rail market for competition (see Graph II.3.1).

The specific structure of the ex-ante regulatory framework stems from the heterogeneous nature of the European rail market, which is spread over 28 different Member States. There is a high degree of market fragmentation, due to e.g. technical barriers that render cross-border services more difficult, but also to hesitancy of Member States to open their domestic rail markets to effective competition. In such a market vertical separation may serve to ensure domestic competition (accompanied by interoperability), although this assumption is not verified in the empirical literature (see Box II.3.2).

([40]) Di Pietrantonio and Pelkmans (2004).
([41]) This overview comes from Roland Berger (2012).
([42]) The Fourth Railway Package is adopted by the European Commission but the legislative procedure involving the European Parliament and Council is still ongoing.
([43]) Weiss (2011).

Box II.3.1: **Opening the rail market through four railway packages**

The First Railway Package, adopted by the European Parliament and Council in 2001, enabled rail operators to have access to the trans-European network and intra-EU international rail freight services on a non-discriminatory basis from 15 March 2003. To improve Europe's rail freight options, the Commission proposed the creation of a one-stop-shop to market freeways. It underlines the need to improve the distribution of train paths, establish a tariff structure which reflects relevant costs, reduce delays at borders and introduce quality criteria. The 2006 assessment by the EC of the implementation of this package showed that the effects already visible are encouraging. The relative position of railways towards other transport modes has stabilized, and the rail traffic performance has been best in countries where the rail freight market had been open for competition relatively early.

The Second Railway Package of 2004 was aimed at revitalising the railways through the rapid construction of an integrated European railway area. The actions presented are based on the guidelines of the 2001 White Paper on transport and are aimed at improved safety, interoperability and opening up of the rail freight market. This package has accelerated the liberalization of rail freight services by fully opening the rail freight market to competition as from 1 January 2007. In addition, the package created the European Railway Agency, responsible for providing technical support for the safety and interoperability work, and introduced common procedures for accident investigation and established Safety Authorities in each member State.

The Third Railway Package, adopted in 2007, introduced inter alia open access rights for international rail passenger services including cabotage by 2010.

The 2011 White Paper on transport proposed a strategy to revitalise the Community's railways by creating a sound financial basis, ensuring freedom of access to all traffic and public services and promoting the integration of national systems and social aspects.

The market shares of incumbents are still high in both the passenger and freight segments, and the independence of the infrastructure management from incumbent undertakings is far from being ensured in certain Member States. In this respect, the 2012 recast of the First Railway Package is expected to improve transparency of the rail market access conditions and to strengthen the independence of national rail regulators. Clear unbundling rules foreseen by the legislation (as in the Third Energy Package) would reinforce the non-discriminatory access to infrastructure.

In January 2013, the Commission adopted its proposals for a Fourth Railway Package covering the issues of improving the governance of rail infrastructure and operation, market opening for domestic passenger rail transport, the introduction of mandatory competitive tendering for Public Service Obligations (PSO) contracts from 2019 and a new role for the European Railway Agency. The legislative procedure involving the European Parliament and Council is still ongoing.

Box II.3.2: **Review of the empirical literature**

A number of empirical studies have been carried out on the effect of market openness and vertical separation on rail performance, the majority of which use a cost-based performance measure. Much of the relevant literature on costs comes from estimation of an overall production or cost function on a panel of European railways over time. The methodological approaches employed in these studies vary between direct comparative assessment of costs, efficient frontier analysis techniques including data envelopment analysis (Cantos et al., 2010; Cantos, 2011), and econometric approaches (Mizutani and Uranishi, 2010). A recent comprehensive study (EVES-Rail, 2012) provides an overview table of findings from the academic literature which we replicate below in slightly revised form.

Study	Countries covered	Effect on cost performance		
		Vertical separation	Competition	Combined effect
Jensen and Stelling (2007)	SE	Negative	Positive	Positive
Friebel et al. (2010)	Europe	Positive*	Positive*	Positive*
Cantos et al.(2010)	Europe	Positive	Positive	Positive
Cantos (2011)	Europe	Not significant	Positive	Positive
Wetzel (2008)	Europe	Not significant	-	-
Growitsch and Wetzel (2009)	Europe	Negative for most countries	-	-
Mizutani and Uranishi (2012)	Europe + Japan	Negative for most countries	-	-

Source: EVES-Rail study

* = positive if appropriately phased

In summary, the empirical literature provides contrasted conclusions on the relation between vertical separation and the performance of the rail sector. There appears to be more empirical concordance on the (positive) relationship between the performance of the rail sector and the degree of competition in the sector.

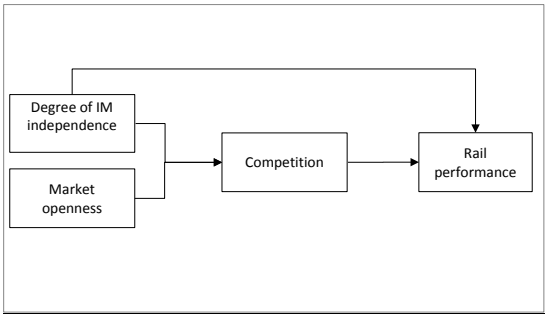
However, the relation between vertical separation and competition is not clear-cut either. Based on data from the Rail Market Monitoring Survey (EC 2012), Drew and Nash (2011) ([1]) compare the market shares of freight incumbents in the EU-27 and find that the average market share is slightly lower in vertically separated rail sectors. EVES-Rail (2012) carries out a similar analysis and concludes that the average share of new entrants in the rail freight sector does not significantly differ between vertically separated and vertically integrated or holding regimes. Furthermore, they find that neither full separation nor full separation of capacity allocation lead to stronger growth in the market share of rail operators other than the largest operator. A 2011 study by IBM Deutschland GmbH ([2]) employs a composite index to measure the degree of competition. The study provides graphical indications that this composite index tends to reach higher values in Member States in which the rail sector is vertically separated. It deserves to be noted that the results of these studies are based on simple comparisons of (mean) values of competition indicators which do not account for possible interaction effects with aspects of market openness other than the degree of independence of the infrastructure manager. ([3])

Study	Countries covered	Effect of vertical separation on competition
Drew and Nash (2011)	EU-27	Slightly positive
EVES-Rail (2012)	EU-27	Neutral

In summary, competition appears to have a positive impact on railway performance, but it remains unclear whether vertical separation results in a higher degree of competition.

([1]) Drew and Nash (2011)
([2]) IBM Deutschland and Kirchner (2011)
([3]) IBM Deutschland and Kirchner (2001) does look at the (univariate) correlation between the composite competition index and a composite market openness index. The correlation coefficient found is 0.84

Graph II.3.1: **Conceptual model of the role of the ex-ante regulatory framework for the rail sector performance**



Source: Commission Services

However, as far as the effect of vertical separation is concerned, **efficiency gains resulting from increased competition may be (partly) offset by efficiency losses** resulting from reduced incentives for efficiency ([44]) and appropriate investment by the infrastructure manager and increased transaction costs between the infrastructure manager and the incumbent operators (although there is evidence that transaction costs form only a very small proportion of total costs([45]) ([46]) The empirical literature does not provide clear-cut conclusions as to which effect on efficiency dominates (see Box II.3.2).

3.3. EX-ANTE REGULATORY FRAMEWORK IN THE EU RAILWAY MARKET: STYLIZED FACTS

The EU approach to competition on the rails is based on non-discriminatory access to infrastructure for rail operations and the control of monopolistic power to ensure fair access prices. This requires decision-making independence of the infrastructure manager from railway operations in combination with an independent regulatory body that guarantees non-discriminatory access and disciplines market power.

([44]) Note that EU legislation does require Member States to introduce efficiency incentives for infrastructure managers.
([45]) Drew and Nash (2011).
([46]) See van de Velde et al. (2012) for an extensive coverage and analysis of possible efficiency losses of vertical separation.

Table II.3.1: **Model of separation between the infrastructure manager and railway undertakings in 1994, 2002 and 2012 by member States**

	1994	2002	2012
AT	FI	FI	HC
BE	FI	FI	HC
BG	FI	VS	VS
CY	-	-	-
CZ	FI	FI	VS
DE	FI	HC	HC
DK	FI	VS	VS
EE	n.a.	n.a.	VS
EL	FI	FI	VS
ES	FI	FI	VS
FI	FI	VS	VS
FR	FI	VS	VS
HR	n.a.	n.a.	n.a.
HU	FI	FI	SEF
IE	FI	FI	FI
IT	FI	HC	HC
LT	n.a.	n.a.	SEF
LU	FI	FI	FI/SEF
LV	FI	FI	HC
MT	-	-	-
NL	FI	VS	VS
PL	FI	HC	HC
PT	FI	VS	VS
RO	n.a.	n.a.	VS
SE	VS	VS	VS
SI	n.a.	n.a.	SEF
SK	FI	VS	VS
UK	VS	VS	VS

Note: FI = full integration; HC = holding company (legal separation); SEF = institutional separation of essential infrastructure managing functions; VS = vertical separation
Source: EVES Rail Study (2013); Fourth Rail Market Monitoring Report (2014)

3.3.1. Independence of the infrastructure manager

The role of the infrastructure manager is to operate and maintain the network, to allocate infrastructure capacity and to determine infrastructure access charges. For this reason, it has to be fully independent from service operations (freight and passenger) in order to ensure fair and non-discriminatory access to new entrants. Several elements are important in this context.

First, the independence of the infrastructure manager should be reflected in the corporate organisation through an effective functional unbundling from the service operators. In particular, the independence of the essential functions of the infrastructure manager, notably path allocation and track access charging, must be ensured. In 2012, the majority of the Member States had opted for the institutional separation of the infrastructure manager from railway undertakings (see overview in Table II.3.1).

Table II.3.2: **Overview of Member States by model of separation between the infrastructure manager and railway undertakings (2012)***

Independency of the infrastructure manager	Member States
IM institutionally independent from any railway undertaking	BG, CZ, DK, EE, EL, ES, FI, FR**, NL, PT, RO, SE, SK, UK
IM integrated in a structure responsible for transport operations, but with an institutionally independent body in charge of essential functions.	HU, LT, LU, SI
Legally independent IM owned by a holding company which also owns and controls a railway undertaking	AT, BE***, DE, IT, LV, PL
IM integrated in a structure responsible for transport operation	IE

*The overview represents the situation in 2012 and as such does not reflect more recent developments.
**In 2014 France adopted a bill on railway reform which will result in the setting up of a public railway group, incorporating both infrastructure manager and rail operator under the control of a holding.
***Since 2014 Belgium has the model of vertical separation between infrastructure manager and railway undertakings
Source: Rail Liberalisation Index, 2011; Fourth report on monitoring development of the rail market (2014), Commission Services

Austria, Belgium, Germany, Italy, Latvia ([47]) and Poland have the model of a legally and functionally separated infrastructure manager, controlled by a holding company which also controls the incumbent railway undertaking. The latter model, while ruled as acceptable by the European Court of Justice, requires suitable arrangements to be in place in order to remove the potential risk of market distortions in the form of inter alia cross-subsidization between subsidiaries and discriminatory behaviour vis-à-vis new entrants. In Hungary, Lithuania, Luxembourg and Slovenia the infrastructure manager is integrated within a structure responsible for transport operations but a separate, institutionally independent body is in charge of essential functions.

Second, traffic management should be performed by the infrastructure manager in order to ensure non-discrimination (in terms of tariff setting, path allocation and traffic management). According to existing rules, traffic management is not considered an essential function, and therefore is not necessarily performed by the infrastructure manager. ([48]) However, the Commission has proposed to include traffic management among the functions attributed to the infrastructure manager and requiring independence, notably because of its potential to distort competition. ([49])

During the period 1994-2012 the rail sector in the EU evolved from a situation with vertical integration in virtually all Member States to a situation with functional or institutional vertical separation in the majority of the Member States (Table II.3.1) ([50]). In 2012, only the rail sector in Ireland remained fully integrated.

3.3.2. Independence of the regulator

In order to ensure fair and non-discriminatory access to the rail network and services an independent regulatory body, the independence of which is guaranteed by EU law, needs to be set up. Regulatory bodies must be in place to monitor railway markets and to act as an appeal body for rail companies if they believe they have been unfairly treated. ([51]) The regulatory bodies in Europe can be divided into two categories: (i) regulatory bodies within a railway authority ([52]) or other special regulatory bodies and (ii) regulatory bodies within a (transport) ministry. **The regulatory model varies across Member States in terms of independence and competencies**. Since 2013 all Member States have the model of a

([47]) Latvia has a legally independent infrastructure manager owned by a holding company which also owns and controls a railway undertaking but with strong guarantees of organisational and decision-making independence in relation to the railway undertaking.
([48]) Currently, in Latvia, Lithuania, Luxembourg and Slovenia traffic management is still operated by the incumbent railways service operator.
([49]) EC (2013b).
([50]) Annex II.3.3 provides a more detailed version of this table with information for each year during the period 1994-2012.
([51]) http://ec.europa.eu/transport/modes/rail/market/index_en.htm
([52]) A railway authority deals with licenses, safety and other railway-specific administrative tasks.

Table II.3.3: **Overview of market entry conditions in the passenger rail sectors in 2013 in 18 Member States***

Market entry conditions	Member States
Franchised to single firm	BE, BG, EL, ES, FR, IE, SI
Franchised to several firms, each with exclusive rights to a geographical area	HU, NL
Franchised to several firms that compete in the same geographic area	IT, SK, UK
Free entry (upon paying access fees)	AT, CZ, DE, DK, EE, SE

*The overview represents the market entry conditions in 2013 and as such does not reflect more recent developments.
Source: OECD Product market regulation index, http://www.oecd.org/eco/reform/Services-all-data-2013.xlsx

special regulatory body or have the regulatory body located within a railway authority. ([53])

3.3.3. Market openness and access

Tale II.3.3 provides an overview of the market entry conditions in the rail freight and passenger sectors in 18 EU Member States.

The rail freight sector was fully liberalised in 2007. In all Member States except Ireland, Finland, Lithuania and Luxembourg, the market share of new entrants is 10% or higher, indicating that markets are effectively open to competition. As regards the passenger sector there are still six Member States in which the operation of the market is based on the franchising of entry to single firms. The difference in market entry conditions between the freight and passenger segment is related to the difference in applicability of the EU law on market opening. While the freight market has been open since 2007, the international passenger market was opened only in 2010, and the domestic passenger markets of Member States will become open only after adoption and implementation of the 4th Railway Package (although some Member States have already fully opened to competition their domestic passenger markets). This explains why the market share of the incumbent rail operator is generally lower in the freight sector (see Section 4.3) than in the passenger sector.

Passenger rail services can be divided into commercial services and services under Public Service Obligations (PSOs). For PSOs, the introduction of mandatory competitive tendering, which is an important element of the 4th Railway Package, could have a significant positive impact on the efficiency of passenger railway operations as it would oblige the incumbent to compete for the market with potential new entrants.

In 2012, only 36% of the total passenger-kms in the EU were carried out in open markets that are based either on open access or competitively tendered PSOs (Graph II.3.2). Only two Member States - the United Kingdom and Sweden - award all public contracts based on competitive tendering. A further 26% of passenger-kms were performed in semi-open markets where potential open access operators compete with the holders of directly awarded public service contracts (PSOs), often facing additional restrictions related to the preservation of the financial viability of the PSOs.([54]) Of all passenger-kms in the EU, 38% were performed in closed markets where the incumbents had legal monopolies or exclusive rights that have been directly awarded. In ten Member States, representing 20% of all passenger-kilometres, rail markets consist of commercial services in open access in combination with directly awarded PSOs. ([55]) In Estonia, Latvia, Lithuania and Slovakia, where PSOs are competitively tendered, only the incumbent participated. ([56])

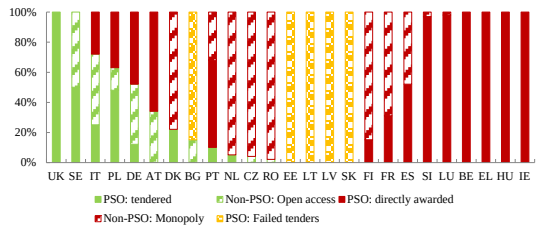
([53]) Slovenia (in 2011) and Spain (in 2013) were the last Member States to transfer the competences of the regulatory bodies from the ministry to a separate agency and an independent competition commission, respectively

([54]) Such restrictions, aimed at mitigating the effects of 'cherry-picking' (i.e. behaviour whereby open access operators focus only on the most profitable lines, thereby increasing the cost of provision of services under PSOs), do not yet apply to domestic passenger services, although they have been proposed in the 4th Railway Package.

([55]) Further to the *Bundesgerichtshof* decision, Germany will not be part of this group anymore (EC, 2014).

([56]) These percentages should not have changed substantially since no further opening has been reported, except for rail tourist services in Spain. It is important to underline that press reports suggest that the Czech Republic is considering increasing the tendering of public service contracts and Spain ponders to open to competition some

Graph II.3.2: **Structure of the rail market (2012)**



Source: EC: monitoring development of the rail market (2014). The underlying data is from RMMS questionnaires, impact assessment 4th railway package, CER (2010), DG MOVE

3.4. PERFORMANCE AND COMPETITION IN THE EU RAILWAY MARKET: STYLIZED FACTS

The expected outcome of the ex-ante regulatory framework is that it fosters competition and thereby increases the market share of new entrants while ensuring the viability of the sector in terms of output and financial performance.

3.4.1. Output performance of the rail sector

The railway sector has been slowly declining over the past decades. The development of transport in a context of full deregulation and the increased flexibility of the economy have accelerated the decline of the share of rail transport in most Member States. Passenger rail overall has increased, but due to the opening of new high speed lines in some countries. However, given the need to reduce congestion, oil dependency, and greenhouse gas emissions, the revitalisation of railways is high on the EU agenda and in national transport strategies.

During 1996-2011, in the EU28, the modal share of passenger railways in inland transport remained stable at about 7.0% (Graph II.3.3) ([57]). In the freight segment, the share declined by 1.0% per year; 17.4% in 2011 against 20.3% in 1995. During the same period, the share of road transport was broadly stable in the passenger segment whereas it increased in the freight segment.

The EU average masks huge disparities across Member States (see Annex II.3.2). **The picture is more positive in old Member States** in some of which the modal share of railways increased both for passenger and freight (Germany, Denmark, Sweden, United Kingdom) during 1996-2011. In the new Member States, the modal share of railways decreased in both segments, more sharply in the freight segment. In 2011, the modal share of passenger railway was particularly low for Estonia, Greece, Ireland, Lithuania and Slovenia (below 3%); in the freight segment, the modal share was particularly low for Spain, Greece, Ireland, Luxembourg and the Netherlands (below 5%).

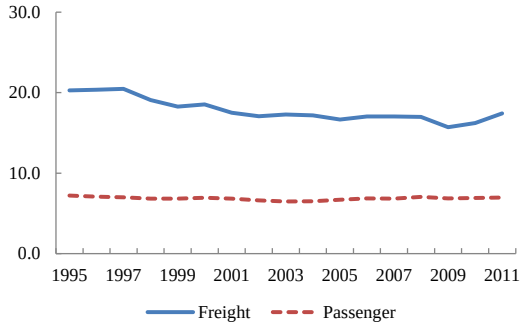
Rail transport intensity in the EU28 increased in the passenger market (Graph II.3.4). The number of passenger kilometres per capita grew from 730 to 809 during the period 1995-2011; an average annual increase of 0.6%. The freight transport intensity, measured as the ratio of tonne kilometres to GDP, decreased in the same period by 1.3% annually.

Again, the EU average masks marked differences between Member States (see Annex II.3.1). In terms of rail transport intensity, Austria, Germany, Denmark and United Kingdom displayed positive annual growth rates during 1996-2011, both in the freight and passenger segments. By contrast, a large number of countries displayed negative annual growth of rail transport intensity for both segments. Very often, the railway network was built and developed during the 19th and 20th centuries. In most countries, the sharp decline in traffic observed from the mid-nineties has resulted in underutilisation of available infrastructure.

of its commercial services. It is also important to underline that in Germany, the number of train-kilometres in PSO that have been competitively tendered has progressed to up to 51% (EC, 2014).

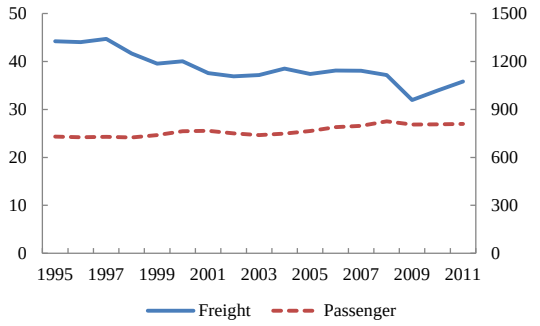
([57]) Data on the modal share are from EC (2013a).

Graph II.3.3: **Evolution of the modal share of rail in inland transport for freight (tonne kms) and passenger transport (passenger kms) in the EU28**



Source: Own calculations based on Eurostat data

Graph II.3.4: **Evolution of the performance in the rail sector for freight (tonne kms/GDP) and passenger transport (passenger kms per capita) in the EU28**



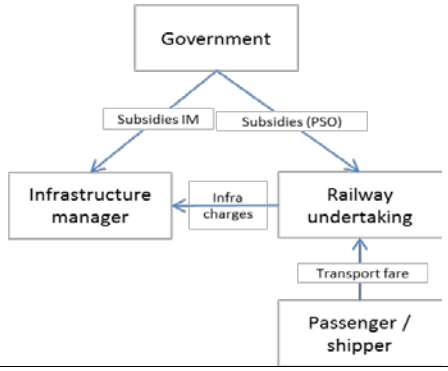
Source: Own calculations based on Eurostat data

3.4.2. Financial performance of the rail sector

As mentioned above, the EU approach to competition on the rails is based on non-discriminatory access to infrastructure for rail operations and the control of monopolistic power to ensure fair access prices.

In most EU Member States the railroad system is highly dependent on government funding since for substantial parts of the system the costs exceed the commercial revenues. Rail operations on parts of the network that have been opened for tendering, i.e. Public Service Obligations (PSOs), often require government subsidisation to compensate for operating losses incurred by the operator providing the rail services. ([58]) ([59])

Graph II.3.5: **Financial flows in the rail sector**



Source: Commission Services

For the infrastructure management, government funding is also generally required to ensure operability and sufficient spending on maintenance and investments. Graph II.3.5 provides an overview of the financial flows in the rail sector.

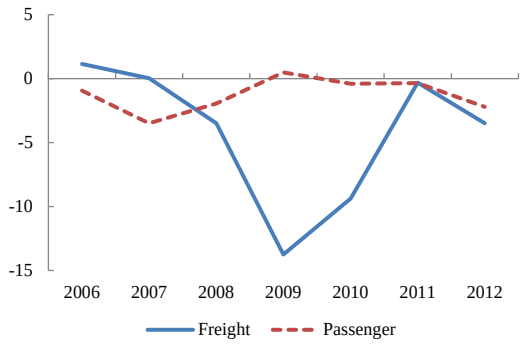
Graph II.3.6 provides an overview of the evolution of the EU average EBIT margin (i.e., earnings before interest and taxes divided by total revenues) for passenger and freight incumbents during the period 2006-2012. **The rail freight incumbents were evidently affected by the crisis, revealing their exposure to market forces. The passenger incumbents, on the other hand, relying more heavily on government funding and subsidisation in relation to public service obligations, appear to have remained sheltered from the crisis ([60])**.

([58]) The arrangements regarding financial compensation are central elements of a procurement contract.

([59]) Before the liberalisation process the sector relied heavily on internal cross-subsidisation, e.g., the use of monopoly rents generated on profitable routes to finance the operation of non-profitable routes of the network such as regional passenger services.

([60]) Preliminary analysis based on a small sample seem to indicate negative, albeit weak, correlation between the EBIT margin and the amount of state subsidies for public service obligations per train kilometre in 2012.

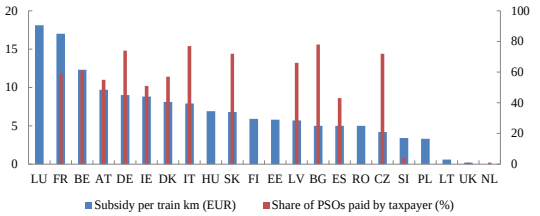
Graph II.3.6: **EBIT margin of EU freight and passenger incumbents over the period 2003-2012**



Source: ORBIS database, Bureau van Dijk, https://www.bvdinfo.com/en-gb/products/company-information/international/orbis-(1), own calculations. Values for freight incumbents are based on data from 17 Member States; values for passenger incumbents are based on data for 19 Member States.

The amount of state funding required is related to the price setting of the commercial passenger and freight services provided by rail operators (e.g. passenger fare levels), which display considerable variation across Member States. As a result, **in the passenger sector there are marked differences between Member States in terms of the subsidization of the rail operators** (whether measured in terms of PSO subsidies per train kilometre or in terms of the share of the cost of PSOs paid by the taxpayer), reflecting different approaches to the organization of the rail market (Graph II.3.7).

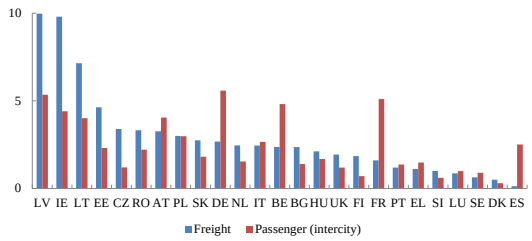
Graph II.3.7: **Subsidies per train kilometre (EUR) and share of PSOs paid by the taxpayer (%) in 2012**



Source: European Commission: monitoring development of the rail market (2014)

Infrastructure access charges also display considerable variation across Member States (see Graph II.3.8). It is estimated that **infrastructure charges represent 41% of all of the main infrastructure manager's revenues.** At the aggregate level, access charges for freight trains are higher than for intercity passenger trains, although this does not always hold at the Member State level.

Graph II.3.8: **Track access charges for freight and intercity passenger rail transport (EUR per train km) in 2014**

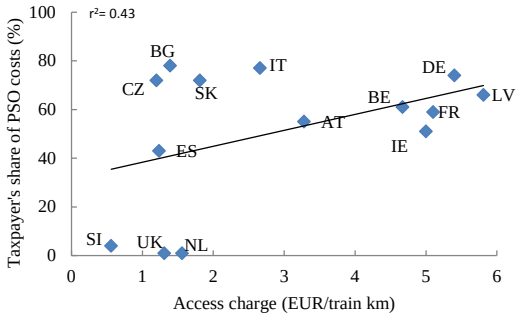


Source: European Commission: monitoring development of the rail market (2014)

The level of the track access fees charged to operators can affect the allocation of state funding between infrastructure management and passenger rail operations; higher access charges reduce the required compensation for the infrastructure manager and increase the operating costs and thus the required compensation for the passenger rail operators. Indeed, across EU Member States **the level of access charges for intercity passenger rail is positively correlated to both the state subsidies per train kilometre and the taxpayer's share of the cost of PSOs** (see Graph II.3.10 and Graph II.3.9). ([61])

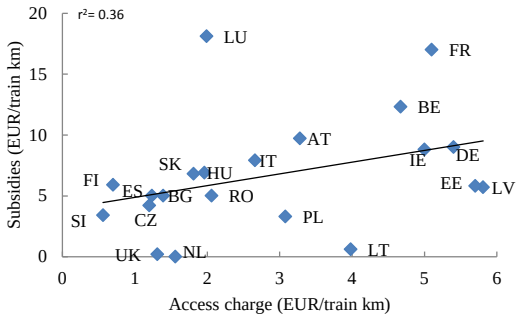
([61]) Note that access charges refer to intercity passenger trains whereas figures on subsidisation are based on total passenger train traffic.

Graph II.3.9: **Access charges for intercity passenger trains (EUR/train km, 2013) versus the share of the costs of PSOs paid by the taxpayer (%, 2012)**



Source: Own representation based on European Commission: monitoring development of the rail market (2014)

Graph II.3.10: **Access charges for intercity passenger trains (EUR/train km, 2013) versus the government subsidy in the context of PSOs (EUR/train km, 2012)**



Source: Own representation based on European Commission: monitoring development of the rail market (2014)

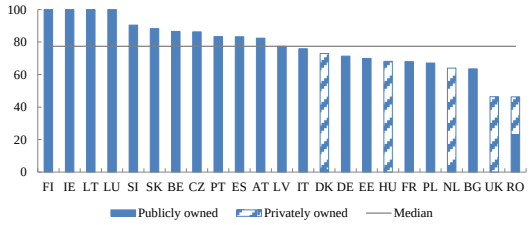
3.4.3. Share of new entrants in the freight and passenger markets

The differences in timing and degree of market opening between the freight and passenger segments appears to be reflected by differences in the incumbents' market shares. ([62]) Under EU law, railway freight services have been open since 2007 and international passenger services since 2010. There is currently no obligation at the EU level to open passenger domestic markets, which represent 94% of all passenger-km in the EU.

([62]) While the timing and degree of market opening presumably affect market shares, other determinant factors, including lower profitability of passenger transport, may also play a role.

The share of the historical freight incumbent is still high in many Member States (see Graph II.3.11)**, albeit generally lower than that of the passenger incumbents.** In four Member States (Finland, Ireland, Lithuania and Luxembourg) it is still 100 percent. In another nine the share is above 80 percent. In general, these countries also tend to have a lower total number of active licences, as compared to the other Member States. The public ownership of the first freight operator is still 100 percent for most Member States. The exceptions are Romania (50), the Netherlands (6), Denmark (2) and Hungary and United Kingdom, where the public ownership is zero.

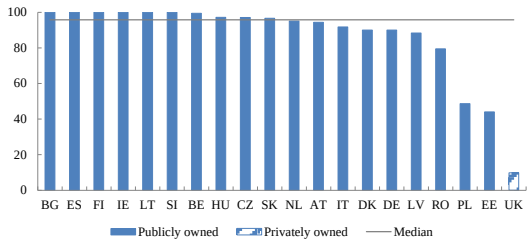
Graph II.3.11: **Market share of the rail freight incumbent (2012)**



Source: European Commission: monitoring development of the rail market (2014). No information available for EL and SE

The share of the passenger incumbent is still high in most countries - above 90% (Graph II.3.12).

Graph II.3.12: **Market share of the passenger rail incumbent (2012)**



Source: European Commission: monitoring development of the rail market (2014). No reliable information available for EL, FR, LU, PT, SE

Only in Estonia, Poland and United Kingdom incumbent shares below 50% are observed – ranging between 9.8% and 48.6%. The public ownership of the first passenger operator is still 100% for most Member States. The exception is United Kingdom where public ownership is zero.

3.5. ASSESSING THE IMPACT OF RAIL REGULATORY REFORMS ON COMPETITION IN RAILWAY MARKETS

There is wide disparity among Member States in terms of the ex-ante regulatory conditions, the degree of competition achieved, and the performance of the rail sector. Although certain patterns and interrelations can be discerned, Member States specificities and policy could play an important role. The empirical literature on the effect of market openness on railway performance does not provide unidirectional conclusions. Competition appears to have a positive impact on railway performance, but findings on the impact of vertical separation on competition have been inconclusive.

This section presents an empirical analysis of the effect of ex-ante regulation on the competitive outcomes in railway markets. In particular, it aims to analyse how the considerable railway regulatory reforms that have been implemented in the EU in recent years have affected the level of competition in railway markets. Due to a lack of comparable, publicly available data on the costs of railway undertakings in Member States, the direct effect of the regulatory environment on costs is not analysed here.

3.5.1. Methodological approach

The analysis of the effect of regulation on competition is done through an econometric regression analysis in which an index measuring the level of competition in railway markets is regressed on another index measuring the level of market opening and on a proxy variable for the size of the domestic railway market. One would expect that increasing the level of market liberalisation should lead to higher levels of competition. In addition, the size of the market could also be an important factor, as larger markets are probably able to attract more new entrants.

As vertical separation of the infrastructure manager from the incumbent has been an important part of railway reforms in the EU, it also an interesting question whether this has had an influence on competition. A set of dummy variables is used in the regression to control for the effect of different vertical separation regimes, and with the use of interaction terms between the dummy variables and the market liberalisation index the analysis aims to capture the possible interaction between the market opening and vertical separation. For instance, a positive significant interaction term between the dummy for vertically separated Member States with market liberalisation would indicate that liberalisation achieves higher returns in terms of strengthening competition if vertical separation is implemented. This would then imply that separating infrastructure management from the operation of rail services improves the effectiveness of other measures aimed at opening rail markets through positive synergies between separation and other measures (see Box II.3.3 for more details on the methodology and data).

Box II.3.3: **Methodology and data used**

In order to assess the impact of rail regulatory reforms – such as market opening, vertical separation and the possible interaction of these two – on competition in railway markets, the following equation is estimated:

$$COM = \beta_0 + \beta_1 LIB + \beta_2 MKT + \gamma D + \delta D*LIB + u$$

Where *COM* is the index measuring competition in railway markets computed by Kirchner et al (2011), *LIB* is the liberalisation index also from Kirchner et al (2011), *MKT* is a proxy for the size of the domestic railway market, *D* is a set of dummy variables for the following vertical separation regimes: (1) full vertical separation, (2) holding company, (3) separation of essential functions, and finally *D*LIB* is a set of interaction terms between the dummy variables and the liberalisation index, while *u* is a disturbance term.

The econometric model assesses whether the different regimes of vertical separation influences market competition, captured by the COM index, while controlling for the size of the domestic market. Furthermore, the estimated model analyses to what extent market openness, as captured by the LIB index, influences market competition and, with the use of the interaction terms, to what extent the effect of vertical separation on competition differs in the degree of market openness.

The COM and LIB indices computed by Kirchner et al (2011) are used because they provide a good summary of the most important aspects of both competition in railway markets and market opening that are covered in Sections 3 and 4. The COM index incorporates both market structure (market share and number of external railway undertakings) and rail performance (captured by the modal share of railways).

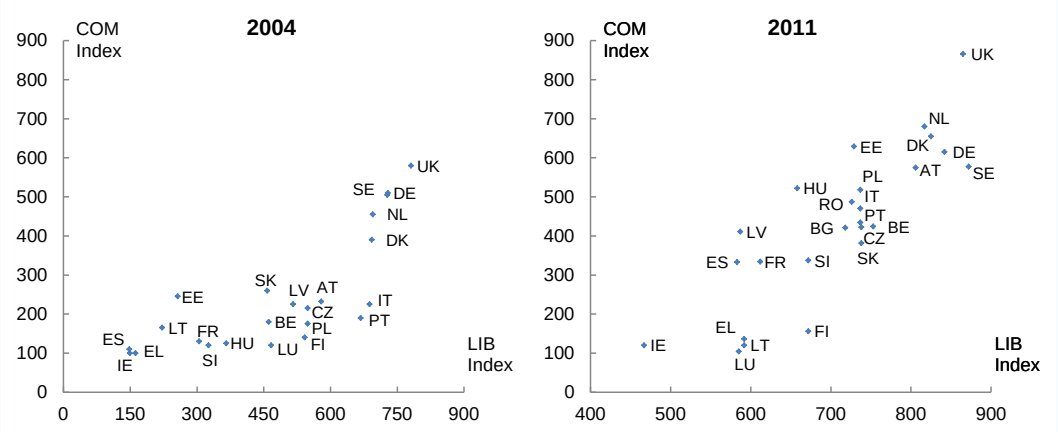
Furthermore, the LIB index is a composite indicator incorporating various regulatory aspects of market opening and therefore by using it as an explanatory variable one can control for the effects of a very wide range of aspects of market openness such as the legal environment, non-legal barriers (information, administrative and operational barriers), share of market accessibility, etc. Another important advantage of this data source from the point of view of econometric estimation is that it represents a consistent dataset of four periods between 2002-2011, which is the period when the majority of Member States engaged in opening up their railway markets.

There is a strong comovement between the COM and LIB indices as shown by the scatter plots in Graph 1, which indicates that market opening and competition are closely linked to each other. This holds for the entire sample as well as for individual years. Member States have shown significant heterogeneity in terms of market opening and competition, but in general higher liberalisation goes together with higher levels of competition. In addition, a comparison of the scatter plots of 2004 and 2011 shows a notable improvement in both market opening and competition across the EU, although there are still several countries with low performance in both aspects.

(Continued on the next page)

Box (continued)

Graph 1: **Scatterplots of the COM and LIB indices for 2004 and 2011**



Source: Commission Services based on Kirchner et al (2011)

The econometric estimation is carried out on a sample of 25 EU Member States for the years 2002, 2004, 2007, 2011 in line with data availability. The estimation is based on a pooled ordinary least squares method. Due to the use of dummies that are rather stable in time, fixed effects are not included in the estimation. Consistent standard errors are used to correct for cross-sectional heteroskedasticity which is present in the data, while autocorrelation across time periods is not significant in the sample.

3.5.2. Empirical results

As one would expect, **market opening as measured by the LIB index has a significant and positive impact on the competition outcome** (see Table II.3.4 showing the results of the regression analysis ([63])**.** This comovement has also been emphasised in Kirchner et al (2011) who reports a correlation coefficient of 0.84. The estimated regression coefficient of the analysis here is smaller in magnitude because the effect of market size – which turns out to be significant – is controlled for and because the effect of the LIB index is allowed to differ among the different regimes of vertical separation.

The size of the domestic rail market is also found to be an important driver of the level of competition with a significant positive coefficient. This implies that larger markets can achieve a higher level of competition than smaller markets – other factors kept equal – because larger markets can be more attractive to new entrants as a business opportunity. This result highlights the importance of efforts to integrate railway markets in the EU. Railway markets have traditionally been highly fragmented along national borders while the integration of national markets can help strengthening competition in railways.

The results indicate that implementing market opening reforms can be expected to yield stronger competition if vertical separation is also implemented at the same time as opposed to maintaining full integration. This is evidenced by the interaction terms of the dummy variable for Full Vertical Separation with LIB and the dummy for Holdings with LIB, which are both positive and strongly significant.

The negative and significant dummy variables – without the interaction terms – indicate that the beneficial effect of vertical separation on market opening can only be expected at a sufficiently high level of market opening. However, in 2011 almost all Member States were above the estimated cut-

([63]) The coefficients of the dummy variables of the regime "Separation of Essential Functions" and its interaction with the LIB index are not significant and therefore they are not reported. This regime is represented by only four observations in the total sample which is insufficient to provide reliable econometric estimates.

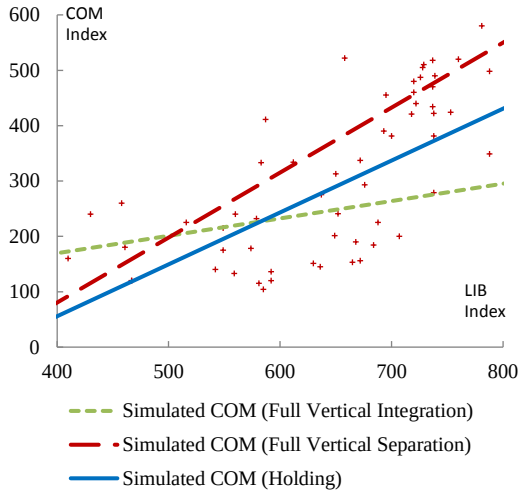
off point where full vertical separation starts to be beneficial, only the index of Ireland was below this level. ([64]) Therefore, for all Member States except Ireland, the estimated regression model implies a positive effect of vertical separation at their respective levels of competition observed in 2011. ([65])

In addition, full vertical separation seems to have a stronger beneficial effect in supporting market opening reforms aimed at strengthening competition than maintaining a holding structure. This is shown in the coefficient of the interaction terms with a value of 0.86 for full vertical separation and 0.62 for the holding structure.

Finally, the regression was also augmented with a dummy variable for EU-12 Member States (countries that joined the EU after 2004) to control for any potential structural difference of this group compared to the other Member States. The estimated coefficients turned out to be insignificant and the main results were unchanged which implies that the EU12 group does not show any systematic differences in the estimated relationship.

Graph II.3.13 illustrates the estimated model and compares its predictions of the COM index as a function of the LIB index with actual values observed in the sample. The dots represent the observed position of Member States in a given time period (25 Member States, observed throughout 4 different periods of time). The three lines depict the simulated values of the COM index as a function of the LIB index assuming a constant market size equal to the EU average in three different regimes of vertical separation. As the figure shows, full vertical separation has the highest slope, i.e. the returns of market opening are highest in this regime. The line of the holding company regime has a lower slope, while full vertical integration has the lowest slope.

Graph II.3.13: **Simulated values of the COM index as a function of the LIB index in different regulatory regimes and actual observed values**



Note: The chart combines a scatter plot of actual observations and simulated values of COM assuming different regimes of vertical separation. Dots represent actual observed values, while the lines show the simulated COM values as a function of the LIB index. Simulations are based on the regression estimates of coefficients, assuming a market size equal to the sample average.
Source: Commission Services

([64]) The estimated cut-off point where full vertical separation starts to be beneficial is estimated at a LIB index value of 503.

([65]) This can be seen from the fact that the sum of the negative coefficient of the dummy variable for full vertical separation and the positive interaction term – evaluated at the level of the actual observed LIB index in a given Member State in 2011 – is greater than zero.

Table II.3.4: **Results of the regression analysis**

Dependent Variable: Competition Index (COM)	
Regressors	Coefficient
Liberalisation Index (LIB)	0.31***
Size of Domestic Rail Market	0.10***
Dummy Variable: Full Vertical Separation (D_{FVS})	-433***
Interaction term: D_{FVS} * LIB	0.86***
Dummy Variable: Holding (D_H)	-363**
Interaction term: D_H * LIB	0.62**
Dummy Variable: Separation of Essential Functions (D_{SEF})	-864
Interaction term: D_H * LIB	1.42
Adjusted R-squared	0.71
Number of Observations	84

Note: *, **, *** indicate 10%, 5%, 1% significance levels respectively
Source: Commission Services

3.6. CONCLUSIONS

According to the literature competition in the rail sector appears to have a positive impact on railway performance. The stylized facts presented in this section demonstrate that there is **wide disparity among Member States** in terms of their rail performance ([66]), the ex-ante regulatory conditions and the degree of competition achieved in the sector.

In 2012 in the majority of the Member States the infrastructure manager is institutionally separated from any railway undertaking. Only seven Member States have the infrastructure manager still located within a holding company (albeit legally and functionally separated from railway undertakings) or, in the case of Ireland, have a rail sector which is still fully integrated. The degree of market opening is generally higher in the freight sector. In all Member States the rail freight sector is characterised by free entry. As regards the passenger sector there are still six Member States in which the operation of the market is based on the franchising of entry to single firms. The general difference in openness of the market for competition between the freight and passenger sectors is reflected by the market share of the historical rail incumbents. The share of the rail incumbents is still high in both sectors, but particularly so in the passenger segment. In most countries the rail passenger incumbent's share is 100%; only three Member States report a share below 80%.

In most EU member states **the railroad system is highly dependent on government funding**. There is considerable variation across Member States in terms of the level of government subsidisation of passenger rail operators and in terms of the access fees rail operators pay to the infrastructure managers.

The results from the econometric analysis confirm that **both market opening and the size of the domestic rail market are important drivers of the level of competition.** Furthermore, **implementing market opening reforms can be expected to yield higher gains in terms of stronger competition if vertical separation is also implemented at the same time.** Full vertical separation seems to have a stronger beneficial effect in supporting market opening reforms aimed at strengthening competition than maintaining a holding structure. Finally, the positive effect of vertical separation on competition can only be expected at a sufficiently high level or market opening, and all EU Member States except Ireland show sufficient market opening for vertical separation to be beneficial.

A follow-up question is whether the beneficial effects of vertical separation on rail transport performance through increased competition result in increased cost-performance of the railway sector, taking into account potential efficiency losses resulting from reduced incentives for

([66]) Here, performance refers to the modal share of rail and freight and passenger traffic intensity.

efficiency ([67]) and appropriate investment by the infrastructure manager. The answer to this question, however, is outside the scope of the present analysis.

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([67]) Note that EU legislation requires Member States to introduce efficiency incentives for infrastructure managers.

ANNEXES TO II.3

Annex II.3.1

Table II.3.A.1: **Evolution of the performance in the rail sector for freight transport (tonne kms/GDP) and passenger transport (passenger kms per capita) in EU28 Member States**

	tonne kilometres per GDP			passenger kilometres per capita		
	1995	2011	average growth rate %	1995	2011	average growth rate %
EU28	44	36	-1.30%	730	809	0.60%
AT	68	76	0.60%	1275	1294	0.10%
BE	30	23	-1.60%	667	946	2.20%
BG	488	122	-8.30%	557	281	-4.20%
CY	-	-	-	-	-	-
CZ	289	118	-5.50%	776	640	-1.20%
DE	36	46	1.60%	870	1039	1.10%
DK	12	13	0.40%	937	1189	1.50%
EE	672	512	-1.70%	291	183	-2.90%
EL	2	2	-0.70%	148	86	-3.30%
ES	17	10	-3.20%	421	488	0.90%
FI	88	56	-2.80%	624	722	0.90%
FR	35	19	-3.70%	937	1370	2.40%
HR	81	66	-1.20%	244	346	2.20%
HU	134	102	-1.70%	817	782	-0.30%
IE	8	1	-14.50%	359	358	0.00%
IT	17	14	-1.40%	821	730	-0.70%
LT	628	644	0.20%	310	127	-5.40%
LU	28	9	-7.10%	708	682	-0.20%
LV	1461	1631	0.70%	549	357	-2.70%
MT	-	-	-	-	-	-
NL	8	12	2.40%	1060	945	-0.70%
PL	423	167	-5.60%	690	472	-2.40%
PT	17	15	-0.80%	480	392	-1.30%
RO	700	159	-8.90%	831	251	-7.20%
SE	88	69	-1.60%	776	1208	2.80%
SI	158	119	-1.80%	299	377	1.50%
SK	538	160	-7.30%	785	451	-3.40%
UK	10	11	0.60%	522	898	3.40%

Source: Commission Services

Annex II.3.2

Table II.3.A.2: **Evolution of the modal share of rail in inland transport for freight transport (tonne kms) and passenger transport (passenger kms) in EU28 Member States**

	share in total inland freight transport (%)			share in total inland passenger transport (%)		
	1995	2011	average growth rate	1995	2011	average growth rate
EU28	20.3	17.4	-1.00%	7.2	7	-0.20%
AT	27.2	34.9	1.60%	12	11	-0.60%
BE	12.2	14.8	1.20%	5.7	7.2	1.50%
BG	58.4	11.2	-9.80%	11.3	3.3	-7.30%
CY	-	-	-	-	-	-
CZ	40.1	20.1	-4.20%	9	6.9	-1.60%
DE	18.2	22.3	1.30%	7.3	8	0.60%
DK	7.2	11.9	3.20%	8.1	10	1.30%
EE	71.3	51.5	-2.00%	5.5	1.9	-6.40%
EL	1.2	1.7	2.00%	2.4	0.8	-6.60%
ES	9.2	4.3	-4.60%	5.3	5.4	0.10%
FI	28.1	25.8	-0.50%	5.2	5	-0.20%
FR	18.9	13.8	-1.90%	7.1	9.2	1.60%
HR	35.2	18.5	-3.90%	6.3	4.9	-1.50%
HU	32.8	18.8	-3.40%	11.6	9.9	-1.00%
IE	9.9	1	-13.20%	3.4	3	-0.80%
IT	10.5	11.5	0.50%	6.2	5.3	-1.00%
LT	49.9	40.6	-1.30%	5.3	1.2	-9.00%
LU	8.3	3.1	-6.10%	5.2	4.4	-1.00%
LV	57.7	59.5	0.20%	12.5	5.2	-5.30%
MT	-	-	-	-	-	-
NL	2.8	4.8	3.50%	10.1	9.3	-0.50%
PL	51	18.9	-6.00%	15.1	5.1	-6.60%
PT	5.9	5.9	0.00%	7	4.2	-3.10%
RO	41	27.5	-2.50%	24.4	5.1	-9.30%
SE	38	38.2	0.00%	6.4	8.6	1.90%
SI	48.2	18.6	-5.80%	2.8	2.6	-0.50%
SK	37	18.5	-4.20%	11.3	6.9	-3.00%
UK	7.1	11.4	3.00%	4.3	7.4	3.40%

Source: Commission Services

Table II.3.A.3: **Degree of structural separation in Member States over the period 1994 - 2012**

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
AT	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	HC	HC	HC	HC	HC	HC	HC	HC
BE	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	HC	HC	HC	HC	HC	HC	HC	HC
BG	FI	FI	FI	FI	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
CY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CZ	FI	FI	FI	FI	FI	FI	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
DE	FI	FI	FI	FI	FI	FI	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC
DK	FI	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
EE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	VS
EL	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	HC	HC	HC	VS	VS	VS
ES	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS
FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
FR	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
HR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
HU	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI/SEF	FI/SEF	FI/SEF	HC/SEF	HC/SEF	HC/SEF	HC/SEF	HC/SEF	SEF
IE	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI
IT	FI	FI	FI	FI	FI	FI	FI	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC
LT	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	SEF
LU	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI/SEF	FI/SEF	FI/SEF	FI/SEF
LV	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	FI	HC	HC	HC	HC	HC	HC
MT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NL	FI	HC/SEF	HC/SEF	HC/SEF	HC/SEF	HC/SEF	HC/SEF	HC/SEF	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
PL	FI	FI	FI	FI	FI	FI	FI	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC	HC
PT	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
RO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	VS
SE	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
SI	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	SEF
SK	FI	FI	FI	FI	FI	FI	FI	FI	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS
UK	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS	VS

Note: FI = full integration; HC = holding company (legal separation); SEF = institutional separation of essential infrastructure mnanaging functions; VS = vertical separation
Source: EVES Rail study (2013); Fourth Rail Market Monitoring Report (2014)

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