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How do EU-15 Member States Benefit from the Cohesion Policy in the V4?

Report prepared within the *Ex post evaluation and forecast of benefits to EU-15 countries as a result of Cohesion Policy implementation in V4 countries,* commissioned by Polish Ministry of Economic Development.

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imapp

coordination:	authors:	cooperation:
Andrzej Regulski	Piotr Bartkiewicz Anna Matejczuk Henryk Kalinowski Magdalena Ośka Andrzej Regulski Julian Zawistowski	Marek Antosiewicz Marcin Buliński Krzysztof Czauderna Beata Dombi Janos Dombi Jan Frankowski Marek Jagielski Kamil Patynowski

imapp

ul. Rejtana 15/25

02-516 Warszawa

imapp@imapp.pl

www.imapp.pl

Institute for Structural Research
(Instytut Badań Strukturalnych)

ul. Rejtana 15/28

02-516 Warszawa, Polska

ibs@ibs.org.pl

www.ibs.org.pl

imapp

ibs

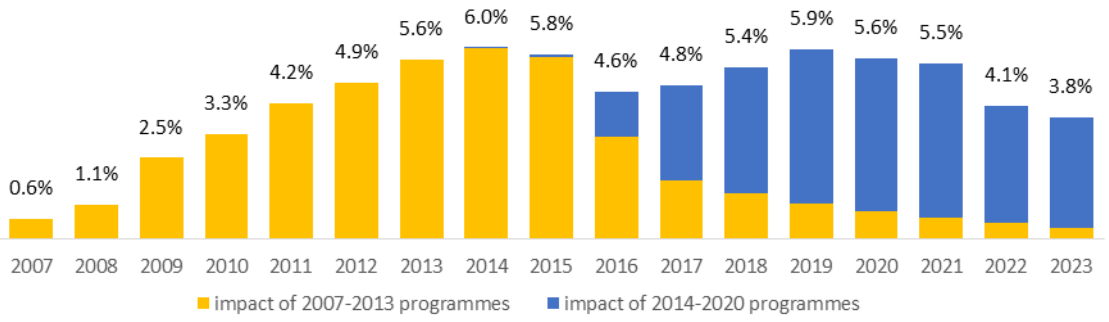
Executive summary

A clear focus on least developed countries and regions remains a key feature of the Cohesion Policy despite shifts in the political agenda and enlargements of the European Union to include more member states. A range of empirical and macroeconomic studies confirm that EU-funded interventions translate into accelerated social and economic change. Meanwhile, the Cohesion Policy has recently become a major source of funding for the Europe 2020 strategy. Consequently, apart from stimulating convergence, interventions should also contribute to attaining the development objectives across the EU in innovation, employment, social inclusion and transition to low-carbon economy.

On average, the total annual value of programmes implemented within the Cohesion Policy in the Czech Republic, Hungary, Poland and Slovakia amounted to 1.8% of GDP since 2007. This scale of interventions is set to continue into 2020. Over the past three financial perspectives, all four Visegrad Group (V4) countries have reported dynamic social and economic transformation, which largely helped to bridge the development gap between those countries and the EU average. This is attributable to many factors such as the global benefits of having open borders, participating in the single market or the inflow of foreign direct investments. However, **the social and economic change in the Czech Republic, Hungary, Poland and Slovakia is also largely due to the impact of operational programmes funded under the Cohesion Policy.**

Figure 1. Impact of the Cohesion Policy on GDP in the V4

(weighted average for CZ, HU, PL and SK,% deviation from the baseline scenario)



Source: Own elaboration.

According to simulations of the model applied in this evaluation, the macroeconomic impulse resulting from structural funds and Cohesion Fund made the level of GDP in V4 countries higher by almost 6% by the end of 2015. Therefore, convergence with the EU has been much faster than in the baseline scenario. Numerous evaluations also confirm tangible impacts of the Cohesion Policy in areas such as increased innovation, positive labour market developments, higher transport accessibility, improved environmental protection and enhanced energy efficiency. Despite many challenges, it is clear that EU-funded programmes in V4 countries have achieved most of their objectives.

While supported with domestic public and private funding, **the unprecedented scale of growth-related investments in V4 countries would not have been possible without the contribution from structural funds and the Cohesion Fund made up** largely of payments by the EU-15 into the EU budget. Their contribution to funding Cohesion Policy implementation in the Czech Republic, Hungary, Poland and Slovakia is estimated at EUR 120 bn in the 2007-2013 programming period. However, **the spending is offset by economic benefits and other positive externalities, which make the Cohesion Policy in its current form beneficial both to support beneficiaries and to the member states which co-finance the interventions**.

Economic benefits to the EU-15[1]

Primarily, the report focuses on **benefits to the EU-15 resulting from the general macroeconomic impact of the Cohesion Policy on V4 economies**. The interventions co-financed by EU structural funds and the Cohesion Fund stimulate aggregate domestic demand, thus increasing GDP. This, in turn, translates into additional external inflows of consumer products and services (i.e. those sold to final consumers) and investment goods and services (i.e. used as inputs in the production process) mainly from the EU-15. Hence, this type of benefits drawn by the EU-15, referred to as **indirect export benefits**, covers exports to the V4 induced by the macroeconomic impact of Cohesion Policy interventions, less the direct involvement of EU-15-based companies in the implementation of projects**. Indirect export benefits are estimated at EUR 76.9 bn in 2007-2015, or 80% of total economic benefits.**

The geographic mix of indirect export benefits is a consequence of the overall structure of international trade of V4 economies. For the most part, these benefits go to main V4 trade partners: Germany, Austria, Italy the Netherlands and France. Additional exports of goods are chiefly in semi-advanced technologies such as electrical machinery and equipment, while additional exports of services are mainly in construction works.

Secondly, the report discusses the benefits enjoyed by companies which are either **based in the EU-15** or are **owned by EU-15-based capital groups,** and which are **directly involved in implementing Cohesion Policy co-financed projects in V4 countries**. Benefits of this type may be related e.g. to technical equipment or software supplies to beneficiaries of EU-funded grants or executing construction works in transport and environmental projects. The total value of tenders awarded to both types of companies was ca. EUR 56 bn in 2007-2015, but this also includes local employee and subcontractor remuneration. With this factored in, **the actual benefits to EU-15 based companies from their direct involvement as**

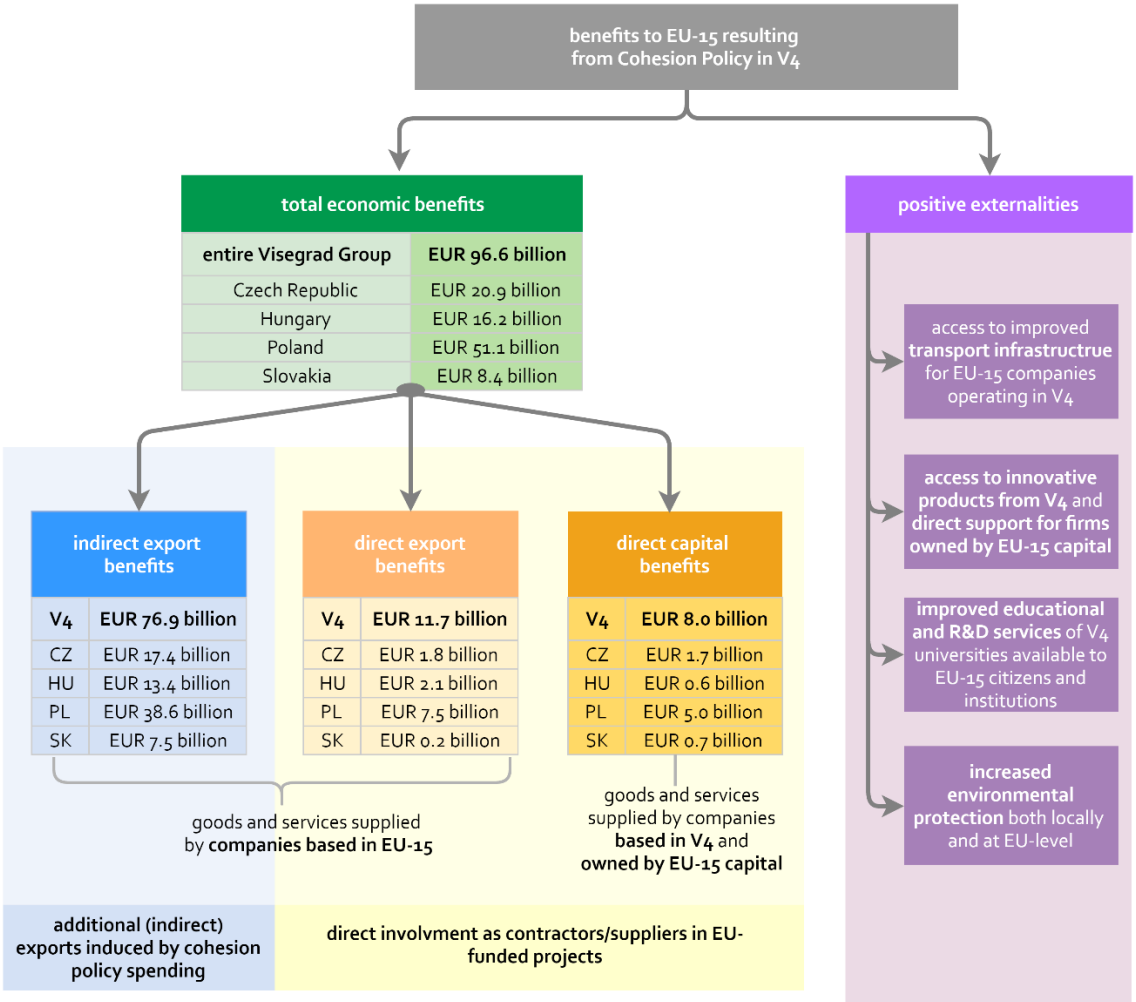
[1] All values are expressed in constant 2010 prices.

contractors or suppliers are said to stand at EUR 19.7 bn (20% of total economic benefits). These can be divided into two subcategories:

- **direct export benefits (EUR 11.7 bn, 12% of total economic benefits),** i.e. benefits resulting from contracts awarded to EU-15-based companies;
- **direct capital benefits (EUR 8.0 bn, 8% of total economic benefits)**, i.e. those flowing from contracts awarded to local V4 companies held by EU-15-based capital groups.

Direct benefits to the EU-15 reside chiefly in supplying construction services to large infrastructural projects and electrical machinery and transport equipment supplies. The brunt of direct capital- and export benefits goes to Germany (mainly in electrical machinery and transport equipment supplies), Spain (construction services, mostly in Poland), Austria (electrical machinery, construction services), France (construction services, transport equipment) and Italy (construction services, electrical machinery).

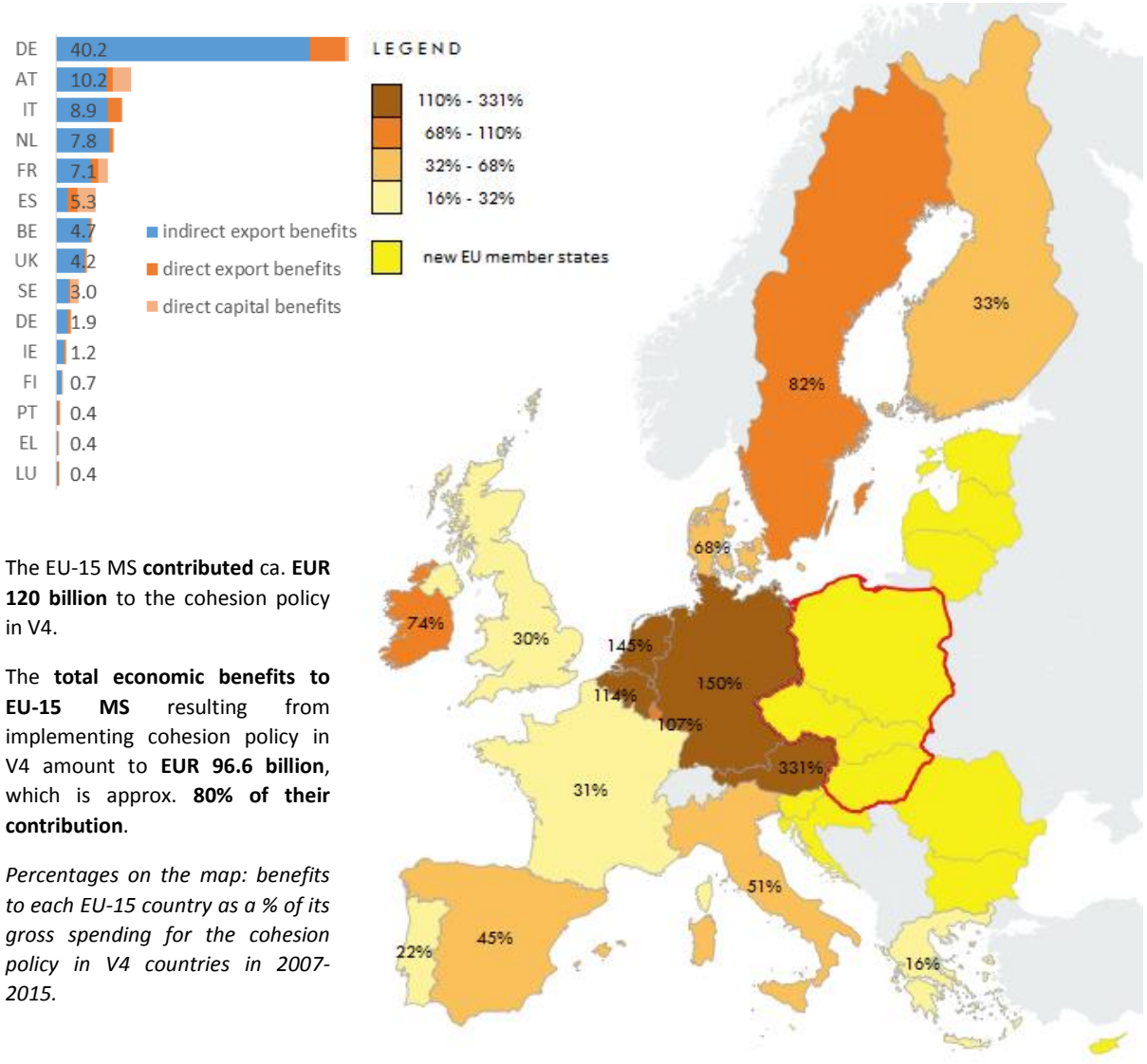
Figure 2. Summary of benefits to the EU-15 (2007-2013 programming period)



Source: Own elaboration.

When combined, indirect and direct export benefits and direct capital benefits **to the EU-15** point to estimated **total economic benefits of ca. EUR 97 bn from implementing the Cohesion Policy in the V4 in 2007-2015**. Over this period, the EU-15 contributed ca. EUR 120 bn gross to the Cohesion Policy. Thus, **the additional export- and capital benefits added to ca. 80% of the spending**. The benefits are expected to continue under the existing profile until the end of the 2014-2020 financial perspective, and will grow moderately in volume as the 2014-2020 spending coincides with the supply-side effects of the 2007-2013 interventions.

Figure 3. Total economic benefits to the EU-15 in relation to gross contribution to Cohesion Policy implementation in the V4 in 2007-2013 programming period (EUR bn,%)



The EU-15 MS **contributed** ca. **EUR 120 billion** to the cohesion policy in V4.

The **total economic benefits to EU-15 MS** resulting from implementing cohesion policy in V4 amount to **EUR 96.6 billion**, which is approx. **80% of their contribution**.

Percentages on the map: benefits to each EU-15 country as a % of its gross spending for the cohesion policy in V4 countries in 2007-2015.

Source: Own elaboration.

Table 1. Summary of benefits to the EU-15 (2007-2013 programming period)

	Czech Republic	Hungary	Poland	Slovakia	V4
total benefits	20 906.27	16 170.14	51 088.55	8 406.79	**96 571.75**
indirect export benefits	17 356.97	13 420.73	38 622.85	7 478.01	**76 878.57**
direct export benefits	1 822.82	2 103.62	7 501.33	228.85	**11 656.62**
direct capital benefits	1 726.48	645.79	4 964.37	699.93	**8 036.57**
total benefits	100%	100%	100%	100%	**100%**
indirect export benefits	83%	83%	76%	89%	**80%**
direct export benefits	9%	13%	15%	3%	**12%**
direct capital benefits	8%	4%	10%	8%	**8%**
total benefits by EU-15 (EUR mn)					
AT	2 423.89	3 285.77	3 127.42	1 402.30	**10 239.38**
BE	696.76	1 015.88	2 457.68	568.70	**4 739.03**
DE	10 236.23	6 147.17	20 680.97	3 174.38	**40 238.75**
DK	147.30	308.50	1 331.46	73.72	**1 860.98**
EL	59.57	34.68	285.88	22.40	**402.54**
ES	527.91	326.39	4 176.19	316.08	**5 346.58**
FI	77.14	74.16	527.87	28.40	**707.57**
FR	1 463.04	1 219.28	3 651.82	811.60	**7 145.75**
IE	234.11	307.87	638.51	34.35	**1 214.84**
IT	1 119.77	1 622.14	5 201.24	956.63	**8 899.78**
LU	83.29	49.03	164.56	62.79	**359.67**
NL	1 947.03	838.04	4 423.91	590.08	**7 799.06**
PT	105.65	68.87	234.36	16.15	**425.02**
SE	879.15	210.96	1 864.31	82.34	**3 036.77**
UK	905.43	661.40	2 322.36	266.85	**4 156.05**
total benefits by EU-15 MS					
AT	11.6%	20.3%	6.1%	16.7%	**10.6%**
BE	3.3%	6.3%	4.8%	6.8%	**4.9%**
DE	49.0%	38.0%	40.5%	37.8%	**41.7%**
DK	0.7%	1.9%	2.6%	0.9%	**1.9%**
EL	0.3%	0.2%	0.6%	0.3%	**0.4%**
ES	2.5%	2.0%	8.2%	3.8%	**5.5%**
FI	0.4%	0.5%	1.0%	0.3%	**0.7%**
FR	7.0%	7.5%	7.1%	9.7%	**7.4%**
IE	1.1%	1.9%	1.2%	0.4%	**1.3%**
IT	5.4%	10.0%	10.2%	11.4%	**9.2%**
LU	0.4%	0.3%	0.3%	0.7%	**0.4%**
NL	9.3%	5.2%	8.7%	7.0%	**8.1%**
PT	0.5%	0.4%	0.5%	0.2%	**0.4%**
SE	4.2%	1.3%	3.6%	1.0%	**3.1%**
UK	4.3%	4.1%	4.5%	3.2%	**4.3%**

Source: Own elaboration.

Positive externalities

Positive externalities are defined as benefits that an entity (i.e. EU-15 individuals or institutions) may draw from a public intervention co-financed within the Cohesion Policy in the V4, even though the intervention was not initially addressed to the entity in question. Many case studies presented here prove that the Cohesion Policy in its current form is beneficial both to support beneficiaries in the Czech Republic, Hungary, Poland and Slovakia and to the member states co-financing the intervention.

The first type of positive externalities is due to relatively high spending on fostering **entrepreneurship and innovation** in the V4. Some of the benefits stemmed from earlier direct investments made by the EU-15: companies with a majority equity stake held by EU-15-based capital groups applied directly for funding in operational programmes that were later rolled out in the Czech Republic, Hungary, Poland and Slovakia. As estimated, they received ca. 15% of the allocations. Entrepreneurship and innovation projects also made it possible mainly for German, Austrian and Italian technology vendors to sell to buyers interested for instance in state-of-the-art production lines which were unavailable domestically. The report stresses that exporters of goods and services to the EU-15 had a large share in the population of support beneficiaries. Since most compete in export markets both on price and quality, product innovations developed with the support of EU structural funds are also available to customers in the EU-15. Moreover, new and improved products developed thanks to EU funds affect the daily lives of Europeans across the EU.

The biggest share of Cohesion Policy funding was spent on developing **transport infrastructure** across the V4. Benefits of such investments to the EU-15 stem not only from direct participation in construction works, as discussed above, but mainly from improving spatial cohesion and access to transport in what previously were peripheral EU regions. Importantly, in this context many bottlenecks in trans-European transport networks were cleared thanks to Cohesion Policy grants. While the impact of the investments is visible mainly in the V4, logistics service providers with their majority stake held by EU-15-based enterprises also benefit substantially such investments. Moreover, other than benefiting from expanding existing transport infrastructure, they also draw from schemes which help them develop their own infrastructure. In a broader perspective, the impact of infrastructure investments yields benefits to all EU companies that are present in Central and Eastern European markets thanks to the reduced cost and time of shipping goods. Also, new and upgraded transport infrastructure is beneficial also to all people who can travel across Europe faster, more easily and safely.

Universities have been successful in effectively applying for Cohesion Policy aid in the V4. The report lists some projects designed to expand the teaching provision. Clearly, such projects were put in place mainly for the sake of Czech, Hungarian, Polish and Slovak students. Evaluations indicate that substantial progress has been made in this respect. Yet, some universities described in this report prove that enhanced teaching and learning potential has also pulled in EU-15 students, who benefit from support available for infrastructure and soft projects via student exchanges and BA, MA and PhD programmes in the V4. Universities and research centres in the Czech Republic, Hungary, Poland and Slovakia have also received substantial funding to expand their research potential. This has spawned closer scientific collaboration with EU-15 centres in common advanced research in areas which improve the lives of Europeans (such as medical sciences).

Investments in **environmental protection** have been an important part of interventions programmed and financed by the Cohesion Policy in the V4. By definition, they were designed mainly to solve local problems such as air pollution, and consequently the principal beneficiaries were people living in the Czech Republic, Hungary, Poland and Slovakia. Yet, the examples quoted in the report clearly demonstrate that better air and water quality also benefits EU-15 populations. The Cohesion Policy has also allowed the V4 to finance many investment projects in the energy sector. These largely contribute to EU energy Policy as they boost energy security across the EU and help to reduce energy consumption and emissions.

Table 2. Summary of case studies described in the report

type of intervention	project/group of projects	location	impact in V4	positive externalities (EU-15 perspective)
innovation and entrepreneurship	support for Continental Automotive Czech Republic s.r.o. (group of projects)	Czech Republic	development of R&D infrastructure in the Czech Republic, including creation of new high quality jobs	increased capital stock of the Czech subsidiary of the German Continental corporation, access to relatively less expensive research and expert HR.
	investment support for Grupa Kęty S.A.	Poland	development of the company's production infrastructure, setting up an R&D centre	development of new manufacturing technologies thus allowing the company to supply to leading transport equipment manufacturers in EU-15
	product innovations in Chirana Medical a.s	Slovakia	research in diagnostics, monitoring and control of artificial lung ventilation used in intensive therapy and anaesthesiology	development of AUTOLungs, an innovative system reducing mortality in most acute cases and facilitating surgery in previously un-operable older patients due to high risk of cardiovascular damage.
	product innovations in Digiterm	Hungary	expanding the company's infrastructure (shop floor, R&D) to develop and manufacture innovative medical equipment	development of Dia Care, an innovative dialysis chair exported to the EU-15, with smart control systems and electronic solutions improving the patients' comfort, the safety and effectiveness of procedures, and the work of medical personnel.
universities and research institutes	development of the curriculum of multi-department media studies – French language at the University of Nitra	Slovakia	new accredited university curriculum with an online platform for specific courses	bilateral student exchange and development of curricula with a double diploma in Slovak and French, plus joint research
	expanding the offer and teaching resources of the Physics Department of the University of Warsaw (group of projects)	Poland	new Department facility with state-of-the-art teaching, R&D infrastructure, more attractive PhD programmes: an international PhD programme in English	joint research with EU-15 researchers, access to PhD programmes for candidates from EU-15
	support for research – Central Institute of	Czech	setting up a R&D centre combining research in life	co-operation with EU-15 companies and research institutions to develop

type of intervention	project/group of projects	location	impact in V4	positive externalities (EU-15 perspective)
	Technology in Brno	Republic	sciences, advanced materials and technologies	new technologies, access to research infrastructure including biotechnology
	expanding the teaching offer – University of Debrecen	Hungary	additional research potential: initiated research of 118 research teams	research in co-operation with EU-15 research centres, researchers and companies; more attractive programmes for EU-15 students
transport infrastructure	development of Gdynia Port infrastructure (group of projects	Poland	developing and improving the competitiveness of one Poland's main sea ports	additional capacity, part of the TEN-T Baltic-Adriatic corridor creating conditions for addressing the offer to EU-15 logistic companies and ship owners who use the port in Gdynia
	reconstruction of the Old Bridge in Bratislava	Slovakia	enhancing Bratislava's transport infrastructure (putting the bridge on the Danube back in use)	unblocking a bottleneck in inland waterways in the TEN-T Rhine-Danube corridor, fostering the environment to improve the competitiveness of alternative freight modes
	development of warehouse infrastructure of ATI DEPO	Hungary	improved competitiveness of Hungary's logistics sector	improved competitiveness (direct support and access to Cohesion Fund-supported transport infrastructure) of a subsidiary of UK-based INTERAG Holding
	intermodal terminal infrastructure of METRANS	Czech Republic	improved competitiveness of the logistics sector and stronger market position of a leading Czech logistics enterprise	improved competitiveness of the subsidiary of the German Hamburger Hafen und Logistik AG group. Support for a project to implement HHLA's growth and expansion strategy.
environmental protection	reduced emissions of the Dolna Odra Power Plant	Poland	reduced emissions and improved air quality via reducing SO_2 and NO_x emissions from combustion	reduced emissions and improved air quality in the EU-15, mainly eastern lands of Germany
	development of waste water treatment infrastructure in the Czech Republic	Czech Republic	reduced emissions to surface and groundwater, fulfilment of accession obligations, improved quality and standard of living	reduced emissions and improved water quality of the Elbe (in Germany) and its delta (North Sea)
	landfill rehabilitation – municipality of Kúty	Slovakia	improved environmental conditions and reduced risk of groundwater pollution in the municipality of Kúty and its environs	elimination of a source of potential surface and groundwater pollution in Austria's border regions

List of abbreviations

AT	Austria
BE	Belgium
BERD	business expenditure on R&D
BG	Bulgaria
CEITEC	Central European Institute of Technology
CF	Cohesion Fund
CSR	Country Specific Recommendations
CY	Cyprus
CZ	Czech Republic
CZK	Czech koruna
DE	Germany
DK	Denmark
EC	The European Commission
ECU	European currency unit
EE	Estonia
EEC	The European Economic Community
EL	Greece
ERA	European Research Area
ERDF	European Regional Development Fund
ES	Spain
ESF	European Social Fund
EU	European Union
EU-12	Austria (AT), Finland (FI) and Sweden (SE), Belgium (BE), Denmark (DK), France (FR), Germany (DE), Ireland (IE), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT), Spain (ES) and United Kingdom (UK)
EU-15	EU-12 + Greece (EL), Spain (ES), Portugal (PT)
EU-27	EU-25 + Bulgaria (BG) and Romania (RO)
EU-28	EU-27 + Croatia (HR)
EUR	Euro
FI	Finland
FP7	The 7th Framework Programme
FR	France
GDP	Gross domestic product
GERD	Gross domestic expenditure on R&D
GNI	Gross National Income
GWh	Gigawatt hours
HU	Hungary
HUF	Hungarian forint
ICT	information and communication technologies
IE	Ireland
IT	Italy

ITS	intelligent transport systems
LNG	liquefied natural gas
LT	Lithuania
LU	Luxembourg
LV	Latvia
MS	Member State(s)
MT	Malta
MWe	electrical megawatt
MWt	thermal megawatt
NL	Netherlands
NSRF	National Strategic Reference Framework
OECD	Organization for Economic Co-operation and Development
OP	Operational Programme
PL	Poland
PLN	Polish złoty
PT	Portugal
R&D	R&D
RES	renewable energy sources
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovak Republic
SME	Trans-European Transport Networks
SNCR	selective non-catalytic reduction
TEN-E	Trans-European Energy Network
TEN-T	Trans-European Transport Networks
TO	Thematic objective
UK	United Kingdom
V4	The V4 (CZ, HU, PL, SK)
WHO	World Health Organization

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1 Introduction

This report is a summary of *Ex post evaluation and forecast of benefits to EU-15 countries as a result of Cohesion Policy implementation in the V4*, a study conducted by Imapp and the Institute for Structural Research between September 2015 and May 2016, as commissioned by the Ministry of Economic Development.

Chapter 2 presents key background elements, and focuses on describing the evolving Cohesion Policy objectives, with particular emphasis on changes which have taken place in recent years. The impact of European funds' co-financed interventions on the pace of convergence of the V4 with the European Union is shown in macroeconomic simulations. This is a starting point for a typology of benefits gained by the EU-15 thanks to Cohesion Policy implementation in the Czech Republic, Hungary, Poland and Slovakia.

Chapter 3 reports the economic impact on the EU-15 of Cohesion Policy implementation in the V4. The authors relate this to the additional exports induced by EU spending in the Czech Republic, Hungary, Poland and Slovakia, and to direct involvement in putting in place projects by companies from the EU-15 or local ones acting as suppliers of goods or service providers whose majority stake is held by EU-15 based groups.

Chapter 4 provides a broader typology of positive externalities going beyond the micro- and macroeconomic factors described earlier. The positive impact on the EU-15 caused by Cohesion Policy implementation in the V4 is driven by support to enterprises, higher education and research entities, expanding transport infrastructure, environmental protection and interventions in the energy sector.

The authors would like to thank the beneficiaries who participated in the survey and the representatives of the Steering Group who facilitated its extensive scoping. In particular, we would like to thank Andrej Chudý from the Government Office of the Slovak Republic, Jan Hněvkovský from the Czech Ministry of Regional Development and Anna Marjánovity from the Hungarian Prime Minister’s Office for their help and support at every stage of work on this report.

2 Cohesion Policy and its externalities

2.1 Evolving objectives

For the purposes of this study, an investigation is carried out into how the Cohesion Policy has developed since it was first established in the 1950s. Its evolving objectives will help to understand the current Cohesion Policy with its goals and limitations.

Rather than a mere consequence of decisions and arrangements made in recent years, the current Cohesion Policy framework is a fruit of many historical factors. Before the European Union became what it is today, the initial documents laying down the principles and objectives of cooperation predominantly referred to the single market, harmonious economic development or sustainable growth.2 The 1957 Treaty establishing the European Economic Community spawned one of the pivotal instruments for the future Cohesion Policy that is the European Social Fund. The ESF was aimed at boosting employment and raising living standards.3 The European Regional Development Fund (ERDF), another structural fund, was founded in 1975. Its establishment is said to mark the beginning of regional policy in the European Community of the time.

Successive 1980s enlargements of what was to be the European Union of today caused its territory to expand, and with it came more economic disparities between regions. Levelling out the differences started to move increasingly centre stage.

In the eighties, the Cohesion Policy became one of the Community's top objectives. The Single European Act of 1986 significantly expanded the scope of the Treaty establishing the European Economic Community to include economic and social cohesion. The new provisions promoted harmonious development by establishing and implementing measures aimed to strengthen economic and social cohesion. Structural funds became tools for putting these objectives in place, whereas the ERDF was designed to help redress main regional imbalances. From then on, the Cohesion Policy was set out and clearly defined.

The subsequent evolution of the implementation methods and Cohesion Policy objectives caused significant organisational changes. Increased available financial resources followed suit. Also, structured objectives and priorities were introduced, as did requirements regarding the management, monitoring, co-ordination and control over funds disbursement and multiannual programming.

The next milestone in Cohesion Policy evolution was marked by the 1992 Treaty on European Union, also known as the Maastricht Treaty. Its main goal was to establish the European Union. Yet, it also included provisions on social and economic cohesion. Precisely this treaty triggered off regions' involvement in development planning, a process which has been continuing to this day. Under the Treaty on the European Union, the Cohesion Fund was also established, thus providing a funding source for the largest environmental and transport infrastructure investments in member states with per capita GDP below 90 % of the EU average.

[2] Treaty establishing the European Economic Community, Rome, 1957, Article 3.

[3] Treaty establishing the European Economic Community, Rome, 1957, Article 123.

Plans for further enlargement of the European Union, including the accession of the V4, required more structural changes. For the first time a European Union enlargement was to include as many as 10 new member states. Their relative degree of development differed significantly from those which joined the EU before 2004 (EU-15). According to pre-enlargement estimates, EU population would rise by 20 % with the attendant wealth growth of just 5 %. Agenda 2000 adopted in 1999 took this perspective into account:4 the document outlined EU development forecasts for the period 2000-2006, thus extending the programming perspective to 7 years. For the first time, Agenda 2000 stipulated support instruments for candidate states including the Czech Republic, Hungary, Poland and Slovakia. Before the document was drafted, a detailed impact assessment of the European Union enlargement had been conducted taking into account the then European Union policy principles and their evolution in the future. In its conclusions, the impact assessment pointed at possible beneficial effects of the enlargement for peace, security and the economic growth development across Europe.

All the V4 joined the European Union in May 2004, when the 2000-2006 financial perspective was already underway. This meant that the new member states had to shorten their planning horizon to less than three years. The National Development Plans were to remain in force from 2004 to 2006 and refer to the objectives set forth in Agenda 2000.

Member State	Priorities for 2004-2006 programming period
Czech Republic	• creating conditions for economic growth by strengthening internal factors • enhancing workforce skills, competitiveness and mobility, while limiting negative impact on the disadvantaged groups • achieving greater compliance with European environmental standards • ensuring sustainable development of regions
Hungary	• improving competitiveness of the manufacturing sector • increasing employment and human resources development • enhancing infrastructure and Environmental protection • strengthening regional and local potential
Poland	• supporting competitiveness of businesses • ensuring HR development and increasing employment • creating conditions for enhancing investment, ensuring sustainable development and promoting territorial cohesion • contributing to structural transformation in agriculture and fisheries, and the development of urban areas • strengthening the growth potential of regions and counteracting the exclusion of certain areas
Slovakia	• increasing business competitiveness by supporting development, innovation and restructuring of economic companies • increasing employment through training and job creation • establishing core infrastructure • rural development.

[4] Agenda 2000 - for a stronger and wider Europe.

In the run-up to the 2007-2013 financial perspective, EU Cohesion Policy objectives were further re-prioritised. This helped to identify three priorities. They became the EU strategic guidelines on economic, social and territorial cohesion.[5]

[5] *Community strategic guidelines on cohesion*. Council decision of 6 October 2006 on (2006/702/EC) http://ec.europa.eu/regional_policy/sources/docoffic/2007/osc/l_29120061021en00110032.pdf

Scheme 1. Cohesion Policy priorities 2007-2013

Source: Community strategic guidelines on economic, social and territorial cohesion for the years 2007-2013.

Those priorities co-existed with the new objectives, which were financed at the regional level:

Structural funds objectives for 2007-2013	
Objective 1 Convergence	speeding up the convergence of least-developed member states and regions by improving conditions for growth and jobs. (the objective concerned the least developed regions)
Objective 2 Regional competitiveness and employment	strengthening regions' competitiveness and attractiveness as well as employment (with the exception of the least developed regions)
Objective 3 European territorial cooperation	promoting common solutions for neighbouring regional authorities in the area of urban, rural and coastal development, development of business relations and establishing networks of small and medium sized enterprises

The Lisbon Treaty (2007) stated that in order to achieve harmonious development, the EU should promote economic, social and territorial cohesion, especially by reducing development disparities among regions and the disadvantages of those lagging behind the most. All EU-25 members were obliged to prepare National Strategic Reference Frameworks where they would set forth their priority strategic objectives and key fields of intervention in the area of Cohesion Policy.[6]

Before the implementation of 2007-2013 programmes, all the V4 countries engaged in preparations by drawing on previous years' experience. In successive programming periods, the Czech Republic, Hungary, Poland and Slovakia were able to use the entire available financial envelope under the same terms and conditions as the other EU member states. Each member state drafted a National Strategic Reference Framework, which outlined the areas to which EU funding would be channelled in the years 2007-2013. In line with *The Community Strategic Guidelines on Cohesion*[7] and the recast Lisbon Strategy, programmes co-financed by Cohesion Policy funds were to be targeted at enhancing the attractiveness

[6] *Cohesion Policy 2007-13. National Strategic Reference Frameworks*
http://ec.europa.eu/regional_policy/sources/atlas2007/fiche/nsrf.pdf

[7] *Community strategic guidelines on cohesion*. Council decision of 6 October 2006 on (2006/702/EC)

of EU member states, regions and cities, at supporting innovation and entrepreneurship and creating more and better jobs.

Although the Czech Republic, Hungary, Poland and Slovakia had similar priorities arising from converging conditions and problems, each V4 country opted for its own strategic objectives and a varied number of operational or horizontal goals.

Member State	Priorities for 2007-2013 programming period
Czech Republic	• competitive Czech economy • open, flexible and cohesive society • attractive environment • balanced territorial development
Hungary	• increasing employment and sustaining long-term economic growth
Poland	• better operation of public institutions and expanded partnership mechanisms • improving human capital quality and enhancing social cohesion • building and upgrading technical and social infrastructure which is of paramount importance for stepping up Poland's competitive edge • increasing the competitiveness and innovation of economic enterprises, in particular in the manufacturing sector, with high added value, plus the development of the service sector • increasing the competitiveness of Polish regions and preventing their social, economic and spatial exclusion • more equal development opportunities and support for structural changes in rural areas
Slovakia	• regional infrastructure • innovation, information society and knowledge economy • human resources and education

The programming approach in the 2014-2020 period is based primarily on the objectives of Europe 2020 – A European strategy for smart, sustainable and inclusive growth. The Cohesion Policy was an essential instrument for pursuing the implementation of the strategic objectives of Europe 2020, and as such it should remain one of the leading EU policies.[8] At the operational level, member states were committed to put in place and roll out plans which set out investment priorities for the five European structural and investment funds.[9] Such strategies are included in Partnership Agreements concluded by the European Commission and national authorities. The preparation of agreements was underpinned by intensive work and discussions around the shape of future interventions, and included recommendations prepared by the European Commission for each member state.[10]

[8] Programme of the Polish Presidency of the EU Council. 1 July 2011 – 31 December 2011. Ministry of Foreign Affairs, 2011.

[9] European Structural and Investment Funds (ESIFs): European Regional Development Fund (ERDF), European Social Fund (ESF), Cohesion Fund (CF); European Maritime and Fisheries Fund (EMFF), European Agricultural Fund for Rural Development (EAFRD). Only the ERDF, ESF and CF are included in the cohesion policy.

[10] Country Specific Recommendations (CSR).

Objectives of Europe 2020 - A European strategy for smart, sustainable and inclusive growth	
employment	• 75 % of the population aged 20-64 should be in active employment
R&D	• 3 % of the EU's GDP should be invested in R&D
climate change and energy efficiency	• reduce greenhouse gas emissions by at least 20 % against 1990 levels (or by 30 %, if the conditions are in place) • 20 % of energy should come from renewable energy sources • energy efficiency should be up by 20 %
education	• the share of early school leavers should be under 10 % • at least 40 % of population aged 30-34 should have a tertiary degree
combating poverty and social exclusion	• at least 20 mn fewer people should be at the risk of poverty or social exclusion

Implementation rules were simplified in the 2014-2020 programming period, and stronger emphasis was placed on outcomes of the interventions. Linking Cohesion Policy with the Europe 2020 strategy resulted in a reduced number of Cohesion Policy objectives, leading investments accumulating in selected areas, in particular in research and innovation, SME support, development of ICT and low-carbon economy. The EUR 351.8 bn budget concentrates on 11 thematic objectives.

Cohesion Policy thematic objectives 2014-2020	
TO 1	Strengthening research, technological development and innovation
TO 2	Enhancing access to, and the use and quality of ICT
TO 3	Enhancing the competitiveness of SMEs, agriculture, fisheries and aquaculture
TO 4	Supporting the shift towards a low-carbon economy in all sectors
TO 5	Promoting climate change adaptation, risk prevention and management
TO 6	Preserving and protecting the environment and promoting resource efficiency
TO 7	Promoting sustainable transport and removing bottlenecks in key network infrastructures
TO 8	Promoting sustainable and quality jobs and supporting labour mobility
TO 9	Promoting social inclusion, combating poverty and any discrimination
TO 10	Investing in education, training and vocational training for skills and lifelong learning
TO 11	Enhancing institutional capacity of public authorities and stakeholders, and efficient public administration

Due to the aforementioned new guidelines for the 2014-2020 period, the structure of Cohesion Policy objectives and priorities of the V4 were changed accordingly.

Member State	Priorities for 2014-2020 programming period
Czech Republic	• fostering conditions for business development to favour competitiveness of the Czech Republic in European and world markets, leading to the proliferation of new companies, increasing innovative opportunities for existing companies and attractiveness among domestic and foreign investors • ensuring conditions for an inclusive society in all population groups, employment growth, with particular focus on restricting the number of excluded groups and promoting a better quality of life
Hungary	• sustainable economic growth based on high added value output and more jobs, including competitiveness, employability, social inclusion and economic growth
Poland	• more competitiveness, social and territorial cohesion and improved public administration efficiency
Slovakia	• improved quality of life, sustainable development and more jobs

2.2 Evolving expenditures and their distribution

Over the years, the Cohesion Policy budget and its distribution underwent major changes.[11] In retrospect, the EU consistently increased spending on structural funds and the Cohesion Fund in its successive budgets. Moreover, the share of these allocations in the entire EU budget has been on constant rise. This held true especially at the turn of the 1980s: between 1988 and 1993 structural funding went up from ECU[12] 6.4 bn to ECU 20.5 bn per annum, which boosted the share of Cohesion Policy funds in the EU budget from 16% to nearly 31%. In the years 1994-1999[13], structural funds spending continued to grow to ECU 32 bn annually, although its share in overall expenditure distribution remained at about 30% of the total EU budget.

The total structural funds and the Cohesion Fund budget of EUR 213 bn for the EU-15 for the years 2000-2006 and EUR 21.7 bn for the ten new member states between 2004-2006 accounted for approximately one third of the total EU budget and 0.4% of total EU GDP. 72% of structural funds spending was allocated to implementing measures under Objective 1.[14] Both in the 2000-2006 and in the 2007-2013 perspectives, the Cohesion Policy ranked second in terms of spending volume, after the Common Agricultural Policy. Funds allocated to the Cohesion Policy rose sharply between 2000 (EUR 27.5 bn) and 2014 (EUR 54.3 bn). Eventually, their share in the EU's overall budget reached ca. 38%.

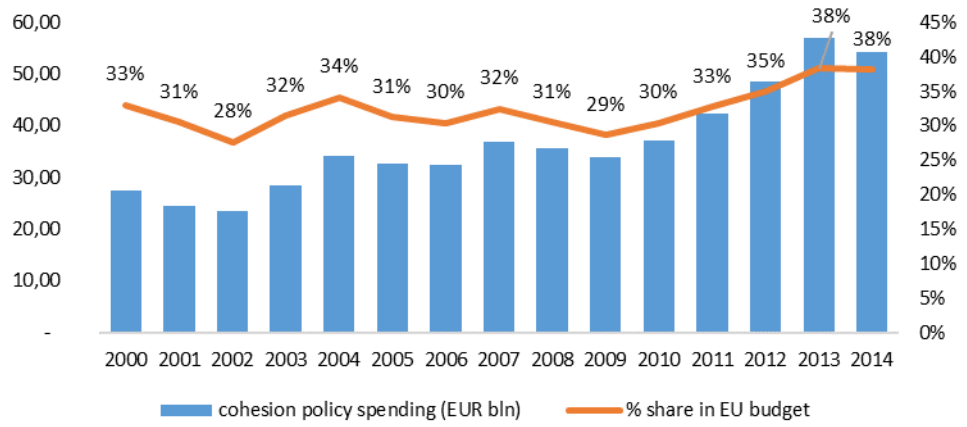
[11] The structure of budgets approved for successive programming periods differed also in terms of categories used for settlement. In general, structural funds and Cohesion Fund expenditure was classified as Cohesion Policy spending. The 2007-2013 financial perspective recognises the Cohesion Policy as a separate budget category under section 1.2 of the EU budget (Cohesion for growth and employment).

[12] ECU, or the European Currency Unit, was the former currency unit of the European Communities, from its adoption on 13 March 1979 to replacement by the euro on 1 January 1999, at a ratio of 1:1. (source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:European_currency_unit_(ECU))

[13] The 1988-1999 analysis does not include the Cohesion Fund.

[14] *Ewolucja celów polityki regionalnej Unii Europejskiej w procesie integracji gospodarczej* [Evolution of EU regional policy objectives in economic integration], in: Ewolucja celów polityki regionalnej Unii Europejskiej w procesie integracji gospodarczej [The evolution of regional policy objectives of the European Union in economic integration]

Figure 4. 2000-2014 Cohesion Policy spending

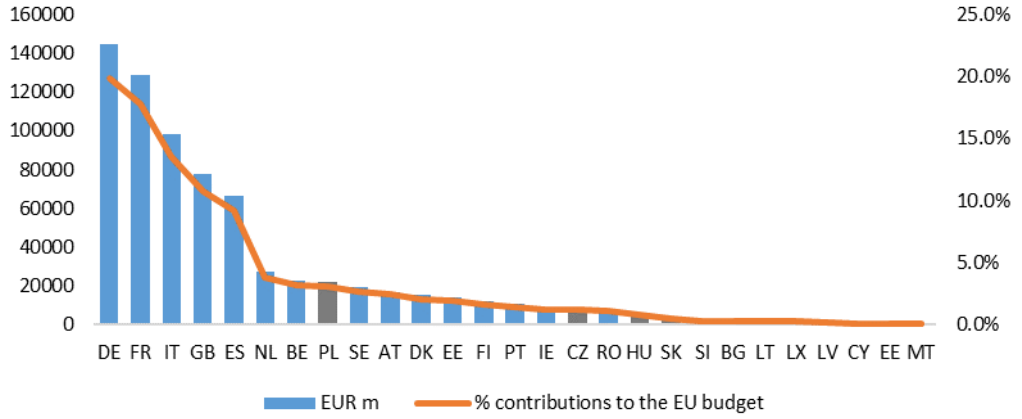


Source: Own elaboration based on European Commission's data (http://ec.europa.eu/budget/figures/interactive/index_en.cfm)

The 2014-2020 programming period anticipates an allocation of EUR 351.8 bn to European Structural and Investment Funds, which will secure the Cohesion Policy its second position in the EU budget in the volume of allocations. The overall scale of investment, combined with national contributions by member states and the leverage effect brought about by various financial instruments may potentially exceed EUR 500 bn.

The European Union budget is financed by member state contributions. In recent years, the brunt of the global budget was funded by contributions from seven member states. The following countries made the largest payments to the budget (listed from largest to smallest): Germany, France, Italy, The UK, Spain, the Netherlands and Belgium. Their contributions accounted for 3/4 of the total. Importantly, no significant differences between the 2004-2007 period and the 2007-2013 perspective were observed. In turn, contributions of V4 countries accounted for 5.7% of all contributions made in the years 2007-2014.

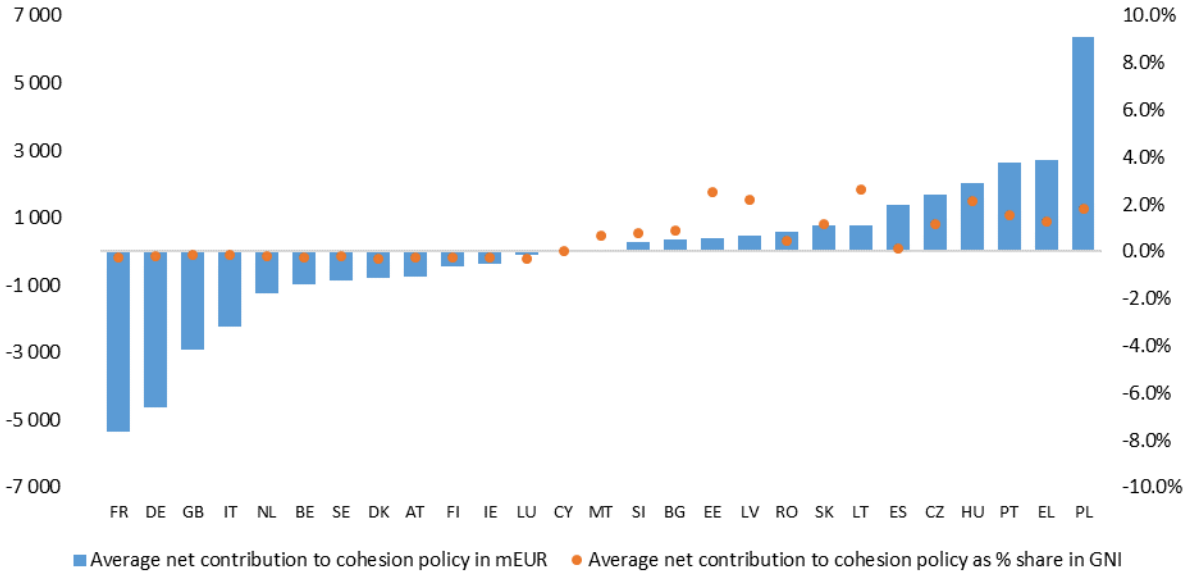
Figure 5. Total contributions to EU budget in 2007-2014



Source: Own elaboration based on European Commission's data (http://ec.europa.eu/budget/figures/interactive/index_en.cfm)

Between 2000 and 2006, support (in gross figures) was channelled mainly to Spain (EUR 56.3 bn), Germany (EUR 29.8 bn), Italy (EUR 29.6 bn), Greece (EUR 24.9 bn) and Portugal (EUR 22.8 bn). Most member states, including those which joined the EU in 2004, are net beneficiaries of EU aid. Net benefits form the Cohesion Policy alone varied considerably between member states. As expressed by the ratio of aid received to contributions made, the smaller new member states such as Lithuania, Latvia, Estonia and Bulgaria, derived the greatest benefits. In absolute value terms, Poland, Greece, Portugal, Spain and Hungary are among as the greatest (net) beneficiaries. Among the V4, Hungary received the highest share of aid in Gross National Income (GNI).

Figure 6. Average annual net Cohesion Policy contributors in 2007-2014



Source: Own elaboration based on European Commission's data (http://ec.europa.eu/budget/figures/interactive/index_en.cfm)

Ever since the V4 joined the European Union, most of their regions have been eligible for Cohesion Policy convergence objectives as their GDP is low in relation to the EU average. In the first programming period, most of the V4 regions (except for Közép-Magyarország and including Budapest, Prague and Bratislava) implemented Objective 1 ("to promote the development and structural adjustment of regions whose development is lagging behind"). This classification of regions in the V4 had substantial consequences for the amounts and the structure of financing in the implemented programmes.

In 2004-2006, the Czech Republic, Hungary, Poland and Slovakia received ca. 8 % of all ERDF, ESF and CF appropriations over the entire 7-year programming period. Poland received the highest share, i.e. over EUR 11 bn. The average amount of Cohesion Policy support was EUR 284 per V4 inhabitant.

Figure 7. ERDF, ESF and CF allocations in 2004-2006

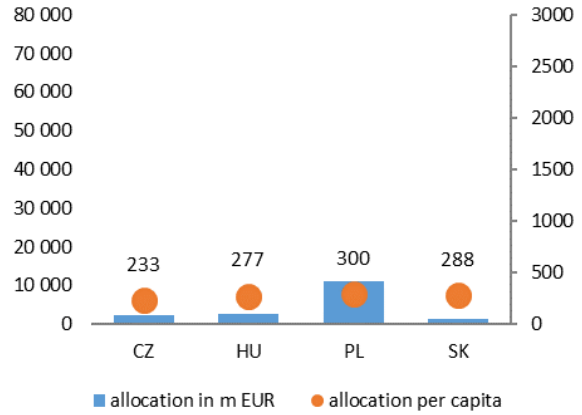
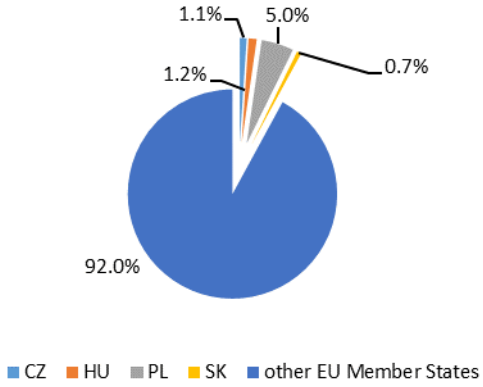


Figure 8. Share of V4 allocations in 2004-2006



Source: Own elaboration based on European Commission's data
http://ec.europa.eu/regional_Policy/archive/funds/procf/cf_pl.htm and
http://ec.europa.eu/regional_Policy/sources/docgener/evaluation/data/funds_commitment_2000_2006.xls

Between 2007 and 2013, the four V4 countries received as much as 20 % of Cohesion Policy allocations. In total, the Czech Republic, Hungary, Poland and Slovakia were granted EUR 117 bn in the entire programming period, with most funds coming from the European Regional Development Fund (ca. EUR 60 bn) and the Cohesion Fund (ca. EUR 40 bn) allocated to major environmental and transport investments. Per capita financing grew as much as 6.5 times, from EUR 284 to EUR 1,850.

Figure 9. ERDF, ESF and CF allocations in 2007-2013

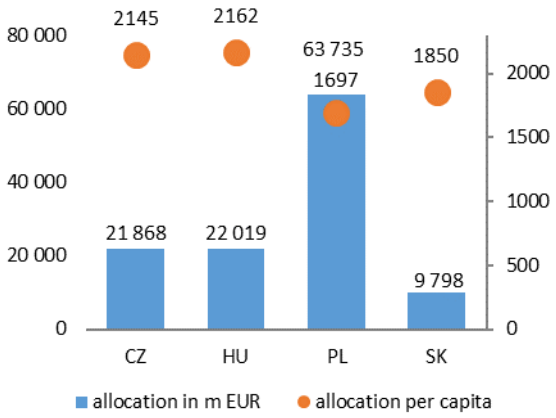
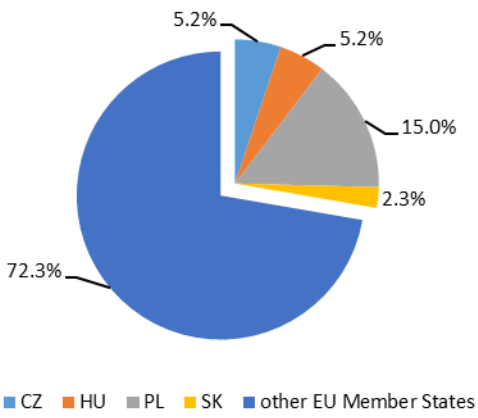


Figure 10. Share of V4 allocations in 2007-2013

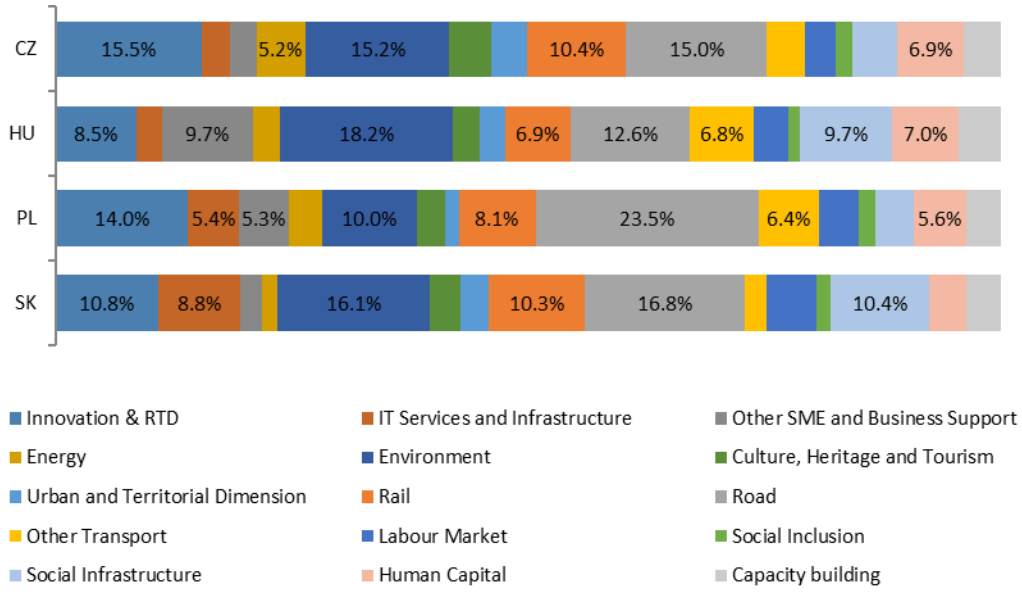


Source: Own elaboration based on European Commission's data
http://ec.europa.eu/regional_Policy/sources/docgener/evaluation/data/priority_theme_overview_2007_2013.xls

Each V4 country took a different approach in dividing available funds between specific intervention areas, with the largest amount allocated to developing transport infrastructure (mainly building roads,

especially in Poland), investing in environmental projects (particularly in Hungary and Slovakia) and innovations (key spending area in the Czech Republic).

Figure 11. Distribution of ERDF, ESF and CF allocations in 2007-2013



Source: Own elaboration based on European Commission's data

In the next 2014-2020 programming period, the V4 are granted EUR 130 bn, where the most is to be taken up by the European Regional Development Fund (nearly EUR 70 bn) and the Cohesion Fund (38 bn), with EUR 21.6 bn allocated to soft activities (ESF).

Figure 12. Allocation of ERDF, ESF and CF appropriations in 2014-2020

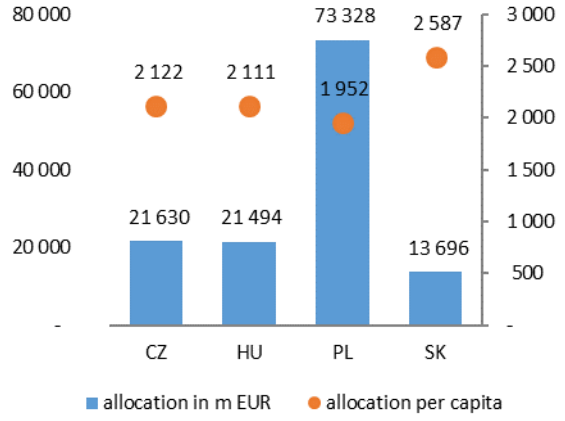
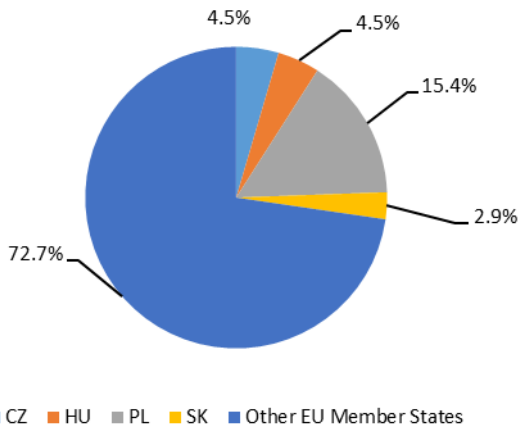


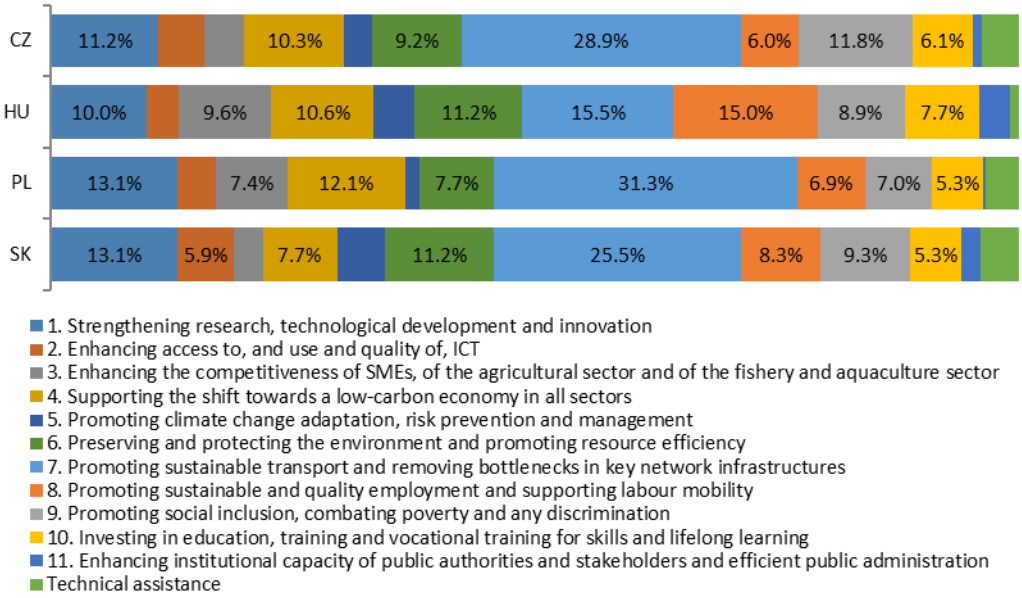
Figure 13. Share of appropriations allocated to V4 in 2014-2020



Source: Own elaboration based on European Commission's data.

The new financial perspective opened a new planning opportunity in key areas requiring support. Almost all V4 countries plan to invest the thrust of funds into developing sustainable transport, followed by environmental protection projects, technology development and social inclusion initiatives (fostering employment, education and combating poverty). Hungary was the only country to take a different approach to the other V4 countries. There, transport infrastructure investments will play a relatively smaller role than elsewhere in the V4. The support is almost evenly divided between environmental, social, infrastructural and technology investments.

Figure 14. ERDF, ESF and CF allocations in 2014-2020



Source: Own elaboration based on European Commission's data.

2.3 Impact of the intervention

The Cohesion Policy co-financed programmes have produced visible results which significantly match the expected impact of the interventions set out at the programming stage. Apart from direct impact arising from the implementation of single projects, the Cohesion Policy has given the V4 a development boost. The impact of the Cohesion Policy can be examined in two fundamental aspects.

Box 1. Findings from ex-post Cohesion Policy evaluations in 2007-2013

Ex post evaluations: thematic dimension

- **Entrepreneurship:** A meta-level study of interventions indicates that support to companies helped to modernise manufacturing processes and fuelled private investments, manufacturing and jobs in SMEs. In addition, new jobs were usually sustainable. Research suggests that investment subsidies largely helped to improve the competitive position of SMEs, and the financial instruments contributed even more to the business activity of beneficiaries. Additionally, ERDF was a catalyst in supporting SMEs' strategic investment plans, thus helping to strengthen profitability and exports.[15]
- **Transport:** CF and ERDF contributions were enablers for member states in upgrading or expanding their transport networks. By the end of 2013, 3,875 km of new roads were built and over 23,000 km were redeveloped. The figures for railways are 269 km and 3000 km, respectively. Nearly half of the roads and railways receiving Cohesion Policy support were part of the TEN-T. Furthermore, transport accessibility of previously peripheral EU regions (including the V4) visibly improved. The Cohesion Policy also stimulated improvements in the way transport interventions are prepared due to strategic planning required from each member state.[16]
- **Human capital:** ESF assistance fostered linking education to job market requirements and to open job opportunities, especially those available to young people. Such initiatives helped to provide nursery school services, facilitate access to new skills, and provide support to disadvantaged populations. R&D investments in research institutions help to improve mobility and to establish relations with other research institutions and businesses.[17] Some 19.6 mn people took part in projects facilitating job market access by the end of 2012. Of this group, 3.3 mn took up a job shortly after the project ended, close to half a mn gained new skills, and more than 42 thousand started their own business.
- **Environmental protection and energy:** In the 2007-2013 programming period, the recycling rate of waste increased, in particular in the EU-12. ERDF and Cohesion Fund projects improved drinking water supply for at least 4 mn EU citizens and contributed to better wastewater treatment for over 7 mn. Energy efficiency interventions helped to reduce energy consumption by ca. 2,904 GWh per annum and reduced greenhouse gas emissions by 1,454 kilo-tonnes per annum.[18]

[15] Support to SMEs – Increasing Research and Innovation in SMEs and SME Development. Work package 2 - Small and medium sized enterprises, innovation, ICT. In: Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), 2016.

[16] Transport. Work package 5. In: Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), 2016.

[17] Final summary report: Key ESF achievements, 2007-2013. ESF Expert Evaluation Network, 2014.

[18] These achievements are a progress reported in the 27 OPs focused on reducing energy consumption and the 20 OPs geared to reduce greenhouse gas emissions which are used as indicators to capture energy efficiency gains in public and residential buildings. For reference see: *Energy efficiency in public and residential buildings. Final Report Work Package 8*. In: Ex-post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).

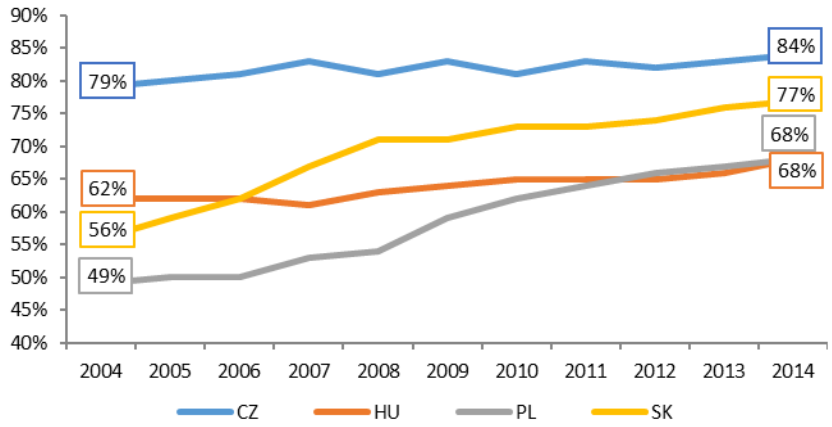
Ex post evaluations: the macroeconomic level

- The impact assessment of ESF, ERDF and CF funding for member states' economies relies on macroeconomic models which compare the observed GDP time series with an alternative scenario where Cohesion Policy interventions are excluded. The European Commission's simulations19 indicate a positive impact on GDP in the 2007-2015 period not only in member states that are far from the EU average but also in some EU-15 regions, including Portugal (1.8% per annum) or Greece (2.2%).20
- The Cohesion Policy impact on GDP is around 4% above the baseline scenario, with no account taken of medium- and long-term CP interventions for EU-12 member states. It is less significant for the EU-15, but the trend strengthens over time. A less significant impact on the EU-15 is a result of lower allocations relative to the size of their economies.

As seen in relative GDP measures, all the four countries have significantly reduced the lag behind the other EU member states. The gross domestic product adjusted for purchasing power parity relative to the EU average has grown in all V4 countries since they joined the Union. Slovakia witnessed the highest growth, where in 2014 the indicator was up by 21 percentage points on the 2004 figure, followed by Poland, with change of 19 %.21

The gradual convergence of the V4 with the development average in the EU is driven by many economic mechanisms. Amongst other factors, the opening of European markets to Czech, Hungarian, Polish and Slovakian companies coupled with the inflow of foreign direct investments, well on the rise post-2004, have played a vital role. However, the Cohesion Policy implemented by the V4 has also been essential for changes on the ground.

Figure 15. GDP Purchasing Power Standards per capita as percentage of the EU-28 average



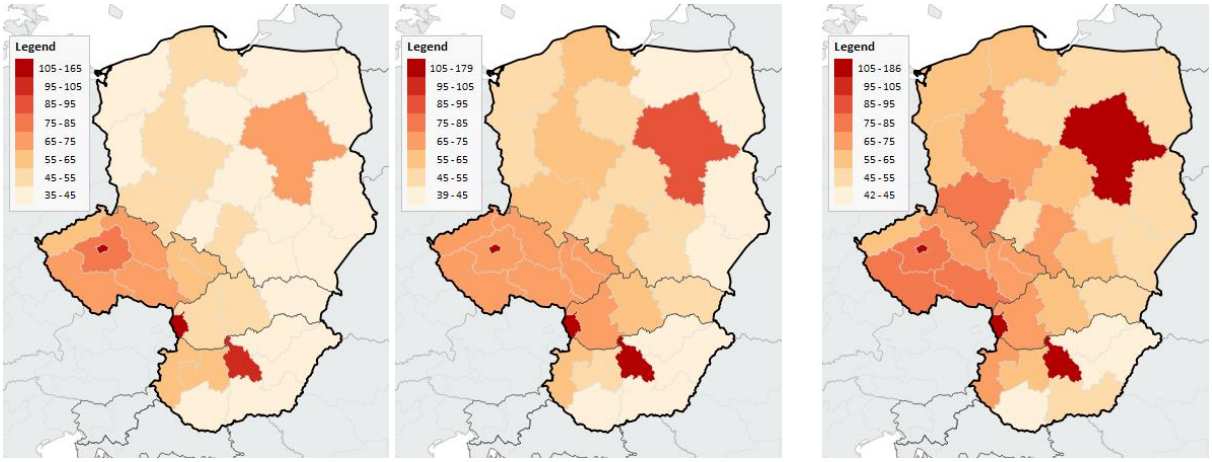
Source: Own elaboration based on Eurostat data [nama_10r_2gdp].

[19] Refers to the simulations run with Quest III, a model developed by the Directorate General for Economic and Financial Affairs of the European Commission.

[20] *The impact of Cohesion Policy 2007-2013: model simulations with Quest III. Final Report. Work Package 14a.* in: Ex-post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).

[21] The indicators benchmarked against 28 EU Member States (EU-28).

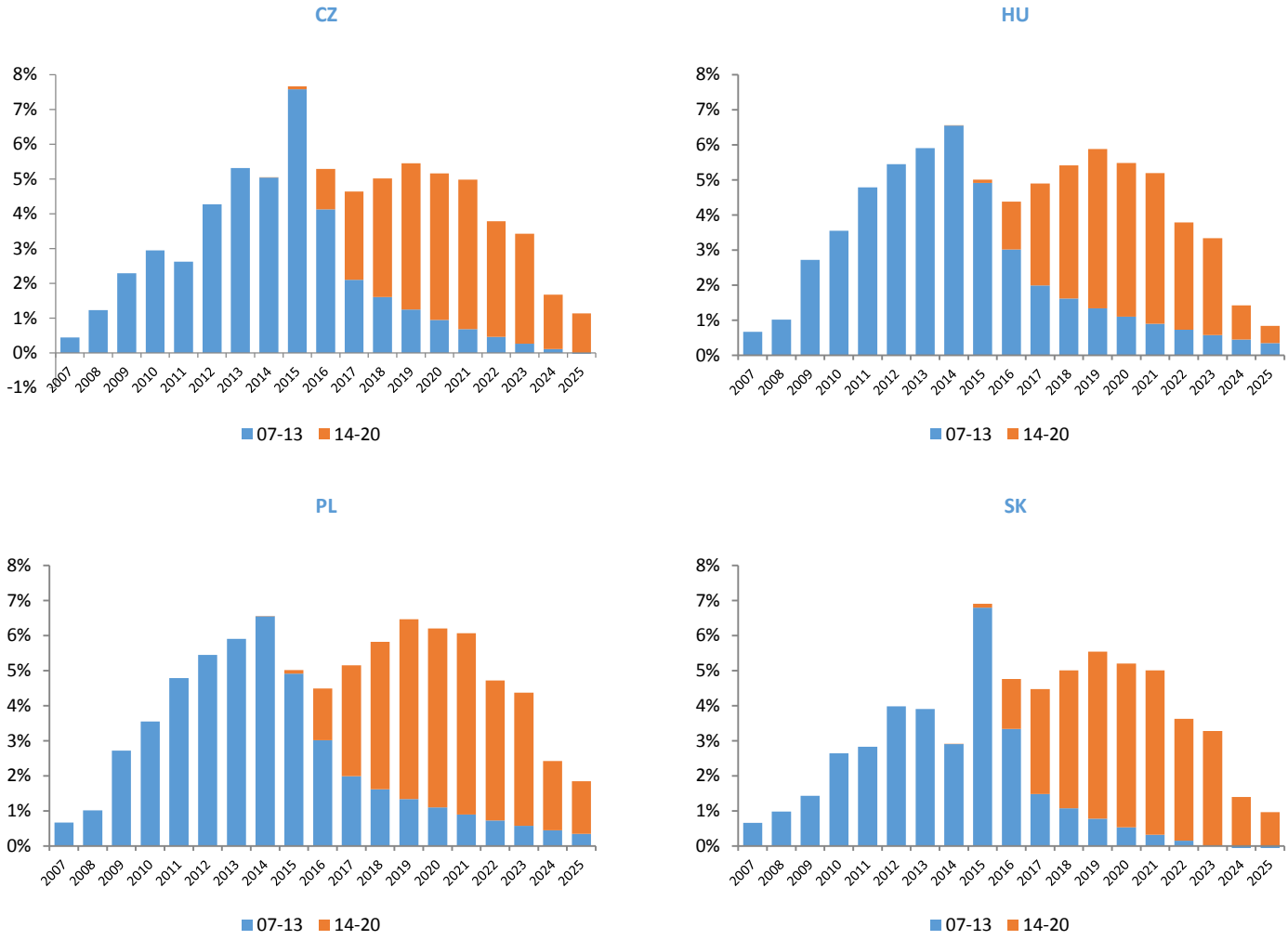
Map 1. V4 convergence towards EU average as % of GDP per capita



Source: Own elaboration based on Eurostat data.

To estimate the impact of the operational programmes in the 2007-2013 financial perspective and to forecast the influence of European structural and investment funds post-2014, the report uses the EUImpactMOD model adjusted (calibrated) to each V4 country profile. As per the simulation, by the end of effective spending under the 2007-2013 programming period (i.e. in 2014-2015), the GDP in the Czech Republic, Hungary, Poland and Slovakia was higher by ca. 6 % than it would have been under the no-support scenario from structural funds and the Cohesion Fund. Two sets of mechanisms underpinned this scale of impact. Firstly, each country's business environment was invigorated by the growth in aggregate demand induced by the implementation of projects co-financed by EU funds, e.g. in demand for building services or machinery and equipment procurements. Secondly, higher GDP was also driven by supply mechanisms, i.e. gradual increase in production capacity of their economies thanks to the impact of implemented projects.

Figure 16. Impact of Cohesion Policy on GDP in the V4 countries:
percentage deviations from baseline scenario (no spending from structural funds and Cohesion Fund)



Source: Own elaboration based on macroeconomic study.

It should come as no surprise that in the spending period the demand mechanism was the driving force. Demand was fuelled by an unprecedented scale of interventions from of funding programmes put to work under the Cohesion Policy, as the annual inflow of EU funds to V4 countries can be estimated at ca. 1.5-2.5 % of their GDP. This lever was very important during the financial crisis, as it helped mitigate its consequences, especially in Poland. However, it should be underlined that the supply-side impact of the interventions came to the fore gradually, accounting for ca. 25-40 % of the impact, depending on the country. This is visible in a study of the outcomes of a simulation conducted for 2016, the starting year for disbursements under the 2014-2020 programmes, when implementation of projects supported under the 2007-2013 financial perspective practically comes to an end. Putting the financial interventions in motion under the present programming period is necessary to maintain the impact of European funds at approx. 6-8 % (when set against the no-funds scenario). Although the positive supply

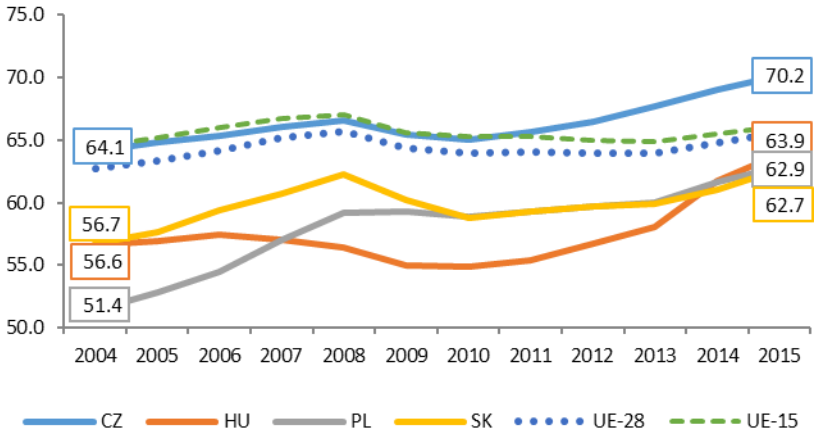
effects of the 2007-2013 programmes will still be noticeable in the years to come, the scale of financing post-2014 will be smaller than in previous years (especially in proportion to GDP).

This macroeconomic impact of interventions in the V4 is a reference point for the in-depth study presented below in the chapter which reviews how strengthened economic activity in the Czech Republic, Hungary, Poland and Slovakia has translated into benefits for the EU-15. As analysed further, GDP growth in the V4 translates into a considerable increase in imports of foreign goods and services mainly from the EU-15 – the main trade partners for the Czech Republic, Hungary, Poland and Slovakia.

Similarly to the GDP, the change in employment rate in the Czech Republic, Hungary, Poland and Slovakia in the period under review was affected by various factors related to the current economic climate and labour-market policies adopted by each country. However, EUImpactMOD simulations indicate that the implementation of Cohesion Policy operational programmes also contributed substantially to perceived changes. As estimated in this report, the structural funds and Cohesion Fund allocations rolled out in the V4 led to an increase in workforce by ca. 3-4 % at the final stage of programme implementation (i.e. in 2014-2015). The percentage deviation from the no-Cohesion-Policy scenario is lower than for GDP as project implementation (on the macroeconomic scale) translates into increased demand for labour, but also into greater productivity.

The employment growth rate in the 15-64 age group is also a good example of the changes occurring in V4 countries. In line with the European Employment Strategy, the active employment rate in the EU should reach 75 % by 2020. Upon their EU accession, this rate in V4 countries ranged from 51 % Poland to 64 % the Czech Republic. It grew significantly over the 10 years of Cohesion Policy implementation in all the reviewed countries, despite a temporary drop due to the economic crisis. The Czech Republic is the closest to the target value 2020, with 70 % of the population between 15 and 64 in active employment. Despite dynamic changes in recent years, the other countries (Hungary, Slovakia, Poland) still have a long distance to cover.

Figure 17. Employment rates 15-64

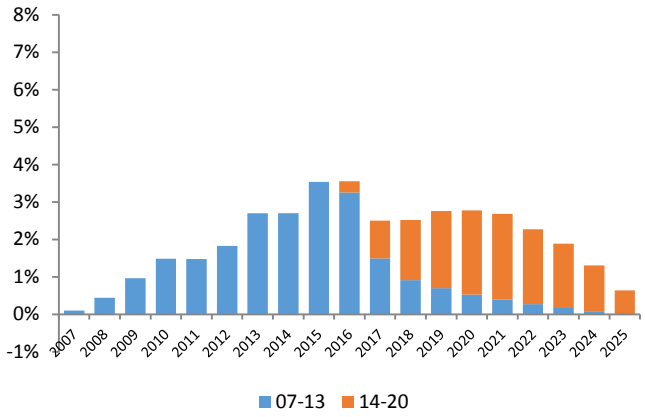


Source: Own calculations based on Eurostat's data [lfst_r_lfe2emprt].

Figure 18. Impact of Cohesion Policy on employment in the V4 countries: percentage deviations from baseline scenario

(no spending from structural funds and Cohesion Fund)

CZ



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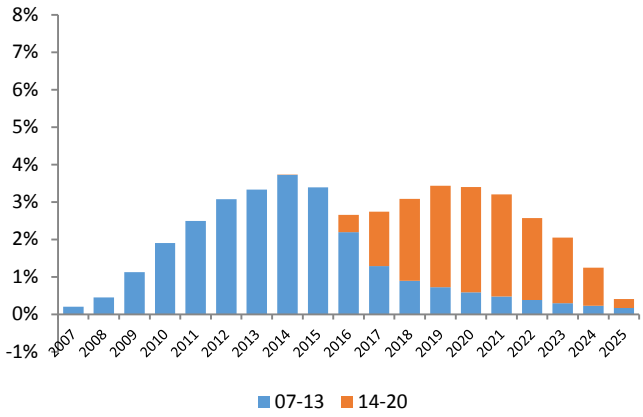

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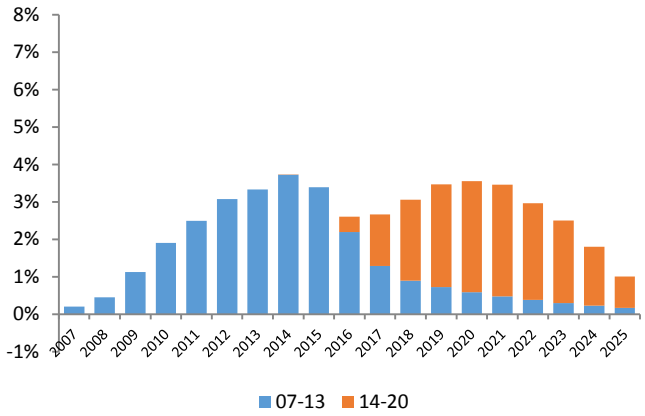

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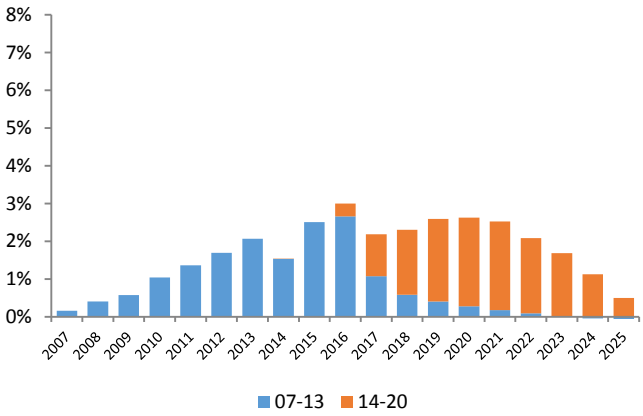


Source: Own elaboration based on macroeconomic study.

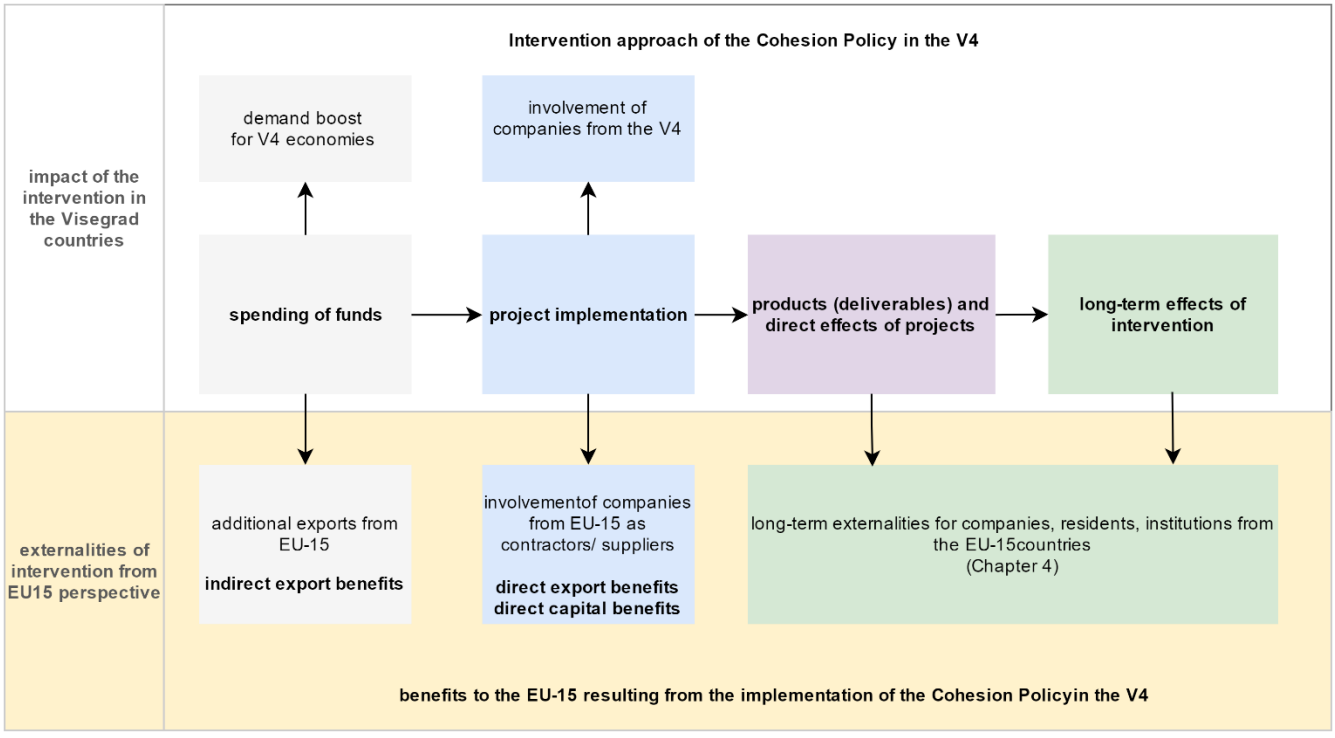
3 Economic benefits

3.1 Introduction

The description of Cohesion Policy's evolution and its implementation in the V4 presented above outlines the main elements of the intervention logic behind EU-funded operational programmes. Their primary objective has been to stimulate growth of relatively less well-developed areas in the European Union, including most regions in the V4. In recent years, the Cohesion Policy has also become one of the main funding sources for the Europe 2020 strategy which defined preferred development trends for the entire Union. Still, anticipated Cohesion Policy outcomes predominantly focus on regions and states to which the ESF, ERDF and CF appropriations are directly allocated.

Based on the above overview of study results, the Cohesion Policy may be said to have reached its objectives at least in part. Empirical studies point *inter alia* to a faster growth in regions where more European funds have been allocated, whereas macroeconomic simulations confirm a large positive contribution of European funds to GDP convergence in the V4 with the EU average, coupled with positive labour market changes leading to increased employment. The ex-post evaluation of 2007-2013 programmes, currently underway, shows that despite various implementation deficiencies there are no reasons to question the overall pertinence of the measures taken so far.

Scheme 2. Intervention logic and externalities of the Cohesion Policy.



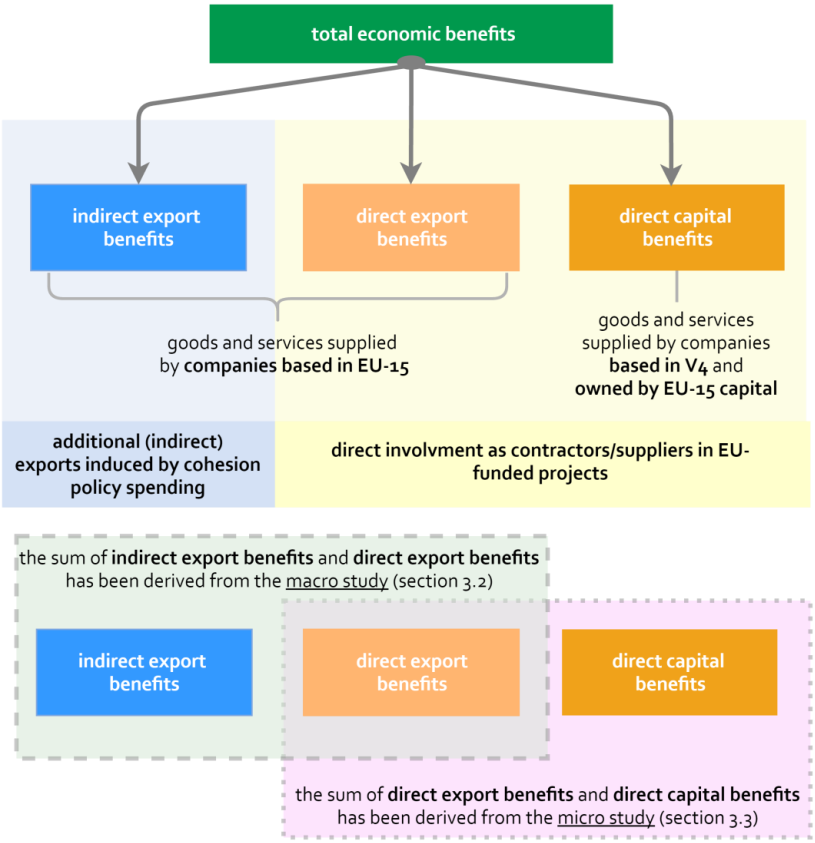
Source: Own elaboration.

This chapter describes the economic consequences of Cohesion Policy implementation in V4 countries from the perspective of EU-15 economies which, as evidenced below, reap tangible benefits thanks to the interventions implemented in the Czech Republic, Hungary, Poland and Slovakia. The economic benefits are broken down into three categories:

- **indirect export benefits**, i.e. exports from the EU-15 induced by the growth of aggregate demand in V4 countries as a result of Cohesion Policy interventions, excluding direct involvement of EU-15-based or EU-15-owned companies in project implementation;
- **direct export benefits**, i.e. benefits derived from direct involvement of EU-15-based companies as contractors or suppliers in EU-funded projects in the V4;
- **direct capital benefits**, i.e. benefits resulting from contracts related to EU-funded projects in the V4 awarded to local companies with a majority equity stake held by EU-15 based capital groups.

A combination of indirect and direct export benefits and direct capital benefits leads to an estimate of **total economic benefits** to the EU-15 drawn from implementing the Cohesion Policy in the V4. When interpreting the results of this assessment, a note should be taken of the fact that all three aforementioned channels of impact are beneficial to both the EU-15 and the V4. In the EU-15, who are mostly net EU-budget contributors, the Cohesion Policy in the V4 translates into additional exports and capital benefits. In the V4, global Cohesion Policy-funded public interventions have a pro-development impact on the four countries' economies.

Scheme 3. Typology of economic benefits.



Source: Own elaboration

3.2 Macroeconomic study: indirect and direct export benefits

The objective of the macroeconomic study was to estimate the total value of export benefits to EU-15 countries drawn from Cohesion Policy implementation in the Visegrad countries. The benefits are defined as those derived from additional EU-15 exports to the V4 generated by increased demand for goods and services produced in the EU-15. In other words, this report attempts to assess to what extent Cohesion Policy implementation in the V4 translates into increased EU-15 exports, as such an increase is identified as a benefit to EU-15 countries. The analysis is based on the outcome of simulations of Cohesion Policy impact on the V4 economies conducted by means of a general equilibrium model calibrated for the purposes of this assessment and supplemented by highly detailed secondary data such as input-output tables or the sectorial structure of international trade in goods and services (see Box 2).

The investigation presented below attempts to estimate the total value of export benefits, i.e. the combined value of indirect and direct export benefits. When interpreting these results, it is worth noting that a separate determination of value in the latter category of benefits (i.e. excluding indirect export benefits) is included in the micro study.

The examination of export benefits covers Cohesion Policy implementation in 2007-2020, thus encompassing the 2007-2013 and 2014-2020 financial perspectives. As structural fund payments can be made during 3 years following the end of the programming period[22], the scope of the study is extended to 2025 to take stock of the delayed impact of the 2014-2020 programming period, i.e. after the definitive end of the spending cycle. The impact of spending is calculated separately for both programming periods as they differ in intervention size and structure. Apart from the timescale and the organisational dimension, a sectorial analysis was also applied to the additional EU-15 exports generated and flowing to V4 countries. For each of the EU-15 Member States, exports are broken down by sector, as defined in the European NACE 2.0 classification (double-digit industry codes).[23] The investigation also uses European classifications of manufacturing industries by degree of technological advancement and of service sectors by knowledge intensity.

[22] According to the n+3 rule

[23] Few exceptions include closely-related industries combined into groups: manufacturing of food products, non-alcoholic beverages, alcoholic beverages and tobacco products (NACE codes 10-12); manufacturing of textiles, textile products, leather and related products (codes 13-15); manufacturing of furniture and manufacturing n.e.c. (codes 31-32); motion picture, video and television programme activities and programming and broadcasting (codes 59-60); telecommunications and information services (62-63); legal and accounting and activities of head offices and management consultancy (69-70); veterinary activities and professional, scientific and technical activities (64-65); security and investigation, services to buildings, landscaping and office administration, office support and other business support activities (80-82); non live-in home care and social work (87-88); arts, entertainment and recreation (section R, 90-93).

Box 2. Macroeconomic study: methodology

The aim of the macroeconomic study is to estimate the value of additional EU-15 exports to the Visegrad countries as a result of Cohesion Policy implementation in the V4. It is split into multiple stages and is fleshed out by outcomes of the simulations run using the EUImpactMOD macroeconomic model and secondary data coming from Eurostat, OECD and European Commission databases.

Scheme 2. Sequence of macroeconomic study assessments

The following sequence has been adopted:

- In step one, the value of additional GDP generated thanks to Cohesion Policy implementation in each V4 country was calculated, as per consecutive programming period. [24]
- In step two, the value of additional consumer and investment expenditure imports was estimated. The enquiries were conducted on the basis of import intensity coefficients and results of the previous steps, i.e. estimated additional GDP in V4 countries, broken down by industry.
- Also, the global output of V4 economies based on national input-output tables was calculated. The global product is defined as the sum of the final product (GDP) and intermediate consumption.
- In the macroeconomic study, it serves as the basis for calculating manufacturing imports, i.e. expenditure on goods and services used by V4-based economic entities at every stage of their manufacturing processes. The sum of additional consumer, investment expenditure and manufacturing imports equals total additional V4 imports from EU-15 countries (i.e. the total additional exports from EU-15 countries to the V4).
- Subsequently, the additional V4 imports from the EU-15 are split by each EU-15 member state. To avoid systematic errors due to insufficiently detailed data, the calculations were run for each economic sector of the V4 included in the study. To this end, an original database was used to show foreign trade patterns, which has been assembled from detailed OECD and Eurostat data on trade in goods and services.
- Finally, the product was aggregated along the time, space and industry axes that are relevant to this investigation. In particular, the European classification of industrial processing sectors by degree of technological advancement was applied together with the European classification of service sectors as per their degree of knowledge involvement.

Source: Own elaboration.

[24] Simulations of the 2007-2013 programming period are based on actual data on EU-funds absorption, which covers the time until 2015. The 2014-2020 simulations are based on a forecast of annual EU-funds absorption into 2023.

In light of the macroeconomic study results, Cohesion Policy implementation in the Visegrad countries led to a measurable and considerable increase in demand for goods and services, in particular those produced in the EU-15. In 2007-2015, additional exports from the EU-15 to the V4 induced by the 2007-2013 financial perspective programmes totalled EUR 88.5 bn.[25] The largest increase was noted in the last two years of disbursements triggered by the closed programming period – in 2014 and 2015; 36% of total export benefits to EU-15 countries concentrated in those two years. However, the impact of the Cohesion Policy does not stop with the disbursements. By 2025, the Cohesion Policy of the previous programming period should increase EU-15 exports by another EUR 31.3 bn.

Table 2. Overall export benefits to the EU-15 due to Cohesion Policy implementation in the V4

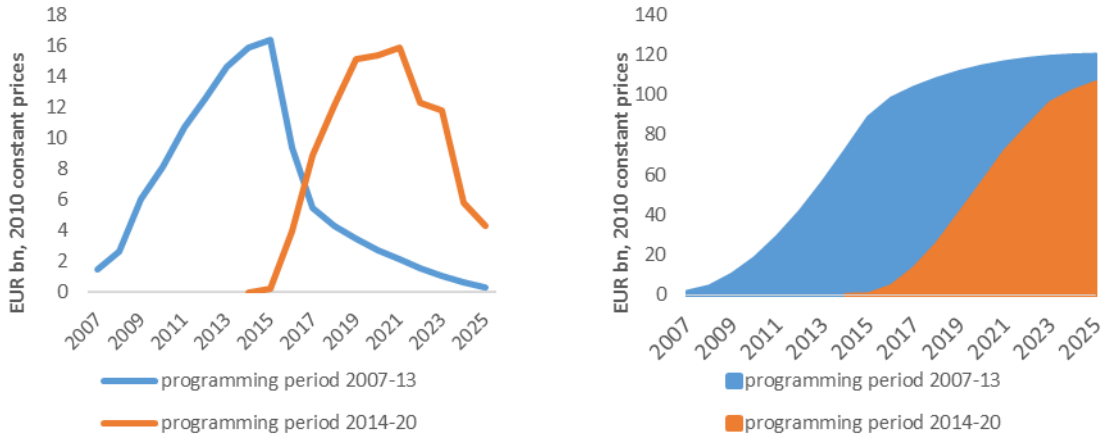
	2007-2013 programming period				2014-2020 programming period				total	
	2007-2015		2016-2025		2007-2015		2016-2025			
	EUR mn	%	EUR mn	%	EUR mn	%	EUR mn	%	EUR mn	%
Czech Republic	19180	22%	7770	25%	53	19%	20395	19%	47397	21%
Hungary	15524	18%	1999	6%	45	16%	15035	14%	32603	14%
Poland	46124	52%	19054	61%	144	52%	58768	56%	124090	55%
Slovakia	7707	9%	2470	8%	34	12%	11479	11%	21690	10%
V4 total	**88535**	**100%**	**31293**	**100%**	**276**	**100%**	**105676**	**100%**	**225780**	**100%**

Source: Own elaboration based on macroeconomic study results.

The lag effect of the previous programming period will overlap with the positive impact of Cohesion Policy implementation under the 2014-2020 financial perspective. In addition, the actual spending of funds in the present programming period is going to last until 2023 and the positive macroeconomic impact is likely to last even longer. In 2014-2025, the Cohesion Policy under the new programming period will increase EU-15 exports to the Visegrad countries by additional EUR 106 bn. Out of this amount, only 55.9 bn will be spent by 2020. The total additional exports over the 2007-2025 period resulting from Cohesion Policy implementation in the V4 under the two successive EU framework budgets will amount to EUR 225.8 bn (ca. EUR 11.9 bn per year).

[25] All data are expressed in EUR, in constant 2010 prices.

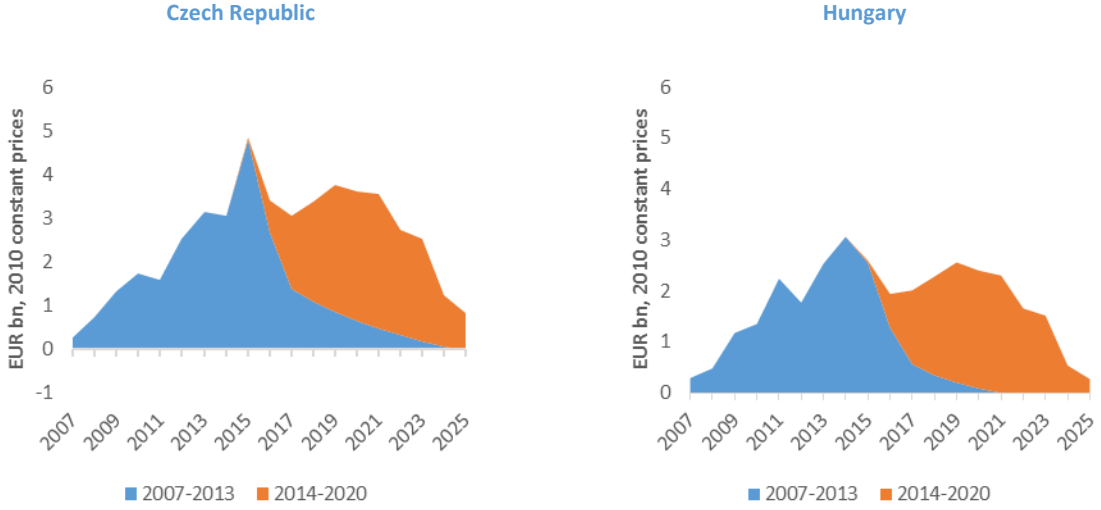
Figure 19. Additional annual EU-15 exports to V4 countries due to Cohesion Policy implementation in the V4 (left) and total additional exports (right)

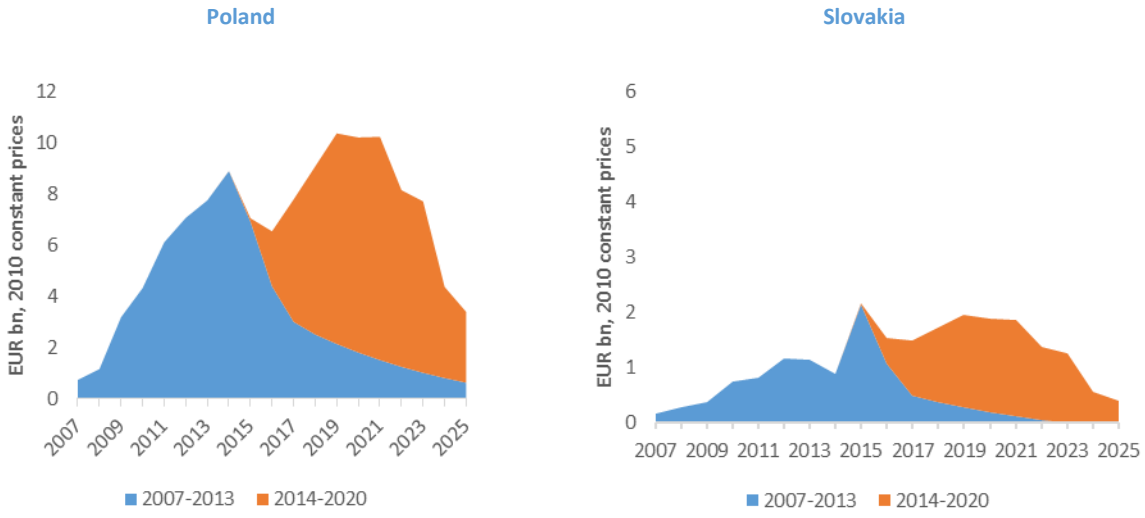


Source: Own elaboration.

The benefits reaped by the EU-15 result mainly from Cohesion Policy implementation in Poland, which accounts for 52% of the additional EU-15 exports generated in 2007-2015. Poland's share is expected to grow to 57% in 2016-2025 once the delayed impact of the funds spent in 2007-2015 is taken into account. The share of the remaining Visegrad countries, given their smaller contribution to the region's GDP and to the aggregate imports of the Visegrad Group is proportionally smaller: in the Czech Republic it stands at 22% of the additional EU-15 exports thus far, and Hungary's contribution to the additional EU-15 exports is 18%. Cohesion Policy implementation in Slovakia accounts for 9% of the additional EU-15 exports in 2007-2015.

Figure 20. EU-15's additional exports thanks to Cohesion Policy implementation in the V4





Source: Own elaboration.

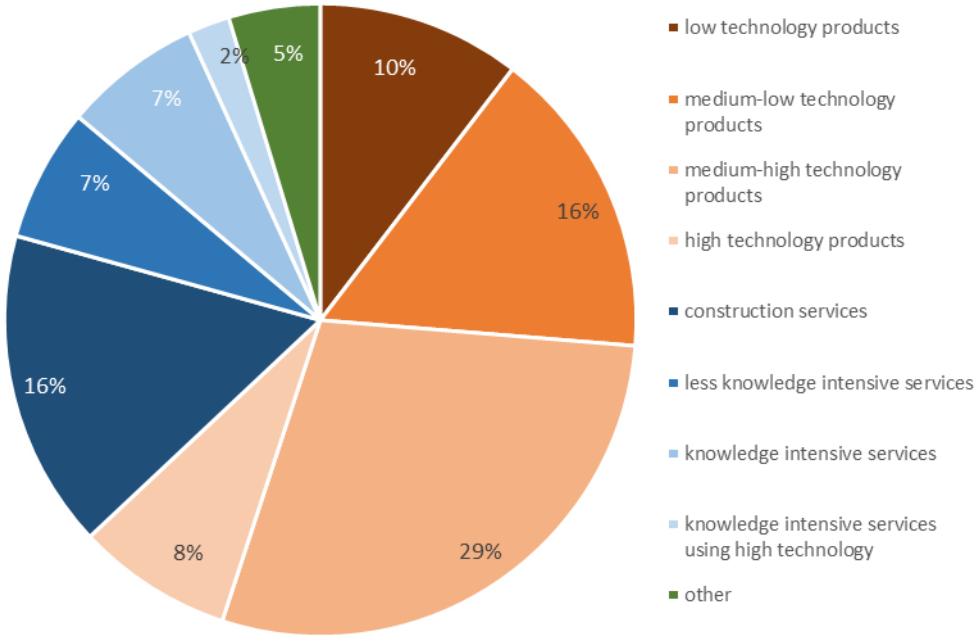
The global analysis of benefits to the EU-15 stemming from Cohesion Policy implementation in the Visegrad countries calls for taking into account their sectorial structure, and consequently for specifying which industries (both in manufacturing and services) dominate the additional trade flows from the EU-15 and the V4. This is enabled by the high degree of detail in the data used in the study.

There are three reasons for focusing on the sectorial structure of the additional EU-15 exports. First, increased demand for specific goods and services is in itself a growth factor for such industries in the exporting countries. Companies may respond by raising productivity or spending more on their factors of production (more jobs or fixed asset investments). Secondly, the sectorial structure of the additional EU-15 exports may differ from that of total exports. If that is the case, Cohesion Policy implementation in the V4 contributed to changing the relative weight of individual industries in the economic mix of V4's main trade partners (i.e. the EU-15) – most likely due to relocating the factors of production (i.e. migration of labour and increased investment in industries benefiting the Cohesion Policy in the V4). Thirdly, the sectorial breakdown of the additional V4 imports may differ from the structural breakdown of total imports. Thus, it is more likely that some trade partners are favoured over others and, consequently, the geographical structure of V4 trade is altered.

The structural breakdown of EU-15's additional exports is dominated by industrial products. Two types of exports make up ca. 60% of the entire estimated figure: products with average technology input (known as medium-high and medium-low technology industries) and construction services. This general structure remains stable over time. This indicates that differences in the intervention structure of Cohesion Funds are too small to significantly affect the structure of V4 countries' additional imports associated with the disbursement of EU funds. As for medium-high technology products, the two largest sectors are machinery and equipment (18% of total additional exports) and transport equipment – both motor vehicles and other vehicles (mainly rolling stock). These two industries account for 7-8% of the additional exports. The share of chemical products (also within this category) is much lower (2.6%). The medium-low technology products whose exports to V4 countries was boosted by Cohesion Policy

implementation are mainly parent metals and fabricated metal products (6%) and petrochemicals (5%). In technology products (8% of the total), the additional exports chiefly include electronics, optical equipment and computers (7.7%). In this context, non-construction services play a secondary role (16% of the total additional exports); the largest share is attributable to IT, telecommunications, architectural and engineering services (4% in total).

Figure 21. EU-15 additional exports to the Visegrad countries due to the implementation of the cohesion policy in the V4 countries broken down by main groupings of sectors[26]



Source: Own elaboration.

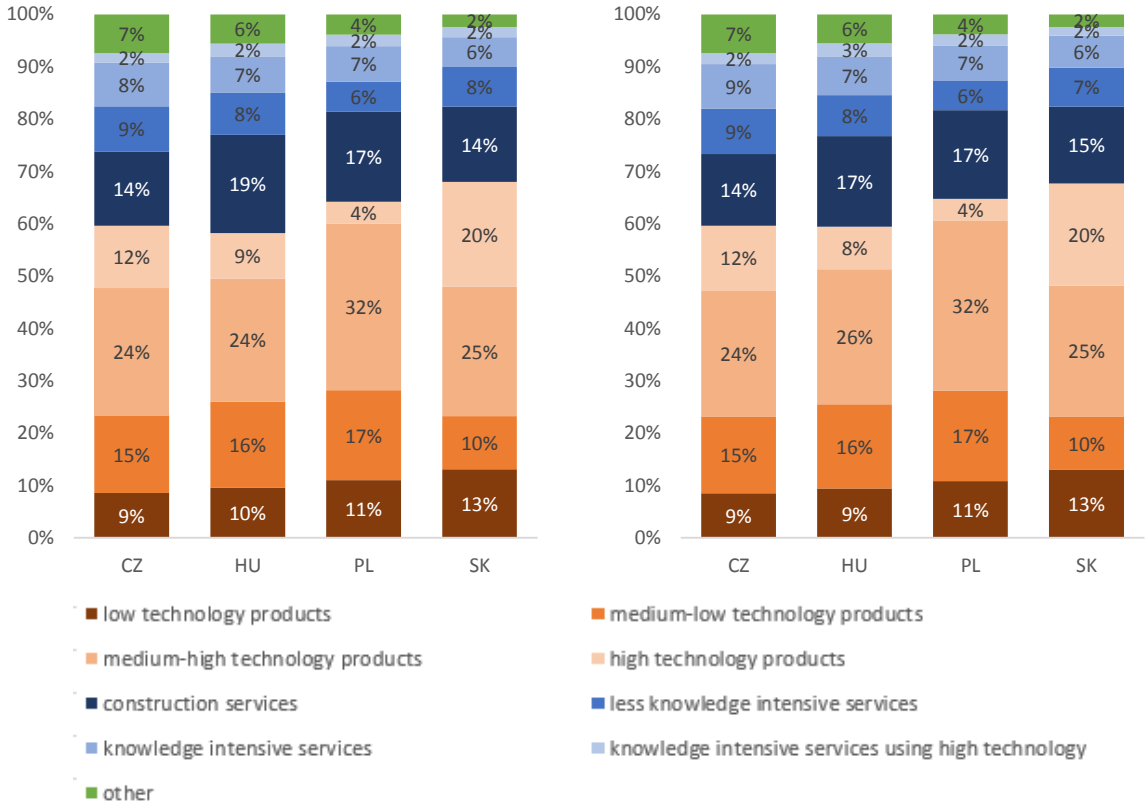
The sectorial break-down of additional EU-15 exports to the Visegrad Group varies in each of the V4. Despite the general pattern remaining the same, in extreme cases shares of industries may differ by up to several percentage points.

- The Czech Republic has the largest share of services (33%). Also, commodities, agricultural products and electrical energy are relatively well present in this mix (*other* category in the chart – 7%). The share of high technology manufacturing (8%) is higher than the average for the entire V4, while medium and low tech industries are in a relatively restricted area (47%).
- The break-down of additional exports to Hungary is the closest to the global V4 average. In particular, Hungary has a lower share of natural and agricultural commodities (6%) and a larger of medium and low tech products (51%) than the Czech Republic.

[26] The *other* category includes agricultural products and electrical energy.

- Additional exports to Poland are in medium tech products, but the share of high tech products in additional imports from the EU-15 is the lowest of all V4 countries at just 4%. Imports of non-construction services are also relatively small (14%).
- In the case of Slovakia, the predominance of trade in goods becomes even clearer (68%). Goods exported to Slovakia are mainly in the high tech category (20%), with a relatively small share of medium-low technology products (10%).

Figure 22. EU-15 additional exports to the Visegrad countries due to the implementation of the cohesion policy in the V4 countries broken down by main groupings of sectors, 2007-2015 (left panel) and 2016-2025 (right panel).



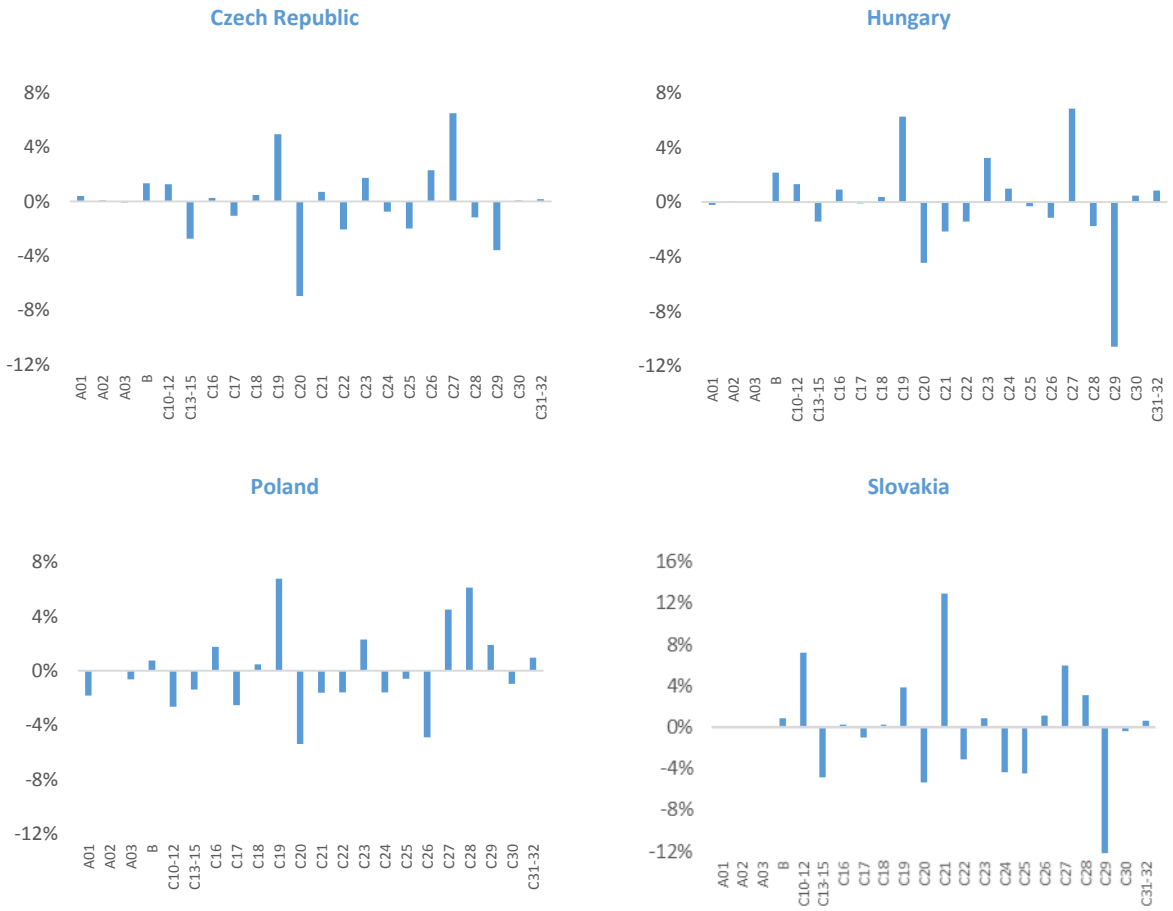
Source: Own elaboration.

As can be easily seen, the structure of additional EU-15 exports to the V4 varies considerably from the structure of global trade between these two groups of countries. A relatively larger share of construction services and lower share of food and commodities are notable. This is corroborated by detailed data investigation showing the structure of total and additional exports, as shown in the figure below.[27] Firstly, it confirms that the share of agricultural crops and food products in the additional imports is lower in each V4 country than in the total commodities imports from the EU-15. Secondly, the share of

[27] For greater clarity, the charts illustrate A01 industries (agriculture, forestry and fishing) through C32 (manufacturing n.e.c.). For reference, see: http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=ACT_OTH_CLS_DLD&StrNom=CL_NACE2&StrFormat=HTML&StrLanguageCode=EN

low tech industries is generally lower in imports attributable to Cohesion Policy implementation. However, there are exceptions to this rule – e.g. imports of wood products by Poland, the Czech Republic and Hungary. Thirdly, medium technology industries are vastly diverse. Although in all four Visegrad countries imports driven by Cohesion Policy implementation consist in a proportionally larger part of petrochemicals, other chemical products have a much greater part in regular imports than in additional imports. A significant share of machinery and equipment is reflected in import mix comparisons – the share of such sectors is notably higher for the additional imports than for regular imports from the EU-15 (by as much as 10 % in the case of Poland). Interestingly, this does not apply to high tech products such as computers, optical and electronic devices or pharmaceuticals.

Figure 23. Break-down of the additional EU-15 exports to the V4 against EU-15 total exports to the V4, 2007-2025

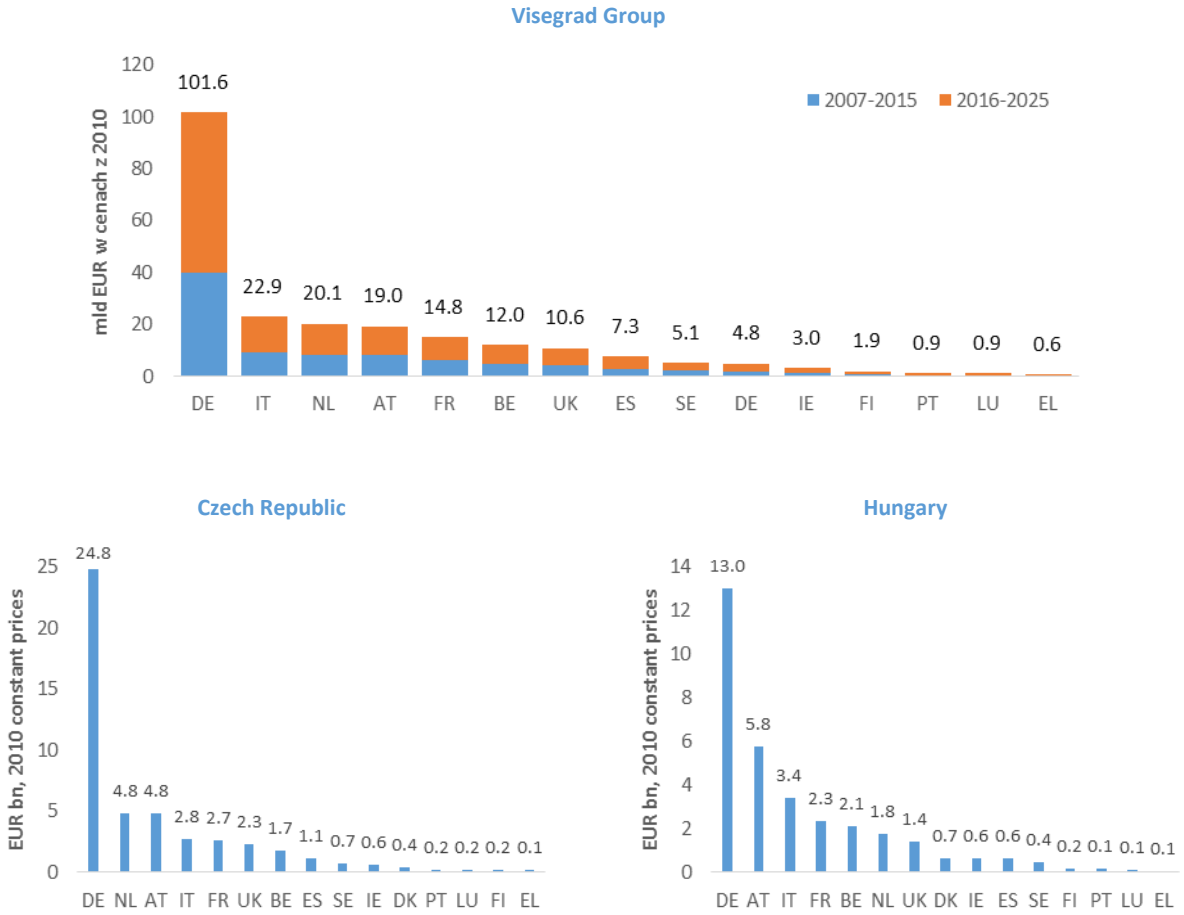


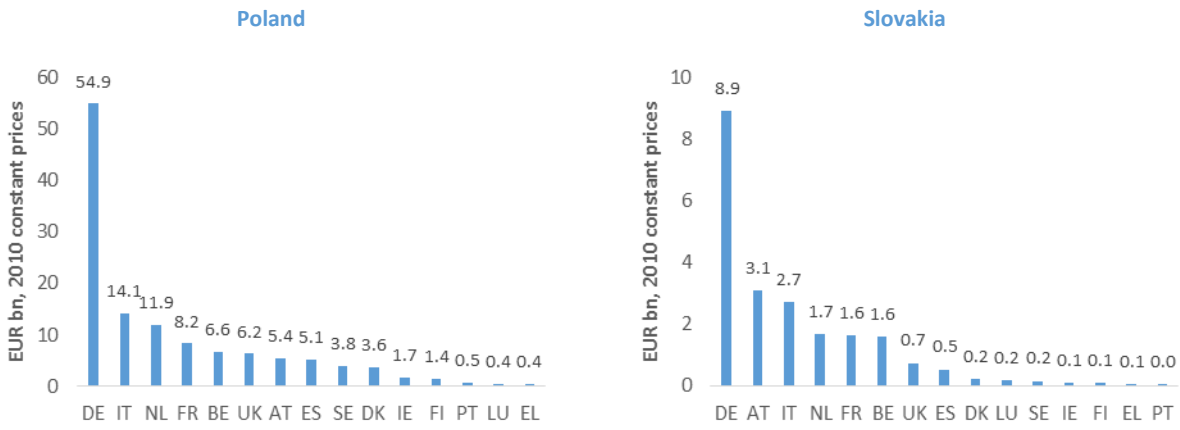
Source: Own elaboration based on macroeconomic study results and OECD STAN data.
Note: negative values indicate a lower share of an industry in additional exports (on average for the entire spending period in both programming periods) than in total exports (data for 2014); positive values point to a proportionally higher share.

Such a shift in the structure of additional EU-15 exports against total exports from the EU-15 to the V4 is a consequence of the structure of Cohesion Policy interventions. A large portion of infrastructural projects and business investments (with generous support in the 2007-2013 programming period) prompted demand for construction services (e.g. building and upgrading plants or warehouses). Furthermore, the bias in the additional EU-15 exports mix towards machinery and equipment should be attributed to investment demand. On the other hand, such projects stimulated demand for food or textile products to a lesser extent. In general, demand for those products is driven by household consumption rather than capital expenditure.

The geographical aspect of the impact of Cohesion Policy implementation in V4 countries is substantial, and not merely because an assessment is needed in order to verify how the export benefits are distributed among EU-15 member states. This also allows for an estimate of the relative benefits achieved in each EU-15 country (i.e. relative to actual and forecasted gross domestic product). Finally, discrepancies in the geographical structure of the additional exports and the regular (total) export mix from the EU-15 to the V4 can serve to illustrate whether the Cohesion Policy stimulates some trade flows.

Figure 24. Additional EU-15 exports to the V4 due to Cohesion Policy implementation in the V4; dynamic (left) and spatial (middle and bottom) perspectives



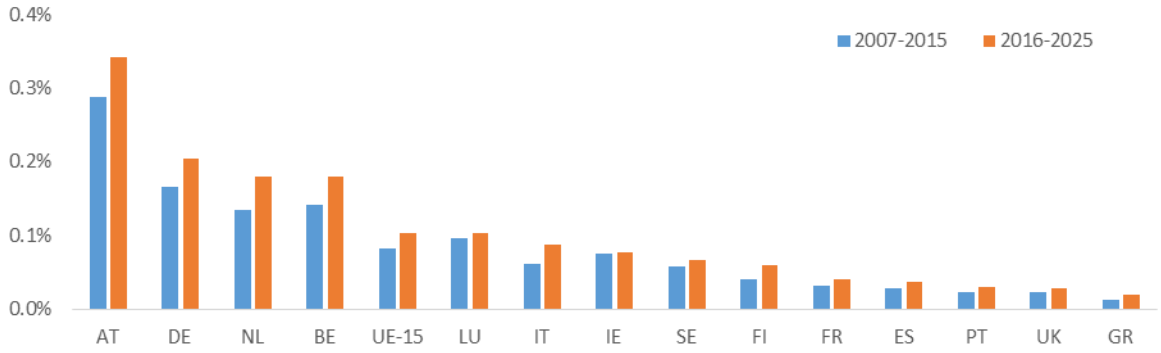


Source: Own elaboration.

Of the whole EU-15 group, the largest additional export flows to the Visegrad countries originate from Germany (since Germany is the largest trade partner for the V4). In 2007-2025, Germany's total additional exports to the V4 due to Cohesion Policy implementation in the V4 will have reached EUR 101.6 bn. Out of this amount, 39% is realised in 2007-2015, and the remaining 61% is due to occur in 2016-2015. In terms of total benefits, Italy comes second (EUR 22.9 bn), followed by the Netherlands (EUR 20.1 bn), Austria (EUR 19 bn), France (EUR 14.8 bn), Belgium (EUR 12.0) and the United Kingdom (EUR 10.6 bn). The other EU-15 countries gained less than EUR 10 bn in total from Cohesion Policy implementation in the Visegrad countries. The benefits to the EU-15 are quite strongly concentrated – the first six member states generate nearly 85% of EU-15's additional exports to the V4.

As EU-15 economies vary in size, it is worth relating the estimated additional exports to the GDP of each pre-2004 member state to see an approximate impact of the Cohesion Policy implemented in the V4 on all the economies of the EU-15. In relative terms, Austria benefited the most from Cohesion Policy implementation in the Visegrad countries, with average gains of 0,25% GDP per year. Next up is Germany, the largest beneficiary in absolute terms; however, its relative benefits are smaller than in Austria: they do not exceed 0.2% per annum. Additional exports to the V4 exceed the EU average of 0.1% also in Belgium and the Netherlands. France and Italy, other large beneficiaries of Cohesion Policy implementation in V4 countries gain relatively smaller benefits in absolute terms. On the other side of the spectrum, there are states whose additional Cohesion Policy-generated exports to the Visegrad countries are relatively low when set against their GDP. This is true i.a. for the United Kingdom, Spain, Portugal and Greece. The explanation is in the nature and scale of their trade relations with the Visegrad countries. Hence, the amount of benefits accrued by the EU-15 is largely consistent with forecasts made with the use of gravity models, i.e. ones linking trade volume and the GDP of trade partners with the distance between them (hence the predominance of Austria). Yet, this is not the complete explanation. Apart from the strength of the existing trade links, there is also something to be said for the sectorial mix of such ties and the specialisation of EU-15 economies as suppliers and service providers to the V4. Since Cohesion Policy implementation stimulates demand for plant, machinery and for computers and electronic equipment (to a greater extent than it would arise from the mix of general imports), suppliers specialising in goods of this type such as Austria, Germany or Italy enjoy a natural preference.

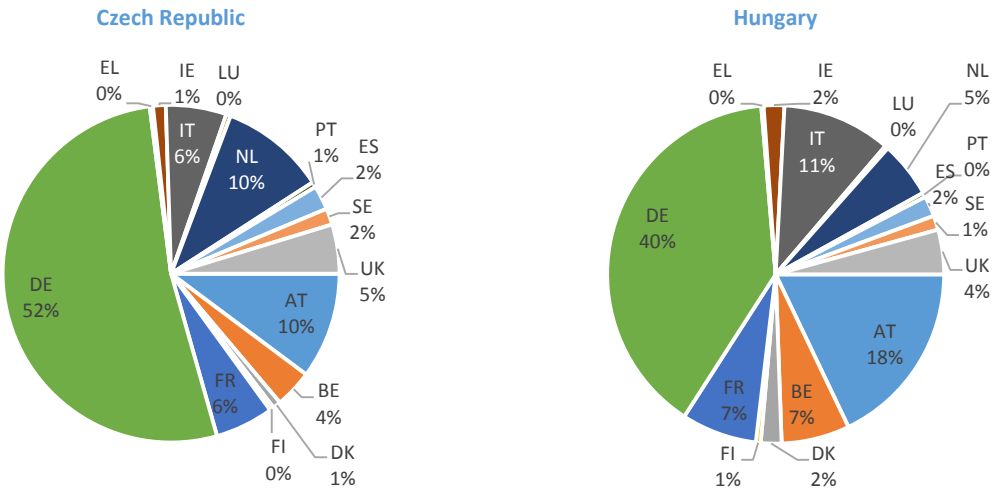
Figure 25. EU-15 total additional exports to the V4 due to Cohesion Policy implementation in the V4, by EU-15 member state, indexed against the GDP of each EU-15 economy

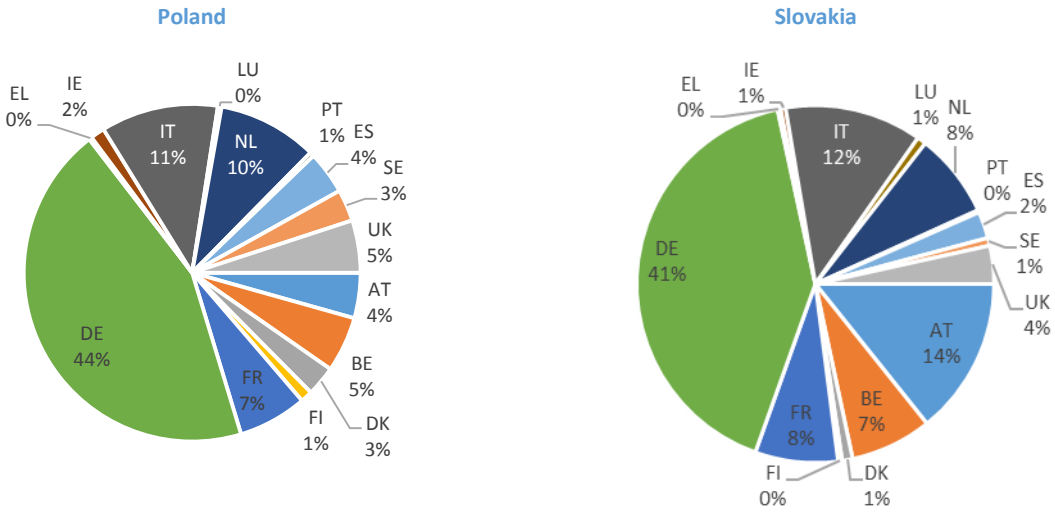


Source: Own elaboration.

The geographical structure of the additional EU-15 exports varies across V4 countries. However, these differences are not remarkably large and the hierarchy of Cohesion Policy beneficiaries in the V4 is similar in each post-2004 member state. Germany comes to the fore in the structure of additional exports – its share ranges from 40% in Hungary to 52% in the Czech Republic. Italy comes second in Poland (11%), whereas Austria has the second largest share in Slovakia, the Czech Republic and Hungary (18% 10% and 10%, respectively). Unlike in these three countries, in Poland the share of Austria's additional exports is significantly lower (4%) and does not differ much from the share of imports from the UK or Belgium (5% each), for instance. As for the share in additional exports to the V4 coming from the likes of Spain, Portugal, Denmark or Ireland, it remains very low in all the recipient countries.

Figure 26. Geographical mix of export benefits to the EU-15 due to Cohesion Policy implementation in the V4, broken down by V4 country



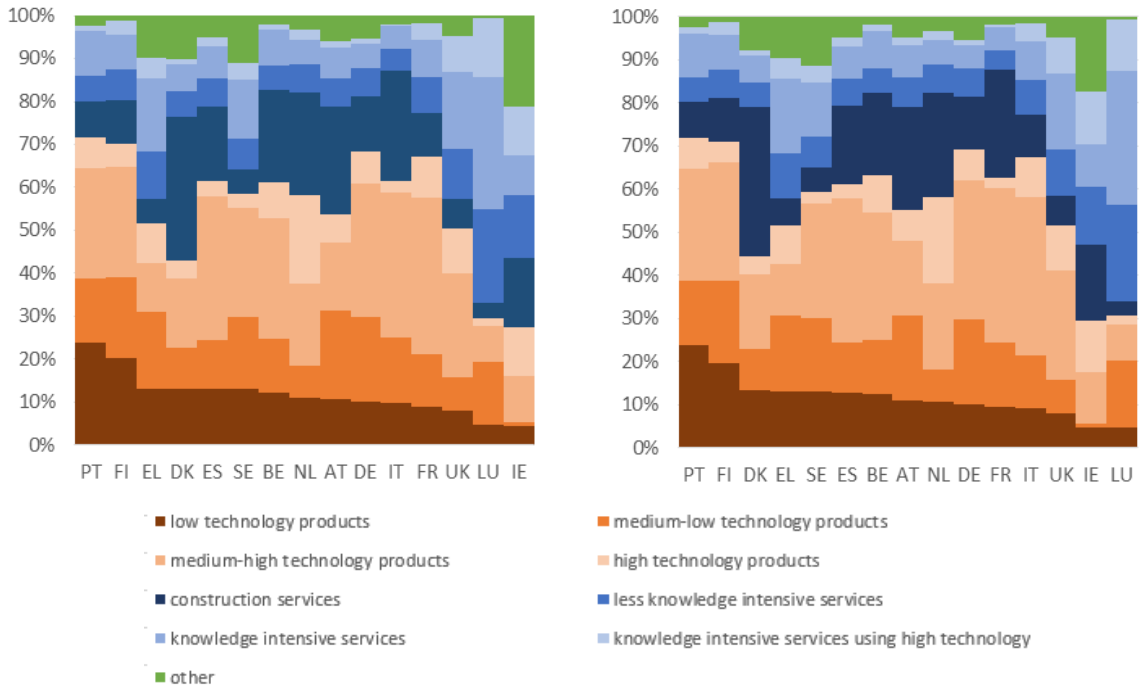


Source: Own elaboration.

EU-15's additional exports to the V4 differ markedly in terms of industry mix. At one extreme, there are the EU-15 member states which increased their exports of services to the Visegrad countries the most thanks to Cohesion Policy implementation in central Europe. This group includes, but is not limited to Ireland, Luxembourg, and to a smaller extent Denmark and the United Kingdom. Ireland is a particularly notable member in this set; services make up 70% of its total additional exports to the V4. Out of this figure, ca. 10% are knowledge-intensive services with high tech input[28], which sets Ireland apart from the rest of the EU-15. However, it should be noted that the value of international trade in services is still much lower than the value of trade in goods. Consequently, it should come as no surprise that the economies where services prevail in the structure of additional exports to the V4 are in the group with a relatively low share in EU-15 total exports to the V4.

[28] This includes IT, telecommunications services, broadcasting and scientific research

Figure 27. Additional EU-15 exports to the V4 due to Cohesion Policy implementation in the V4 by key sectors and EU-15 economies, in 2007-2015 (left) and 2016-2025 (right).



Source: Own elaboration.

At the other end, there are the EU-15 with the largest share in export benefits such as Germany, Italy and France, where industrial goods prevail in their additional exports to the V4 (ca. 60-70%). Against this background, the Netherlands and Austria stand as an exception. In their case, the share of industrial goods in additional exports is slightly lower (ca. 50%), with the gap closed by construction services. As for the economies with the largest share of industrial goods in their export mix, medium-high tech products take the lead in additional exports, thus making up to 50% of additional exports to the Visegrad countries.

The impact of Cohesion Policy implementation in the Visegrad countries on EU-15 exports is generally proportional to the volume of global EU-15 exports to the V4. To estimate discrepancies between the geographical structure of additional exports and the total mix of EU-15 exports to the Visegrad countries, both export flows are compared in this examination. As estimated, in most cases the Cohesion Policy impact on the geographical structure of EU-15 exports does not exceed 0.5%[29]. However, Germany and Poland are conspicuous here – despite Germany's strongest presence in the additional exports to the

[29] 0.5% of total EU-15 exports to the V4.

Czech Republic, Hungary and Slovakia, its share in the benefits accrued thanks to Cohesion Policy implementation in these three countries is slightly lower than may be expected from the total export mix. Poland is quite on the opposite. The Cohesion Policy seems to work to the benefit of flows coming to Poland from most of the EU-15. Yet, it is important to remember that the negative impact of the Cohesion Policy is present in just a few export flows from the EU-15 and is offset by a series of other increased flows to Poland.

Table 3. Relative impact of Cohesion Policy implementation in the V4 on the geographical structure of exports from the EU-15 to the V4, 2007-2025

	AT	BE	DK	FI	FR	DE	EL		IE	IT	LU	NL	PT	ES	SE	UK
CZ																
HU																
PL																
SK																

Legend: Green – cohesion Policy favours exports from one EU-15 country to a one V4 country; white – no marked differences between the structure of total exports and additional exports spawned by the Cohesion Policy; orange – additional exports from an EU-15 country to a V4 country is lower than expected based on the global trade structure.

Source: Own elaboration.

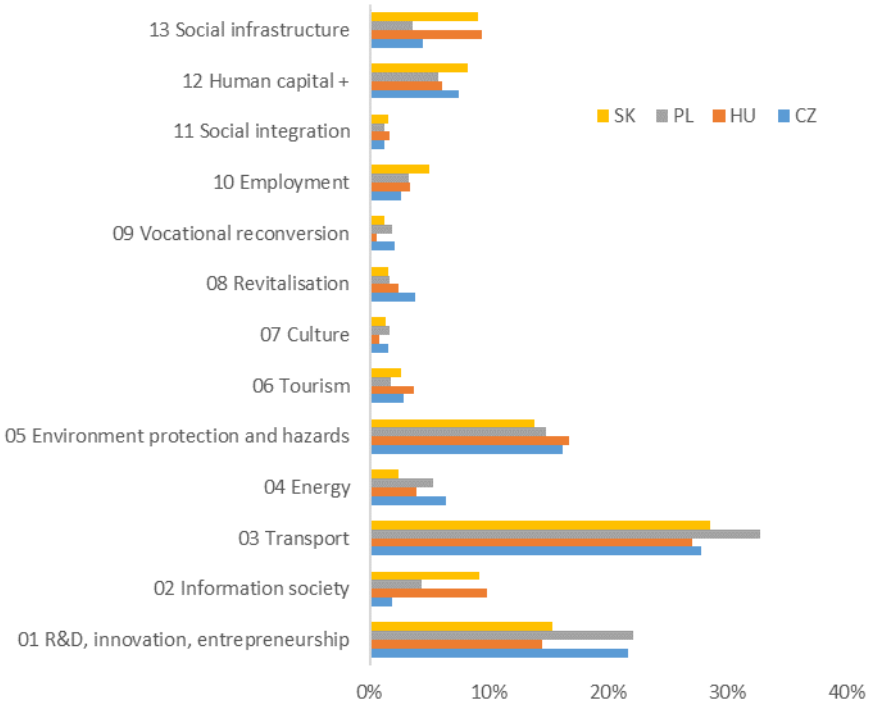
In summary of the macroeconomic study outcomes, Cohesion Policy implementation in the Visegrad countries will contribute to a global increase in EU-15 exports to the V4 by EUR 225.8 bn in 2007-2025. This is ca. 0.2% of EU-15 GDP. Note that the benefits concentrate in some countries – usually those which have had traditionally strong trade relations with the V4. In terms of value of additional exports to the V4, Germany is very prominent, with significant portions going also to Italy, France, Austria and the Netherlands. The concentration of benefits arising from Cohesion Policy implementation in the V4 is also evident in the relative share of each V4 economy, where Poland's share exceeds 50%, and in the sectorial mix of the additional exports (mostly medium-low and medium-high tech products, with focus on mechanical engineering). The discrepancies between the geographical and sectorial structure of the additional exports to the V4 on one hand, and the structure of total exports to those countries on the other indicate that the impact of Cohesion Policy implementation in the V4 goes beyond stimulating additional demand; it also affects the structure of EU-15 economies by favouring industries such as the manufacturing of plant and machinery and manufacturing of computers and electronics.

3.3 Microeconomic study: direct export benefits and direct capital benefits

This section discusses the second channel of benefits to the EU-15 gained thanks to Cohesion Policy implementation in the V4. These are related to foreign contractors being directly involved in implementing projects co-financed by structural funds and the Cohesion Fund. A foreign company is understood to be either an economic company registered outside the country to which it provides services or supplies goods, or one registered in the country, but controlled by foreign owners (see Box 3). The distinction between these two forms of enterprise, combined with the contractor's or supplier's profile of the types of tradable goods/services is highly important in the interpretation of their remuneration for the purposes of this examination (see Box 7).

The direct benefits estimates are based on the results of microeconomic study. Its key element was a survey of the beneficiaries of Cohesion Policy-financed projects coupled with in-house work carried out by the research team, plus an examination of available public procurement data in the V4 (see Box 3). The research team gained access to contractor details in Cohesion Policy-funded projects for the 2007-2013 programming period, which accounted for ca. 42% of all allocations. The resulting data extrapolations served to draw conclusions regarding the entire population of projects.

Figure 28. Break-down of Cohesion Policy grants (per project value)



Source: Own elaboration.

Box 3. Microeconomic study premise

Direct benefits were assessed on the basis of microeconomic study outcomes, where the study was aimed at collecting detailed data on the budgets of Cohesion Policy projects financed in the V4. The microeconomic study consisted of three stages:

1) **Survey among the beneficiaries of Cohesion Policy-funded projects:** the survey was conducted using the CAWI method, where respondents were asked to fill in an online form tailored to specific project profiles.

2) **Supplementary spreadsheet questionnaire:** this was applied to top transport infrastructure projects in Poland and Czech Republic for formal and practical reasons. Those unable to fill in the online questionnaire could do so on a spreadsheet.

3) **Examination of public procurement data from the V4:** to verify information on public contracts awarded in top infrastructural projects, several investigations were carried out on publicly available data sets and using the resources of the institutions responsible for rolling out European funds in the V4.

The premise in the microeconomic study was to cover the largest possible portion of the financed projects. The number of mailed questionnaires was restricted to a random sample only in interventions with a relatively large number of small projects. After the survey, analytic weights were applied to 13 intervention categories to extrapolate the results onto the entire project population. Ultimately, the investigation covered some 31,000 projects for which either survey questionnaires were submitted or public procurement data was analysed. The total value of these projects stands at approx. 41% of the value of all Cohesion Policy-financed projects in the V4 in the 2007-2013 programming period.[30]

Country	Number of projects covered by the microeconomic study	Share of project value covered by the microeconomic study in the global value of projects financed in the 2007-2013 programming period
Czech Republic	6,300	38%
Hungary	6,400	41%
Poland	15,100	41%
Slovakia	2,300	45%

A relatively large portion of investigated projects in the available budget was found in transport and environmental protection interventions (over 70%), as detailed public procurement data on top infrastructural projects was available, and additionally the information could be verified manually. A smaller quota of human capital projects (of less than 30%) is the result of a limited number of survey samples, as mentioned above, and of a relatively small number of returned questionnaires, especially in Poland and the Czech Republic. Yet, the number of collected questionnaires in each category was sufficient for extrapolating the results onto the entire project population.

[30] A relatively greater survey take-up in Slovakia is due to the small number of projects supported by the Cohesion Policy in the 2007-2013 programming period

Before engaging in detailed analysis of the involvement of EU-15 based economic companies in the implementation of Cohesion Policy-financed projects in the V4, the structure of interventions and the scope of information collected in the microeconomic study are worth examining.

In total, i.e. in all four countries and in all intervention categories, beneficiaries spent over 70% of their project budgets on remuneration paid to contractors and suppliers.[31] The remaining expenditure included staff remuneration, project management costs, lease of office space and other items. Such expenditure was excluded from further investigation, which means that it is not considered as benefits to EU-15. It should also be stressed that a large share of such spending can be seen predominantly in "soft" projects financed by the ESF, where i.a. the involvement of coaches or direct benefits to final recipients was a significant budget item.

Figure 29. Project budgets (all V4 countries) by type of intervention

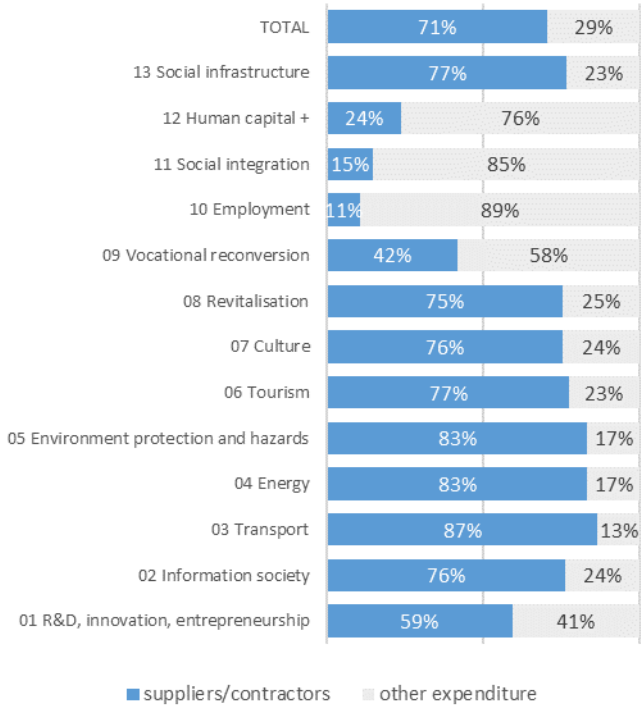
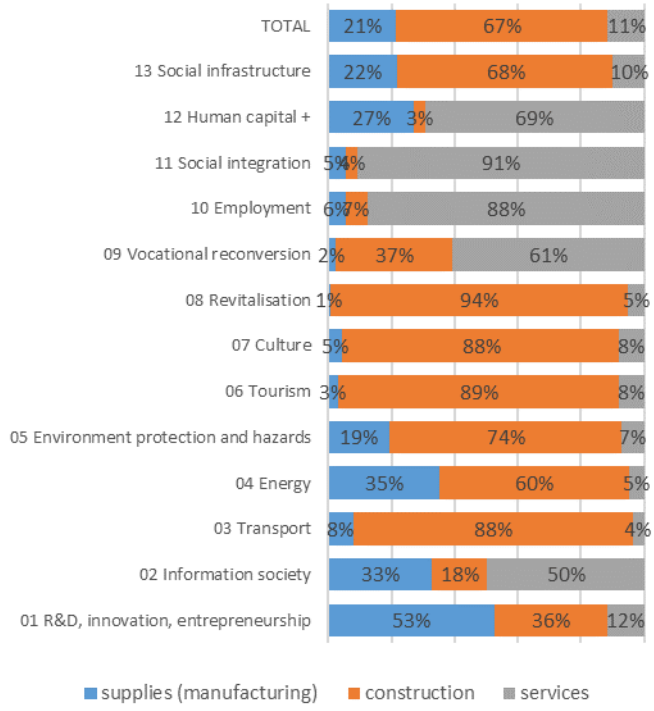


Figure 30. Remuneration of contractors/suppliers (all V4 countries) by type of intervention



Source: Own elaboration based on microeconomic study results.

The structure of budgets varies markedly across intervention categories in terms of portion allocated to contractors and suppliers. Not surprisingly, construction takes up the largest part of the expenditure in infrastructural projects. This rule applies to projects in areas like transport, environmental protection, tourism, culture, revitalisation and social infrastructure. A large share of industrial products supplies (mainly machinery and equipment) is to be seen chiefly in all projects aimed at supporting innovation, entrepreneurship and energy. On the other hand, non-construction activity dominates the budgets in

[31] The survey takes into account both funding from the European funds and national co-financing.

"soft" project. However, since transport and environmental protection projects received the largest chunk of funds under the Cohesion Policy, remuneration of construction contractors is clearly predominant across the board (over 2/3 of the value of all surveyed orders). This also had an impact on the structure and scale of benefits gained by the EU-15, which is largely due to the specificity of the construction market in the V4, such as the presence of foreign capital.

Box 4. How to define foreign links in a company

In the examination of direct benefits, companies which provided services or supplies as part of a Cohesion Policy-funded project are categorised as those registered in a country and having a majority domestic capital stake or ownership, those registered in a country and having a majority foreign equity holding, and companies registered abroad.

type	definition	interpretation of benefits to the EU-15	
(1) domestic company – domestic ownership	A company registered in one of the V4, with majority domestic ownership	No benefits to EU-15 countries	
(2) domestic company– foreign ownership	A company registered in one of the V4, with majority foreign ownership	tradables **direct export benefits** (already included in macroeconomic study results)	non-tradables **direct capital benefits** (added to macroeconomic study results)
(3) company registered abroad	A company registered abroad, with branches, representative offices and distribution centres in V4 countries	**direct export benefits** (included in macroeconomic benefits)	

When defining the status of a company, the following additional assumptions apply:

- Since in most cases information was not available on the distribution of remuneration between syndicate (consortium) members, for the sake of calculations **all the remuneration was attributed to the leading entity**. Hence, no account is taken of the remuneration of EU-15 based companies if they were merely partners in a consortium. This was quite a common feature in construction projects.
- Defining **the company status was part of the microeconomic study**.
    - The registered office of a company was defined as per contractor data available from the project documentation, which usually did not pose a problem as this was contractual information.
    - For companies registered in V4 countries, the ownership structure was defined on the basis of their status information available from the commercial register, where majority foreign ownership profiles are disclosed. In such a case, the next step was to match the country of origin with the owner on the basis of publicly available information (including corporate websites or data coming from the holding company).
    - For projects covered by the survey, the data was entered by beneficiaries and subsequently verified by the research team after the survey.
- By default, **the entire remuneration was assigned to the contractor**, thus leaving the potential remuneration paid to local subcontractors out of the equation due to the absence of relevant project-specific data. However, this was taken into account at the sectorial level when defining the scale of benefits to EU-15 countries (see Box 5). From among foreign companies, EU-15 based companies and those originating from the other V4 countries were isolated on each occasion. The activities of Czech companies in Slovakia are noteworthy in this context.

In all the V4, ca. 58% of the total value of contractor remuneration was allocated to local enterprises with a majority domestic stake. The remuneration of enterprises linked to EU-15 countries may be estimated at ca. 37% [32]of the total pool of allocated funds, where the revenue of companies registered in the V4 but controlled by EU-15 based equity owners is 28%, whereas the revenue of companies registered in the EU-15 stands at 9%.

Such a ratio results essentially from local construction market specificities. As indicated above, construction works corresponded to over 2/3 of total contractor remuneration, where 44% of the global contract value was awarded to enterprises connected with EU-15 countries usually by capital ties. Most frequently, such companies were involved in executing top infrastructural projects. Therefore, their large share in the budgets of transportation projects should come as no surprise. In smaller projects such as the construction and upgrade of buildings, local entrepreneurs were usually employed as contractors.

Supply of industrial products is the second area where a significant share of remuneration was earned by companies linked to the EU-15. However, this sector that accounts for 18% of all expenditure has a specific feature: contracts were usually executed directly by a company registered in one of the EU-15 member states. This was mostly the case of supplies of plant and electronic equipment under support for entrepreneurship and innovation. In transportation equipment supplies, many more contracts were awarded to local companies affiliated with EU-15 based entities. However, non-EU suppliers are a large portion in this group (mostly from Switzerland).

There are substantial differences across the V4 in the scale and sectorial origin of companies linked to the EU-15 which act as contractors and suppliers.

In the Czech Republic, local companies wholly owned by Czech entities or those with a majority Czech capital stake took up ca. 61% of contracts in value terms. The remuneration to enterprises tied to EU-15 economic companies accounted for ca. 35%, with the equity component exceeding 1/3 of the remuneration. Global ratios are close to the V4 average, mainly because of the remuneration structure in the construction sector which is similar to the structure in the other countries. The Czech Republic stands out from Hungary, Poland and Slovakia with its larger share of domestic enterprises acting as industrial product suppliers, mainly in transportation equipment and to a lesser extent in computers and electronics equipment.

Of all the four reviewed countries the largest 70% share of remuneration of domestic companies with a majority local equity stake was noted in Hungary at the expense of revenue earned by companies with capital ties to the EU-15. Such a remuneration structure is mostly due to a larger market share of local construction contractors in Hungary than in the Czech Republic, Poland or Slovakia (almost 80% against the global V4 average of 54%). On the other hand, Hungary has quite a small share of local industrial products suppliers, especially transport equipment, but also electrical tools and appliances, machinery, computers and electronics, which boosts the relative presence of EU-15 contractors.

In the case of Poland, ca. 51% of total remuneration was paid to domestic companies wholly owned by Polish owners, or having a majority Polish stake. This relatively small quota is a result of the building contractors' remuneration structure. Although the share of companies owned by EU-15 based capital is

[32] The remaining 5% of contract value was awarded to companies which were neither local nor locally-owned, or registered in the EU-15, or registered locally and owned by EU-15 based capital groups.

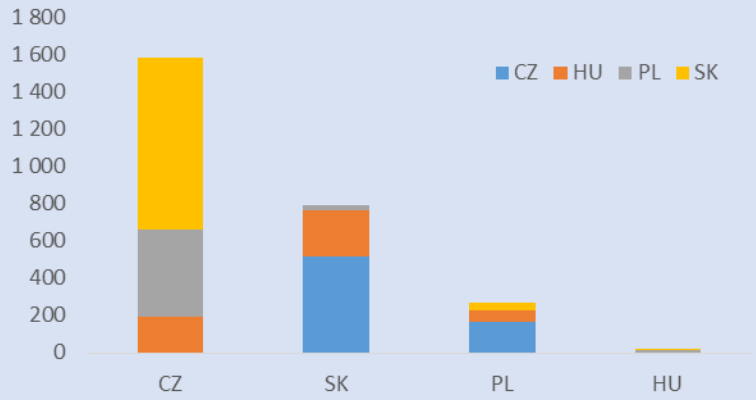
similar to the one in the Czech Republic (31%), the Polish case is unique due to a large 13% involvement of EU-15 registered enterprises, mostly from Spain, which is rarely the case in the other V4 countries. Still, domestic companies in Poland have a notably large share in industrial product supplies, much like in the Czech Republic.

In Slovakia, the proportion of domestic enterprises with a majority Slovak ownership share was relatively high and close to Hungary (69%). Like in Hungary, this meant less revenue for companies linked to EU-15 based capital than in Poland or the Czech Republic. Slovakia's specific feature is its part of domestic companies in construction contract executions, not unlike in the Czech Republic. Also, the country has a higher ratio of remuneration paid to contractors with a majority Slovak equity stake in the industrial product supplies category, predominantly in transport and electronics. The involvement of Czech companies in the execution of EU-funded contracts in Slovakia was notably high, mostly in the supplies of plant and electrical tools and appliances.

Box 5. Economic cooperation among V4 countries

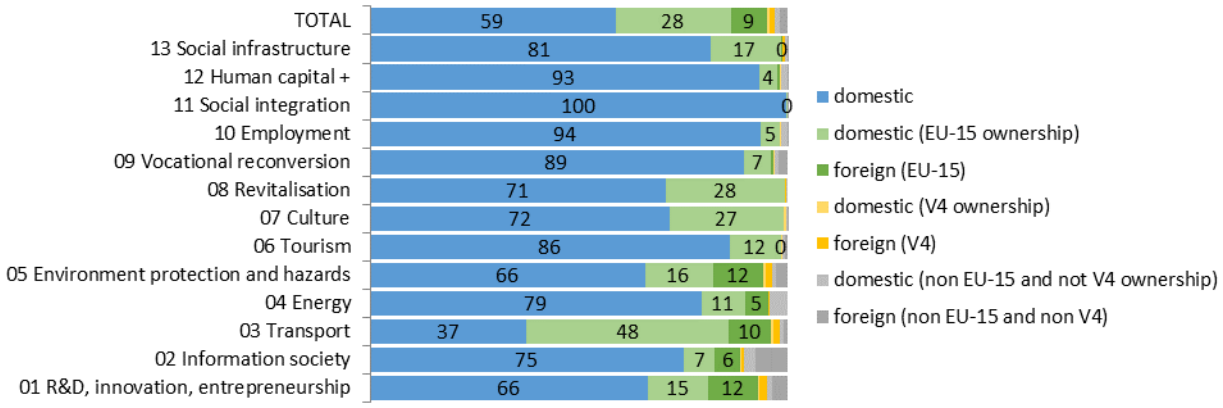
Apart from the benefits derived by the EU-15 as discussed here, it is worth noting that the implementation of Cohesion Policy-financed projects stepped up economic cooperation between V4 countries. As estimated, this enabled additional total turnover of ca. EUR 2.8 bn, more than half of which came from the Czech-Slovak trade in goods and services. Polish contractors established a significant presence in the Czech Republic (EUR 165 mn), and Czech contractors expanded their business to Poland (EUR 468 mn). This notwithstanding, and despite a notable volume of contracts awarded to Czech, Polish and Slovak businesses in Hungary (EUR 497 mn in total), the microeconomic study did not prove any significant expansion of Hungarian companies to other V4 countries.

Figure 31. Remuneration to Czech, Hungarian, Polish and Slovak contractors generated in the other V4 countries (in EUR mn, total of contractual and capital revenues).

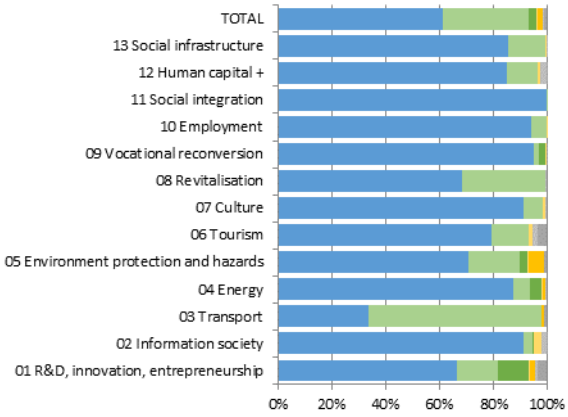


Source: Own elaboration based on microeconomic study

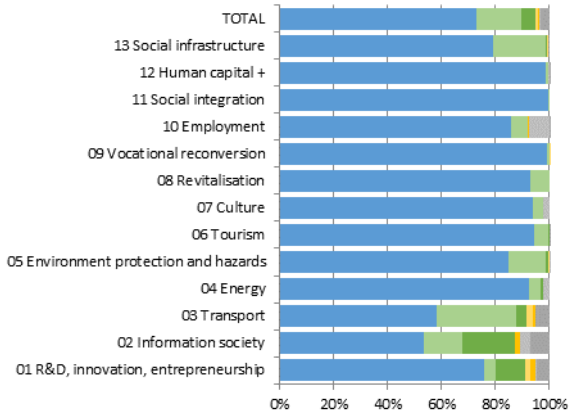
Figure 32. Remuneration to contractors by intervention category (% of all contracts awarded)[33]
All V4 countries



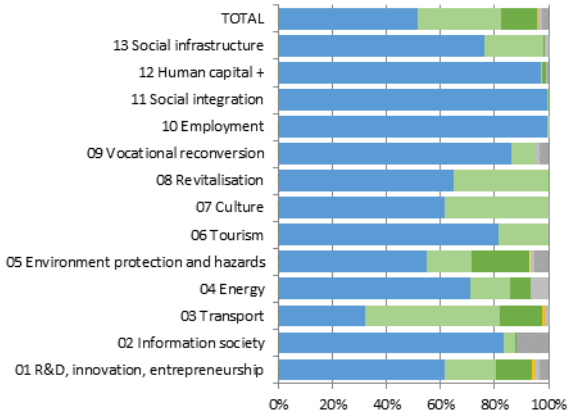
Czech Republic



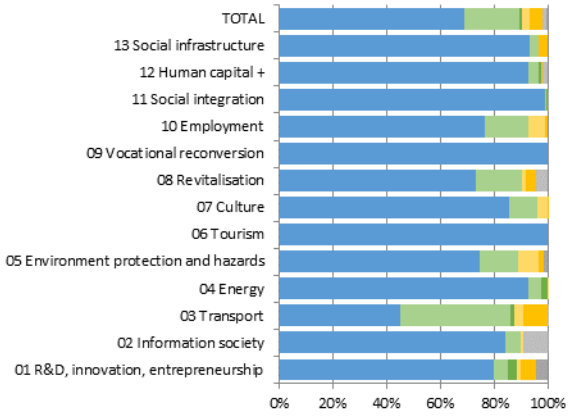
Hungary



Poland



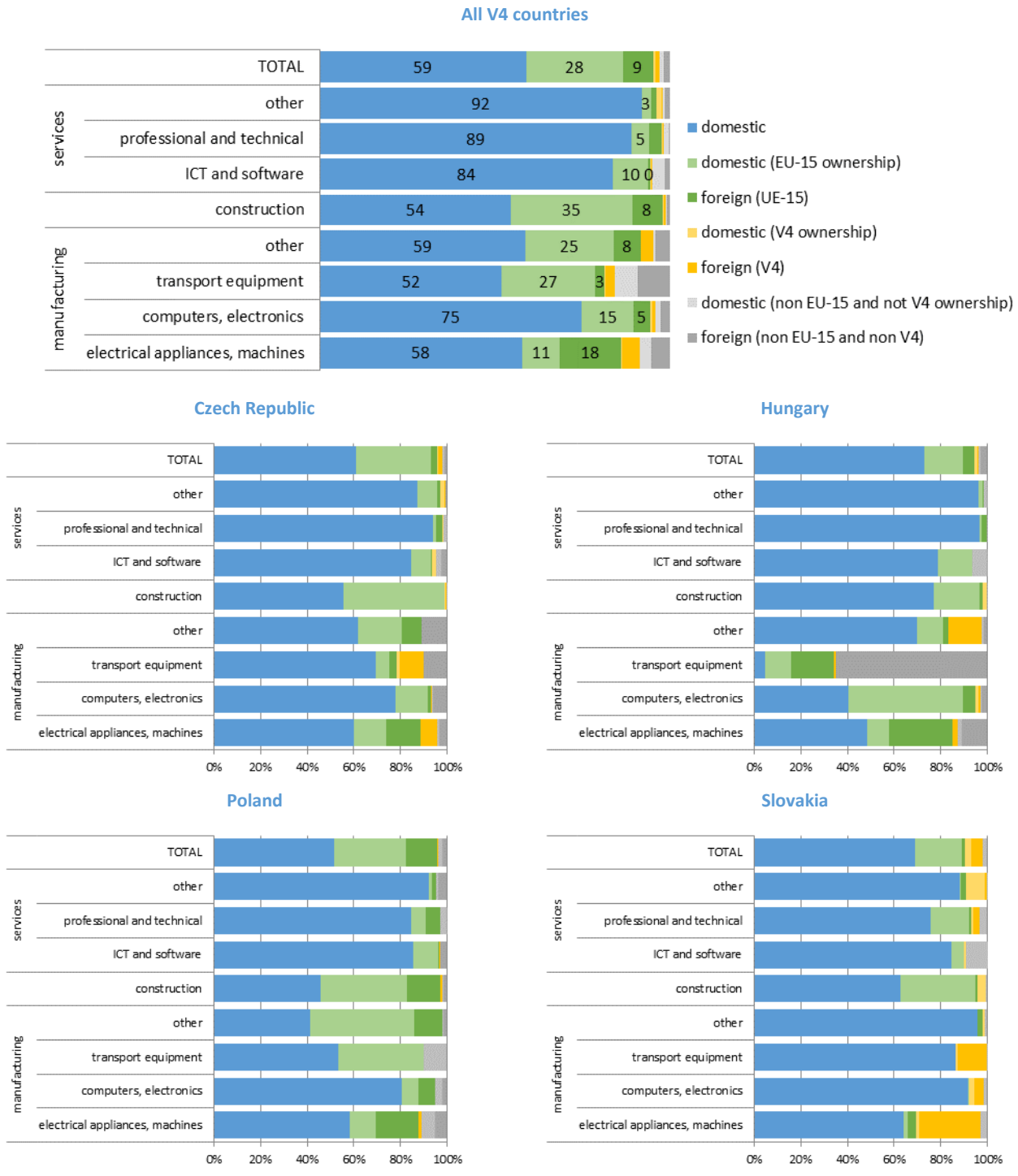
Slovakia



Source: Own elaboration based on microeconomic study

Figure 33. Remuneration to contractors by type of deliverables (% of all contracts awarded)[34]

[33] As contractor status proved impossible to determine for contractors who generated 5% of the total remuneration budget under review, the unidentified share was distributed pro rata among companies in various ownership structure categories registered in each country.



Source: Own elaboration based on microeconomic study

[34] As contractor status proved impossible to determine for contractors who generated 5% of the total reviewed remuneration budget, the unidentified share was distributed pro rata among companies in various ownership structure categories registered in each country.

At this juncture, it is also worth conducting a closer examination of the selection of foreign contractors and its underlying reasons, which were investigated in the beneficiary survey. When requested to specify key factors influencing their decision-making processes, the beneficiaries quite often pointed at price among the options presented in the survey. In parallel, however, foreign contractor selection was often guided by considerations of their higher quality and more functional offer. These outcomes should be treated with caution, as each contractor – including non-public beneficiaries – should be selected under a competitive procedure (cf. Box 5). Yet, as beneficiaries quite often indicated the price together with other selection criteria, it seems that the contractor track record is generally a success factor in foreign contractor involvement.

Figure 34. Reasons underlying foreign contractor selection

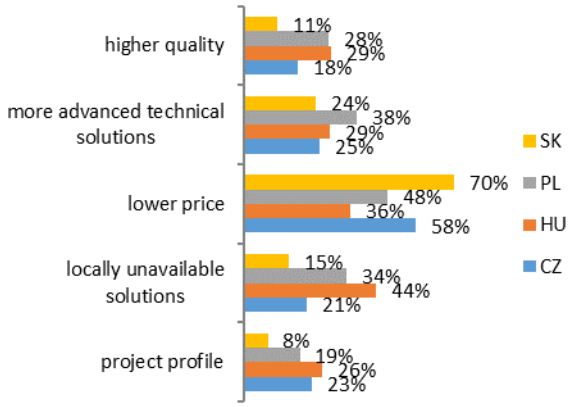
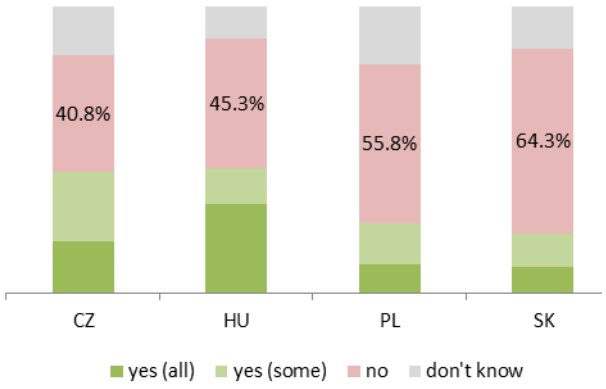


Figure 35. Previous cooperation with foreign contractors



Source: Own elaboration based on microeconomic study.

In most cases, the respondents did not cooperate with their foreign contractor before projects were launched. This implies that projects co-financed with EU funds facilitate new business ties, which would not have been established had it not been for the Cohesion Policy. What is more, beneficiaries declare that in most cases cooperation with their foreign contractor continued, and not just in the follow-up, servicing or upgrade of the contract's initial deliverables, but also on other orders and contracts, and not all of these were co-financed with EU fund

Figure 36. Potential re-involvement of the same foreign contractor on the initial supply/provision

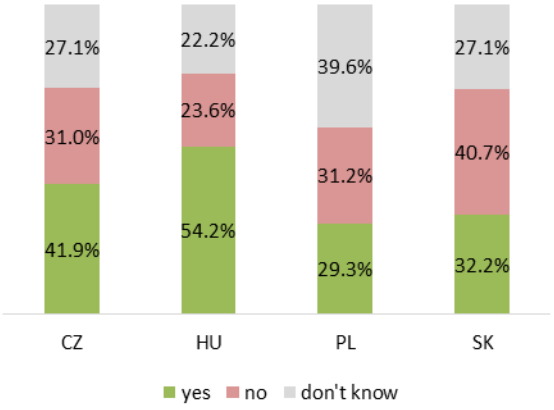
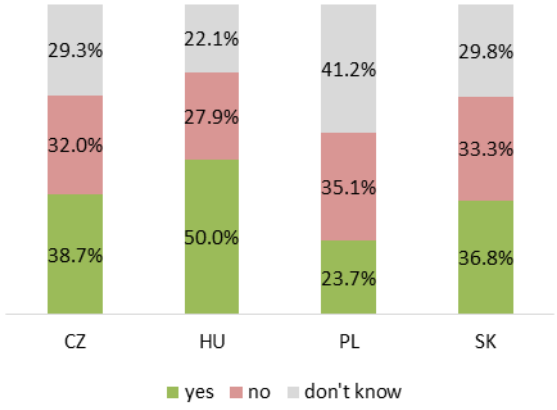


Figure 37. Potential re-involvement of the same foreign contractor in other supplies/ provisions



Source: Own elaboration based on microeconomic study.

Box 6. Share of foreign companies in public procurements in some EU Member States

EU Single Market

The EU Single Market Policy facilitates business across Europe in many different ways. Thanks to the European Single Market, entrepreneurs may in particular benefit from the free movement of goods and services between 28 EU member states. As a result, consumers have access to more products which are competitive in terms of quality and price, and entrepreneurs can operate with no barriers in markets across all EU Member States.

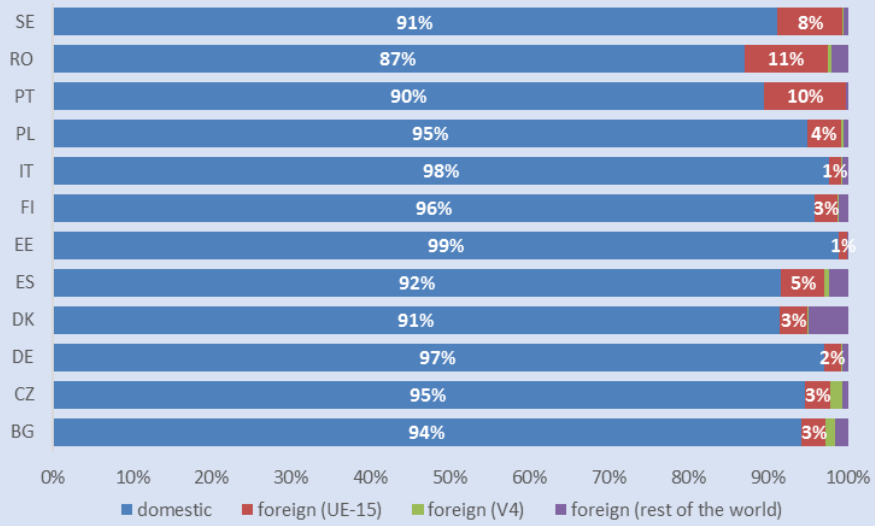
Competitiveness in public procurements

Public procurement regulations guarantee compliance of public spending with the principle of competitiveness. Public procurements play an important role in member states' economies, particularly in some strategic sectors such as transport, construction or energy. Their value is estimated at ca. 16% of EU GDP. The Europe 2020 strategy stresses that the public procurement policy must ensure effective use of public funds, and the public procurement market must remain open to entities from all EU member states. Transparent, equitable and competitive public procurements in the Single Market boost entrepreneurship and economic growth while ensuring an efficient use of public funds.

The following thresholds have been in force since January 2016[35]:

- EUR 5 225 000 for construction works,
- EUR 135 000 for standard supplies and services, EUR 418 000 for sectorial and defence-related services, and EUR 209 000 for other procurements.

Figure 38. Involvement of domestic and foreign companies in public procurements in selected EU countries (2009-2015)



Source: Own elaboration based on TED (Tenders Electronic Daily) data – online version of the Supplement to the Official Journal of the European Union dedicated to European public procurements.

TED (Tenders Electronic Daily) provides free access to procurement notices in the European Union and the European Economic Area, as well as in other selected countries. Furthermore, companies operating in the EU have direct access to information on all large public procurement projects and can submit bids provided that they meet the criteria laid down by the awarding authority.

According to the available information the vast majority of public procurements in the EU is awarded to

[35] Up from previous thresholds.

domestic companies located in the country of the awarding authority. Their share in the global value of TED-published notices was 87% in Romania and 99% in Spain.[36] The most successful foreign bidders come from the EU-15; their share in public procurements is the highest in Romania (11%) and Portugal (10%). Only in Denmark did the majority of foreign public procurement contractors come from non-EU-15 and non-V4 countries. In Poland and the Czech Republic, the foreign contractors' share in the total value of published procurement notices amounted to 5%.

Competitiveness in public procurement in projects co-financed by European funds

Community principles such as **equal treatment, fair competition and transparency** govern all Cohesion Policy-financed goods and services supplies, including those not covered by Public Procurement Directives or relevant national regulations. In particular, these principles have to be applied by non-public institutions (private entities and NGOs) when spending public money. The Court of Justice of the European Union (CJEU) has developed a set of basic standards for the award of public contracts. The principles of equal treatment and non-discrimination on grounds of nationality imply an obligation of transparency which, according to the CJEU case-law *consists in ensuring, for the benefit of any potential tenderer, a degree of advertising sufficient to enable the services market to be opened up to competition and the impartiality of the procedures to be reviewed*.

In order to meet the requirements laid down by the CJEU, **the publication of a notice** prior to the award of the contract is needed. The CJEU states that *the greater the interest of the contract to potential bidders, the wider the coverage should be*. In particular, information should be available to bidders from other Member States if they may be potentially interested in being awarded the contract. [37]

As estimated in this study, the total value of remuneration received during the 2007-2013 programming period in the V4 by companies registered in the EU-15 or controlled by shareholders coming from those member states totalled ca. EUR 55 bn, or more than 1/3 of global remuneration. However, this cannot be regarded as benefiting exclusively the EU-15 economies as contractors spend a large part of this amount in the country in which they are awarded the contract, for example to pay subcontractors or local workers.

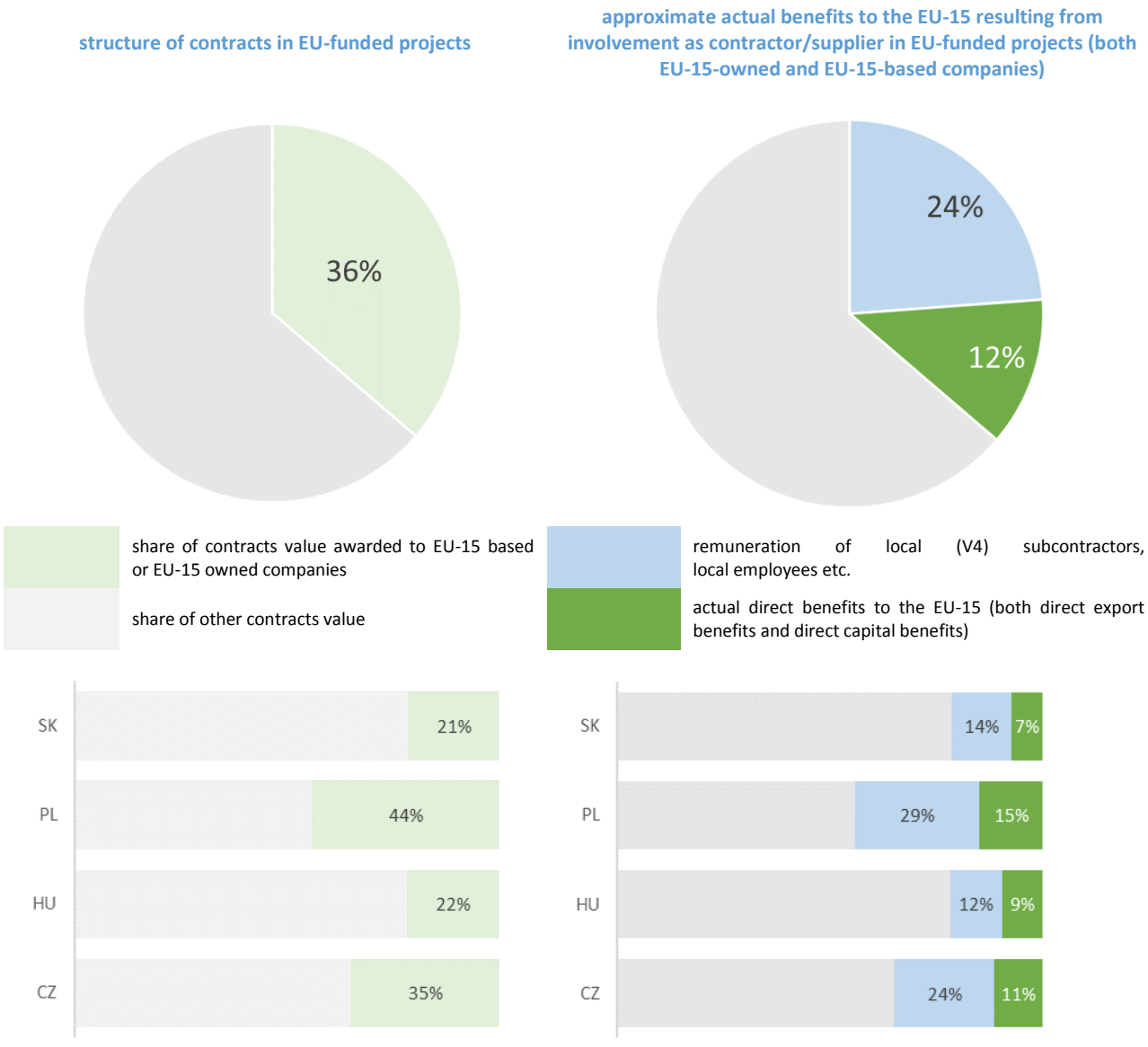
In order to assess the actual direct benefits to the EU-15, the approach presented in Box 7 has been adopted. It consisted in subtracting the value of intermediate costs and the total payroll bill from remuneration expenses in non-tradable services. Consequently, the estimated total direct benefits to EU-15 countries are almost EUR 20 bn, or 1/3 of the value of contracts described above. This correction is dictated primarily by a more realistic evaluation of benefits in the construction sector. Construction companies, even if registered abroad or having a majority foreign ownership structure, rely largely on local factors of production. Therefore, the actual direct benefits enjoyed by the EU-15 as a result of direct involvement in contractor or supplier capacity in EU-funded projects amount to ca. 12% of all awarded contracts (in comparison with 36% of the total value of contracts awarded to EU-15 owned or

[36] The investigation covers only cases where information was available on the awarding authority and the country of registration of the successful bidder.

[37] Commission interpretative communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives (2006/C 179/02)
http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52006XC0801(01)&from=EN

EU-15 based entities). The share is the highest in Poland (15%) close to the V4 average in the Czech Republic, and the lowest in Slovakia and Hungary (7% and 11%, respectively).

Figure 39. Approximate actual direct benefits to the EU-15



ca. EUR 55.2 bn worth of **contracts awarded to EU-15 based or EU-15 owned companies**

ca. EUR 19.7 bn of actual benefits to the EU-15, of which:

- EUR 11.7 bn of **direct export benefits**, resulting form supplies/deliveries of companies based in EU-15)
- EUR 8.0 bn **direct capital benefits** resulting from supplies/deliveries of companies based in V4, owned by EU-15 capital (non-tradables)

Source: Own elaboration.

Box 7. Method of estimating direct benefits

Direct benefits to the EU-15 from Cohesion Policy implementation in the V4 are associated with foreign enterprises' direct involvement as contractors in projects co-financed by European funds. In the methodology applied in this report, EU-15 benefits are linked to two parameters: legal form of establishment of the foreign contractor and the type of product/service provided by it.

Products and services provided by foreign or majority foreign-owned companies are divided into 3 categories:

- tradable industry products, i.e. all industry products, including machinery, electrical appliances, transport equipment, computers, electronics equipment, which as a rule can be manufactured in any country regardless of the country of supply;
- tradable services, i.e. all services which can be provided regardless of the country of supply, in particular software delivery and ICT services;
- non-tradable services which can be provided only in the country of supply, in particular construction services and client oversight.

The remuneration paid to foreign contractors in Cohesion Policy co-financed projects can be divided into three strands: intermediate costs (which cover the cost of all intermediate products and services used in the production process), workers' wages and company earnings.[38]

category	domestic companies – foreign capital			foreign companies		
	intermediate costs	wages	profit	intermediate costs	wages	profit
manufacturing (tradable)	+	+	+	+	+	+
services (tradable)	+	+	+	+	+	+
services (non-tradable)	-	-	+	-	-	+

"+" indicates benefits to the EU-15, "-" indicates domestic benefits (V4 countries)

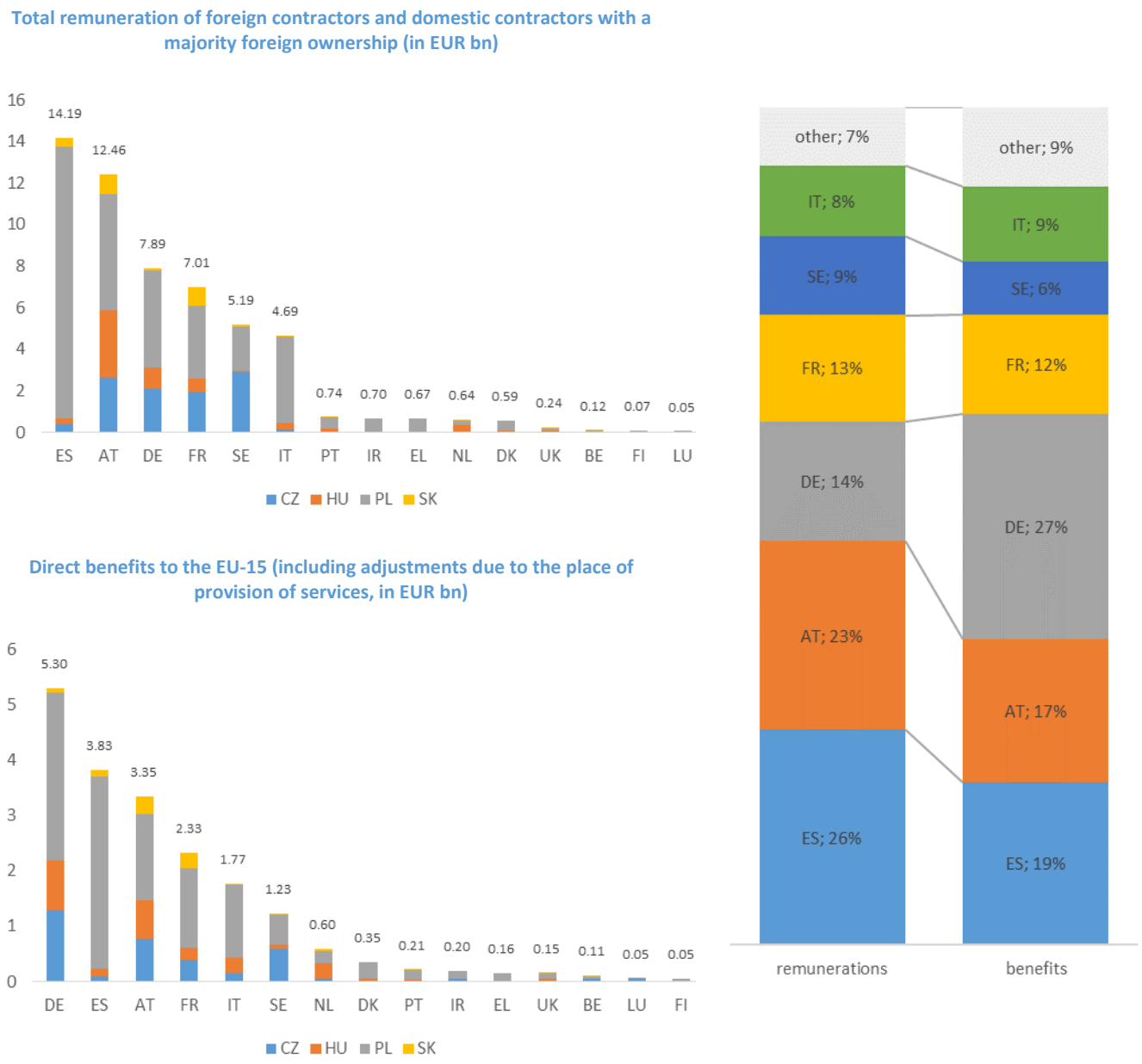
In industrial products and tradable services, the total remuneration to a foreign contractor was regarded as a benefit to EU-15 member states. This results from the specific nature of these products and services which can be delivered regardless of the country of supply. In this case, no transfer of manufacturing processes should be expected, even if the contract is implemented in a V4 country. On the other hand, for non-tradable services, and specifically those in the construction sector, services have to be provided in the country where they are ordered. Therefore, regardless of whether the tender is executed by a domestic company with a majority foreign ownership or one registered abroad, local workforce and materials (e.g. sand or cement) are used. In this case, the assumption in the study is that EU-15 benefits boil down to earnings generated from contract execution only.

The above product/service categories combined with the legal establishment status of a company translate into direct benefits that are interpreted as being part of total benefits.

- Benefits from industrial products and tradable services supplies are interpreted as additional exports already included in the results of the macroeconomic study regardless of whether the contract was executed by a company from a EU-15 member state or one with a majority EU-15 based equity stake and registered in one of the V4. Moreover, benefits resulting from supplies of tradable services by companies from the EU-15 are interpreted in a similar manner.
- Benefits gained from supplies of non-tradable services by companies with a majority foreign stake and registered in the V4 are interpreted as capital benefits that are not part of the additional exports; thus, they are aggregated with the macroeconomic study results.

[38] The proportion of each category in each country was established on the basis of input-output tables published by Eurostat.

Figure 40. Direct benefits to the EU-15 countries



Source: Own elaboration on the basis of microeconomic study.

Direct benefits are not evenly distributed across the EU-15. This results primarily from the trade mix of V4 countries (hence, among others, the high share of Austria and Germany in total benefits) and the specific nature of each reviewed country, such as the presence of foreign ownership in companies operating in the Czech Republic, Hungary, Poland and Slovakia (and the ensuing high share of Spain in total benefits). More than 90% of all microeconomic benefits generated by Cohesion Policy implementation in the V4 can be attributed to five member states of the EU-15 – Germany, Spain, Austria, France and Italy. Consequently, the analysis below focuses on these countries.

Contractors registered in Germany and economic companies with majority German owners received total remuneration of almost EUR 8 bn in the V4, which, after adjustments for the place of service supply, represented the biggest sum of benefits among all the EU-15 and amounted to ca. EUR 5.3 bn. Germany had a very large proportion of industrial product supplies, which explains a relatively small difference between benefits and remuneration vis-à-vis other countries. German companies play a particularly important role as suppliers of plant and electrical equipment (i.e. more than half of all the supplies from the EU-15 covered by the microeconomic study), mainly catering for the needs of projects geared to promote innovation and manufacturing capacity expansion of enterprises in the V4. Moreover, transport equipment supplies take up a significant share in the remuneration of German companies, largely thanks to Siemens' contract for the rolling stock supply to the Warsaw underground railway. German contractors also accounted for the biggest share in contracts in ICT services and software supplies.

Figure 41. Direct benefits: by type of service/supply.

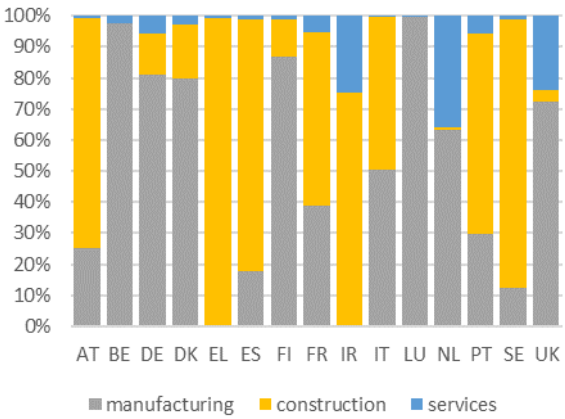
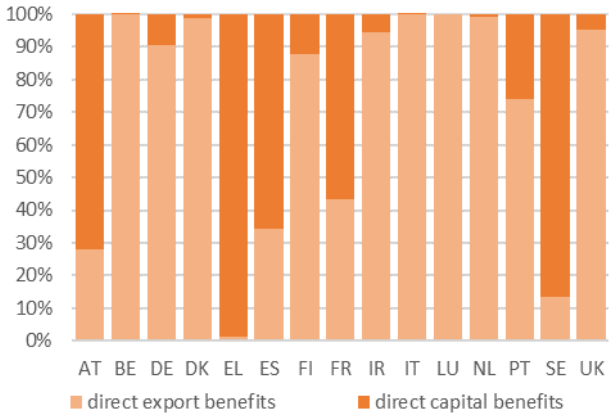


Figure 42. Direct benefits: export and capital benefits



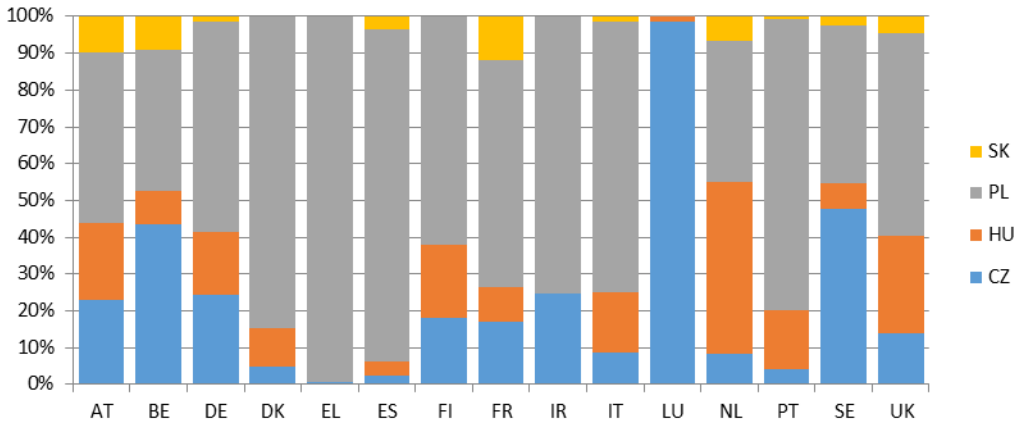
Source: Own elaboration on the basis of the microeconomic study.

Spain has the second largest share of microeconomic benefits. Companies registered there and those with majority Spanish owners received the biggest remuneration (over EUR 14 bn). However, more than 90% of this figure consisted of revenue earned by construction contractors. Having subtracted the indirect benefits to local V4 economies (including subcontractor remuneration and revenue), the estimated total benefits to Spain stand at close to EUR 4 bn, a figure which represents contracts executed practically only in Poland. Companies with majority Spanish owners include Budimex (a leader in the Polish construction market), Trakcja PRKiI and Mostostal Warszawa. Also Dragados, another enterprise registered in Spain, secured contracts for big infrastructure projects in Poland. OHL ZS in the Czech Republic, member of the Spanish OHL group, obtained relatively high value contracts. Apart from construction works, rolling stock supplies to Hungary by CAF (Construcciones y Auxiliar de Ferrocarriles) from Spain are also worth noting.

Benefits to Austria are similar to those of Spain. The total remuneration of companies registered in Austria or controlled by Austrian owners exceeds EUR 12 bn. Yet, as most of this is attributable to payments for construction services, real benefits to Austrian businesses amount to just over EUR 3 bn according to this inquiry. In contrast to Spain, companies with Austrian capital ties are active in all four V4 countries. Among these, members of the Strabag group prevail, with as much as 40% in direct benefits going to the Austrian economy and at least 440 contracts for construction works executed in the

Czech Republic, Hungary, Poland and Slovakia.[39] Construction companies connected with the Porr and Alpine Bau groups also feature quite prominently. Almost 30% of Austrian direct benefits are gained on industrial supplies, e.g. equipment supporting industrial automation processes (Engel) and electronic systems used in the transport sector (Kapsch).

Figure 43. Direct benefits by V4 country



Source: Own elaboration on the basis of the microeconomic study.

As for France, the total remuneration earned by enterprises registered there or controlled by French owners reached almost EUR 7 bn, out of which direct benefits totalled ca. EUR 2.3 bn, as estimated in this inquiry. Most of this was generated by construction contracts performed by companies which belonged to French groups. In this context, subsidiaries of the Colas and Eurovia groups are particularly conspicuous (164 contracts mainly in the Czech Republic, also in Poland and Slovakia): Stavby silnic a železnic in the Czech Republic and Warbud in Poland. A big portion of the total value of the French microeconomic benefits was generated by a contract almost EUR 500 mn signed by France's Alstom for the delivery of rolling stock for long-distance rail transport in Poland.[40] French companies rank second after Germany as contractors for ICT services and software supplies.

According to estimated figures, microeconomic benefits to Italy equalled ca. EUR 1.8 bn, against the total value of remuneration paid to Italian companies of approx. EUR 4.7 bn. Half of the benefits was earned in construction contracts executed by a single company (Astaldi S.p.a.) almost exclusively in Poland. There were relatively few contracts, but they involved one of the biggest infrastructure projects put in place in Poland in the whole programming period. Other benefits to Italy are distributed pro rata among all the V4. They originate from plant and electrical equipment supplies, mainly in projects geared at enhancing innovation in business.

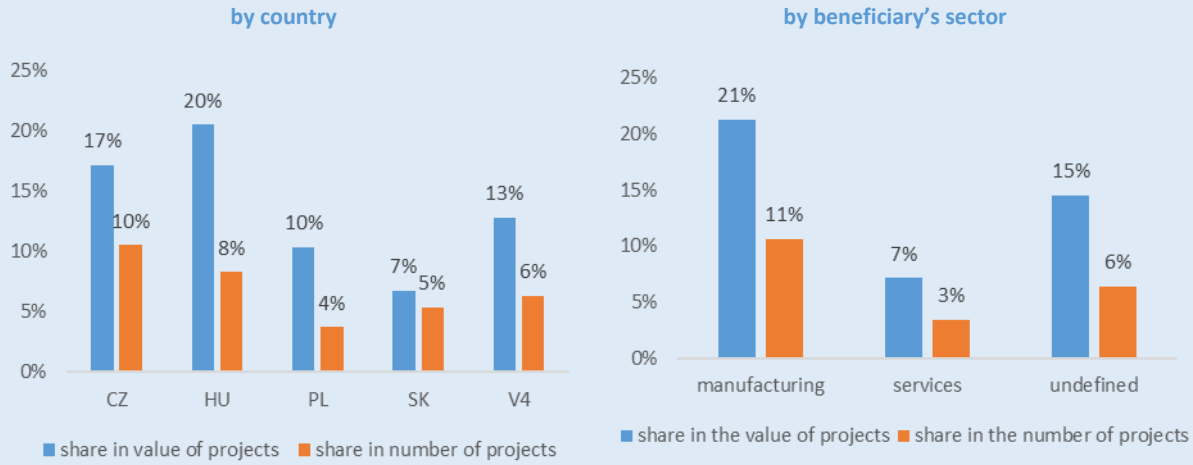
[39] This number of contracts was identified in the microeconomic study. The actual number is likely to be much bigger.

[40] Attributing benefits from this contract to France may be a simplification, albeit one that is consistent with the underlying approach. The leader in the syndicate was Alstom Konstal S.A, a company registered in Poland that was part of Alstom France. Alstom Ferroviaria S.p.A from Italy was a consortium partner and actual manufacturer in charge of producing the rolling stock.

Box 8. EU-15 controlled companies as direct beneficiaries of support.

The focus in this chapter is on direct benefits related to the involvement of EU-15 based companies or those controlled by EU-15 owners as service providers or suppliers of goods in projects supported by European funds. It is worth remembering, however, that local businesses with a majority foreign stake could also apply for support in programmes co-financed by structural funds, e.g. for increased competitiveness and innovation. In all four surveyed countries, this is noted in ca. 6% of supported projects in the business sector. As most foreign-owned companies tended to execute larger projects, in value terms this percentage represents ca. 13% of all the projects, where most were implemented in Hungary (20%) and in the Czech Republic (17%), and relatively fewer ones in Poland (10%) and Slovakia (7%). The share of foreign capital was significantly higher in manufacturing companies.

Figure 44. Share of companies controlled by EU-15 owners in the value of Cohesion Policy-financed projects



Source: Own elaboration on the basis of the microeconomic study.

Following the approach similar to the one adopted in the study of direct export and capital benefits, and based on the projection of results over the entire population of projects, the total value of projects implemented in the V4 in the 2007-2013 programming period by companies controlled by EU-15 majority owners is estimated at EUR 5.7 bn. Out of this, EUR 2.5 bn was co-financed with public funds (domestic and EU).

Table 4. Approximate estimate of Cohesion Policy support granted to companies controlled by EU-15 owners

country	project value [41]	public funds co-financing	average grant value
Czech Republic	EUR 1 693 mn	EUR 727 mn	EUR 623 thousand
Hungary	EUR 1 179 mn	EUR 506 mn	EUR 721 thousand
Poland	EUR 2 829 mn	EUR 1 217 mn	EUR 1,822 thousand
Slovakia	EUR 187 mn	EUR 80 mn	EUR 1,259 thousand
total	**EUR 5 726 mn**	**EUR 2 462 mn**	**EUR 1,023 thousand**

Source: Own elaboration on the basis of the microeconomic study.

The above estimates should be approached with great caution, and they should not be seen as tantamount to the impact of microeconomic benefits discussed in this chapter. A detailed inquiry into how beneficiaries with a majority foreign stake spent their received funds was not included in this study. Also, information on ownership structure was based on respondents' representations.

[41] All values in constant 2010 prices.

3.4 Total benefits

The two above sections describe the economic benefits to the EU-15 from Cohesion Policy implementation in the V4 according to macro- and micro- studies. Conclusions from these two studies allow for an estimate of total economic benefits, as split into three categories:

- indirect export benefits (EUR 76.9 bn), i.e. exports induced by the growth of aggregate demand in V4 countries resulting from Cohesion Policy intervention, excluding direct involvement of EU-15-based or EU-15-owned companies in project implementation;
- direct export benefits (EUR 11.7 bn), i.e. benefits derived from direct involvement of EU-15 based companies as contractors or suppliers in EU-funded projects in V4 countries;
- direct capital benefits (EUR 8.0 bn), i.e. benefits resulting from contracts awarded to local companies owned by majority capital coming from the EU-15.

A combination of indirect export benefits, direct export benefits and direct capital benefits leads to estimated total economic benefits to the EU-15 from Cohesion Policy implementation in the V4 in 2007-2015 (i.e. related to the 2007-2013 programming period) of ca. EUR 96.6 bn.

V4	EUR 76.9 bn (1) **indirect export benefits**: exports induced by the growth of aggregate demand in V4 countries resulting from Cohesion Policy intervention, excluding direct involvement of EU-15-based or EU-15-owned companies in implementation of projects	+	EUR 11.7 bn (2) **direct export benefits:** benefits derived from direct involvement of EU-15-based companies as contractors or suppliers in EU-funded projects in V4 countries	+	EUR 8.0 bn (3) **direct capital benefits**: benefits resulting from contracts awarded to local companies with a majority stake based in the EU-15 (non-tradable services)	=	EUR 96.6 bn total economic benefits to the EU-15 derived from Cohesion Policy implementation in the V4 **total benefits**
Czech Republic	EUR 17.4 bn	+	EUR 1.8 bn	+	EUR 1.7 bn	=	EUR 20.9 bn
Hungary	EUR 13.4 bn	+	EUR 2.1 bn	+	EUR 0.6 bn	=	EUR 16.2 bn
Poland	EUR 38.6 bn	+	EUR 7.5 bn	+	EUR 5.0 bn	=	EUR 51.1 bn
Slovakia	EUR 7.5 bn	+	EUR 0.2 bn	+	EUR 0.7 bn	=	EUR 8.4 bn

Table 5. How to interpret each type of economic benefits?

Type of benefits	interpretation	estimation method		example
total economic benefits	sum of indirect export benefits, direct export benefits and direct capital benefits			
indirect export benefits	benefits to EU-15 companies which boost their exports due to greater domestic demand in the V4 driven by Cohesion Policy implementation	macroeconomic study	-	German plant and equipment manufacturers who increased exports to the V4 thanks to greater domestic demand in the Czech Republic, Hungary, Poland and Slovakia
direct export benefits	benefits to EU-15-based companies involved in projects in the V4 benefits to businesses registered in the V4 with a majority EU-15 equity stake and involved in projects in the V4 – tradable services and supplies of industrial products		microeconomic study	**Presezzi** – Italian supplier of state-of-the-art assembly lines to beneficiaries of Polish Innovative Economy OP
direct capital benefits	benefits to companies registered in the V4 with a majority EU-15 stake and involved in projects in the V4 – non-tradable services (chiefly construction)	-		**Strabag s.r.o** registered in Slovakia (100% Austrian-controlled) involved in a large no. of infrastructure projects, including the construction of D3 highway

Source: Own elaboration

Figure 45. Total economic benefits to the EU-15 by category and V4 country

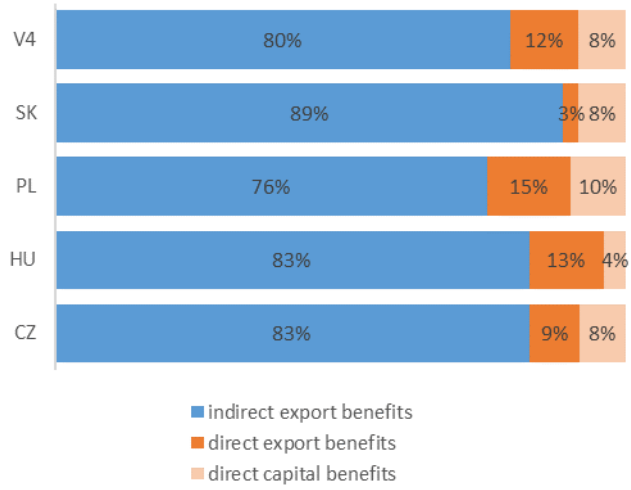
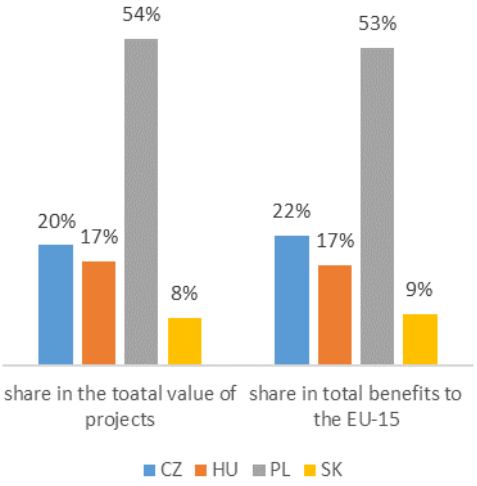


Figure 46. Share in benefits to the EU-15 vs share in the value of Cohesion Policy co-financed projects by V4 country



Source: Own elaboration.

The split of total benefits between V4 countries is very similar to the structure of expenditure in Cohesion Policy co-financed projects in the Czech Republic, Hungary, Poland and Slovakia. Poland's slightly lower share in the total benefits to the EU-15 (53% versus 54% in the value of Cohesion Policy-funded projects) is a consequence of the largest relative share of direct benefits vis-à-vis other V4 countries, in particular in direct export benefits. Still, in all four examined countries, indirect export benefits (i.e. additional exports not directly connected with the implementation of Cohesion Policy co-funded projects) are decidedly the most important type of benefits to the EU-15.

Figure 47. Total benefits to the EU-15 (EUR bn, constant 2010 prices)

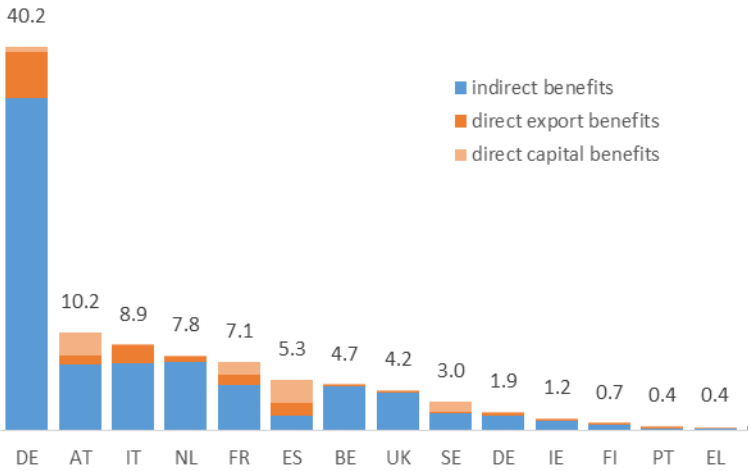
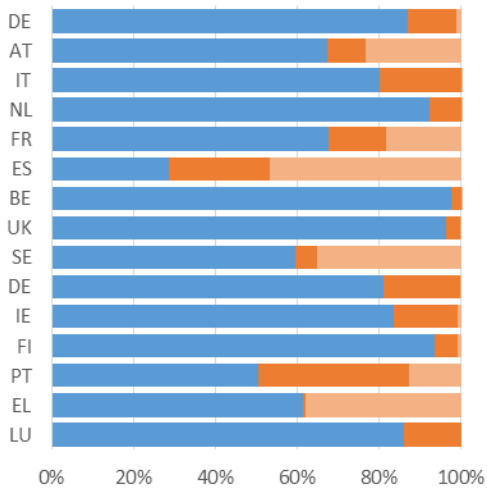


Figure 48. Total economic benefits to the EU-15 by type and EU-15 country



Source: Own elaboration.

Table 6. Summary of benefits to the EU-15 (2007-2013 programming period)

	Czech Republic	Hungary	Poland	Slovakia	V4
total benefits	20 906.27	16 170.14	51 088.55	8 406.79	**96 571.75**
indirect export benefits	17 356.97	13 420.73	38 622.85	7 478.01	**76 878.57**
direct export benefits	1 822.82	2 103.62	7 501.33	228.85	**11 656.62**
direct capital benefits	1 726.48	645.79	4 964.37	699.93	**8 036.57**
total benefits	100%	100%	100%	100%	**100%**
indirect export benefits	83%	83%	76%	89%	**80%**
direct export benefits	9%	13%	15%	3%	**12%**
direct capital benefits	8%	4%	10%	8%	**8%**
total benefits by EU-15 MS (EUR mn)					
AT	2 423.89	3 285.77	3 127.42	1 402.30	**10 239.38**
BE	696.76	1 015.88	2 457.68	568.70	**4 739.03**
DE	10 236.23	6 147.17	20 680.97	3 174.38	**40 238.75**
DK	147.30	308.50	1 331.46	73.72	**1 860.98**
EL	59.57	34.68	285.88	22.40	**402.54**
ES	527.91	326.39	4 176.19	316.08	**5 346.58**
FI	77.14	74.16	527.87	28.40	**707.57**
FR	1 463.04	1 219.28	3 651.82	811.60	**7 145.75**
IE	234.11	307.87	638.51	34.35	**1 214.84**
IT	1 119.77	1 622.14	5 201.24	956.63	**8 899.78**
LU	83.29	49.03	164.56	62.79	**359.67**
NL	1 947.03	838.04	4 423.91	590.08	**7 799.06**
PT	105.65	68.87	234.36	16.15	**425.02**
SE	879.15	210.96	1 864.31	82.34	**3 036.77**
UK	905.43	661.40	2 322.36	266.85	**4 156.05**
total benefits by EU-15 MS (structure)					
AT	11.6%	20.3%	6.1%	16.7%	**10.6%**
BE	3.3%	6.3%	4.8%	6.8%	**4.9%**
DE	49.0%	38.0%	40.5%	37.8%	**41.7%**
DK	0.7%	1.9%	2.6%	0.9%	**1.9%**
EL	0.3%	0.2%	0.6%	0.3%	**0.4%**
ES	2.5%	2.0%	8.2%	3.8%	**5.5%**
FI	0.4%	0.5%	1.0%	0.3%	**0.7%**
FR	7.0%	7.5%	7.1%	9.7%	**7.4%**
IE	1.1%	1.9%	1.2%	0.4%	**1.3%**
IT	5.4%	10.0%	10.2%	11.4%	**9.2%**
LU	0.4%	0.3%	0.3%	0.7%	**0.4%**
NL	9.3%	5.2%	8.7%	7.0%	**8.1%**
PT	0.5%	0.4%	0.5%	0.2%	**0.4%**
SE	4.2%	1.3%	3.6%	1.0%	**3.1%**
UK	4.3%	4.1%	4.5%	3.2%	**4.3%**

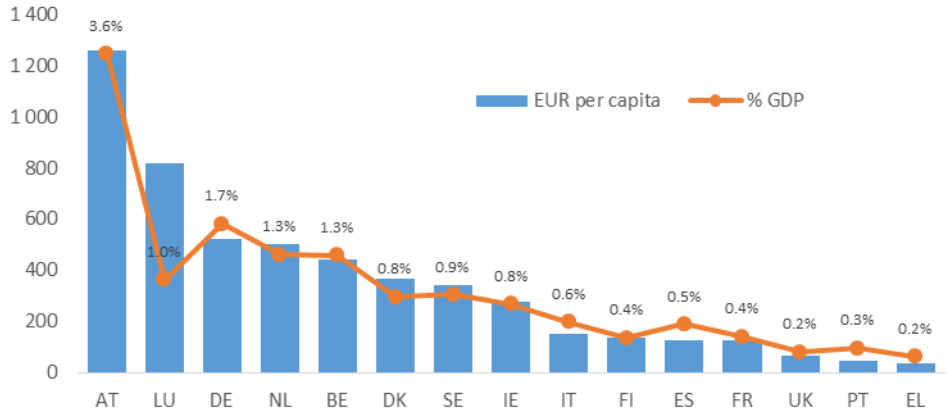
Source: Own elaboration

Since more than 3/4 of the benefits enjoyed by the EU-15 thanks to Cohesion Policy implementation in the V4 are associated with the indirect export category, the structure of total economic benefits resembles the proportions described in the macroeconomic study.

- In 2007-2015, the vast majority of economic benefits (42%) went to Germany, the main trading partner of the V4, and thus one with a dominant share in indirect export benefits. Also, companies registered in Germany and local V4 enterprises with a majority German stake were quite pro-active in securing orders associated with direct implementation of Cohesion Policy co-financed projects.
- Austria, France, Italy, Spain and Sweden are an interesting cluster. The total benefits of each of these countries exceed EUR 3 bn, with a sizeable share not only of indirect export benefits, but also of direct export benefits and direct capital benefits. Spain (over 70% of direct benefits) and Sweden (over 40%) stand out in this comparison. Apart from Austria, none of these countries is a major trading partner for the V4. Yet, the presence of Swedish and Spanish companies in the construction markets in Poland and the Czech Republic has meant that enterprises like Skanska or Budimex were substantial executors of top infrastructural projects.
- The specificity of Belgium, Netherlands and United Kingdom is also worth noting. The presence of their enterprises as direct contractors or suppliers was minor (Netherlands) or practically non-existent (Belgium, UK). However, due to relatively strong commercial ties with V4 countries, these member states account for over 10% of total benefits, which are practically and exclusively indirect export benefits.

The above does not take into account the size of respective economies. From the perspective of the ratio of each country's total benefits to their the GDP, the relative weight of additional exports and capital gains connected with Cohesion Policy implementation in the V4 turns out to be the greatest in Austria (3.6% of annual GDP) and Germany (1.7% of annual GDP) followed by the Benelux countries.

Figure 49. Total benefits to the EU-15 in 2007-2013 programming period (i.e. 2007-2015) as a percentage of per capita GDP in 2010

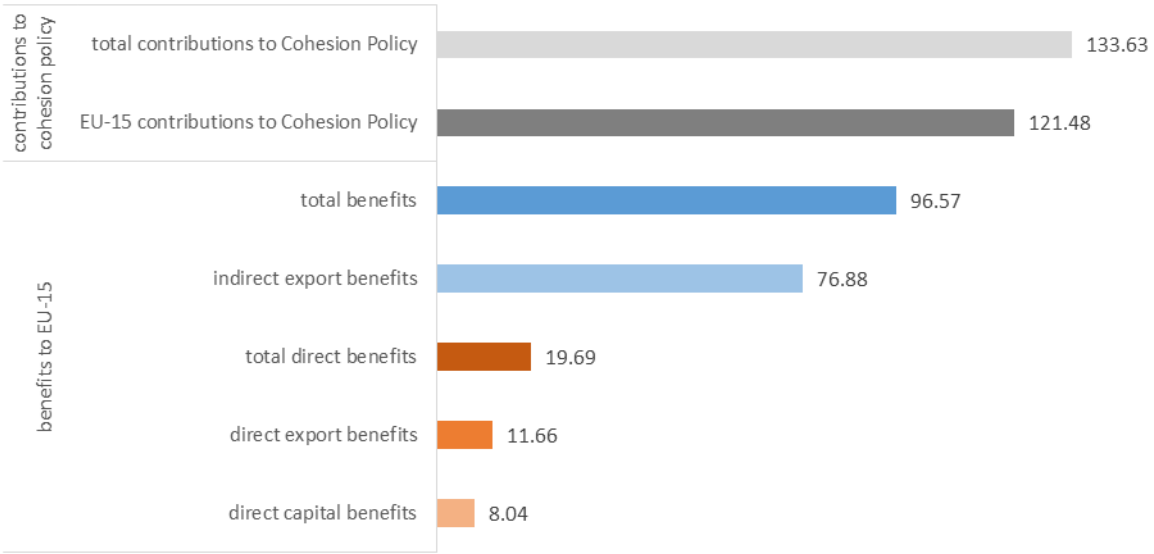


Source: Own elaboration.

The Cohesion Policy in V4 countries would not be feasible on the current scale without EU-15 contributions to the EU budget. For this reason, it is interesting to compare the estimated benefits with the contributions made by each member state to the execution of operational programmes co-financed with structural funds and the Cohesion Fund. Assuming that EU-15 participation in Cohesion Policy financing in the V4 is proportionate to their contributions to the EU budget, the contributions may be estimated at ca. EUR 121 bn in 2007-2015. Consequently, the total economic benefits of ca. EUR 96.6 bn equal 80% of the costs incurred. Austria enjoys by far the most advantageous balance in this respect (over 300%). With its strong economic ties to all V4 countries and in relation to the size of its economy, Austria boasts a large share both in additional exports spurred by increased demand in the Czech Republic, Hungary, Poland and Slovakia and in direct implementation of Cohesion Policy-funded projects in these countries. This holds true also for Germany, which enjoys the greatest benefits in absolute terms, but its benefit-to-cost ratio (150%) is lower than in Austria and this due to the sheer size of the German economy. The balance for the Benelux countries is also in excess of 100%. This can be solely explained by their strong commercial ties with the V4 and by producing additional exports as a result of Cohesion Policy implementation.

When interpreting the ratio between the benefits estimated in this report and the contribution of each member state to Cohesion Policy implementation in the V4, one should also bear in mind that the EU-15 also receive structural fund and Cohesion Fund support. When taking into account such benefits paid in 2007-2015, Greece, Portugal and Spain also emerge as net Cohesion Policy beneficiaries, albeit to a smaller extent than V4 countries. If the analysis is limited only to net contributors (EU-12) and if their contributions are adjusted for transfers they receive the core results do not change: the cost-to-benefit ratio is still the most advantageous for Austria, Germany and the Benelux.

Figure 50. Total benefits – summary (EUR bn)



Source: Own elaboration.

Map 2. Ratio of EU-15 total benefits to EU-15 gross Cohesion Policy contributions (%)

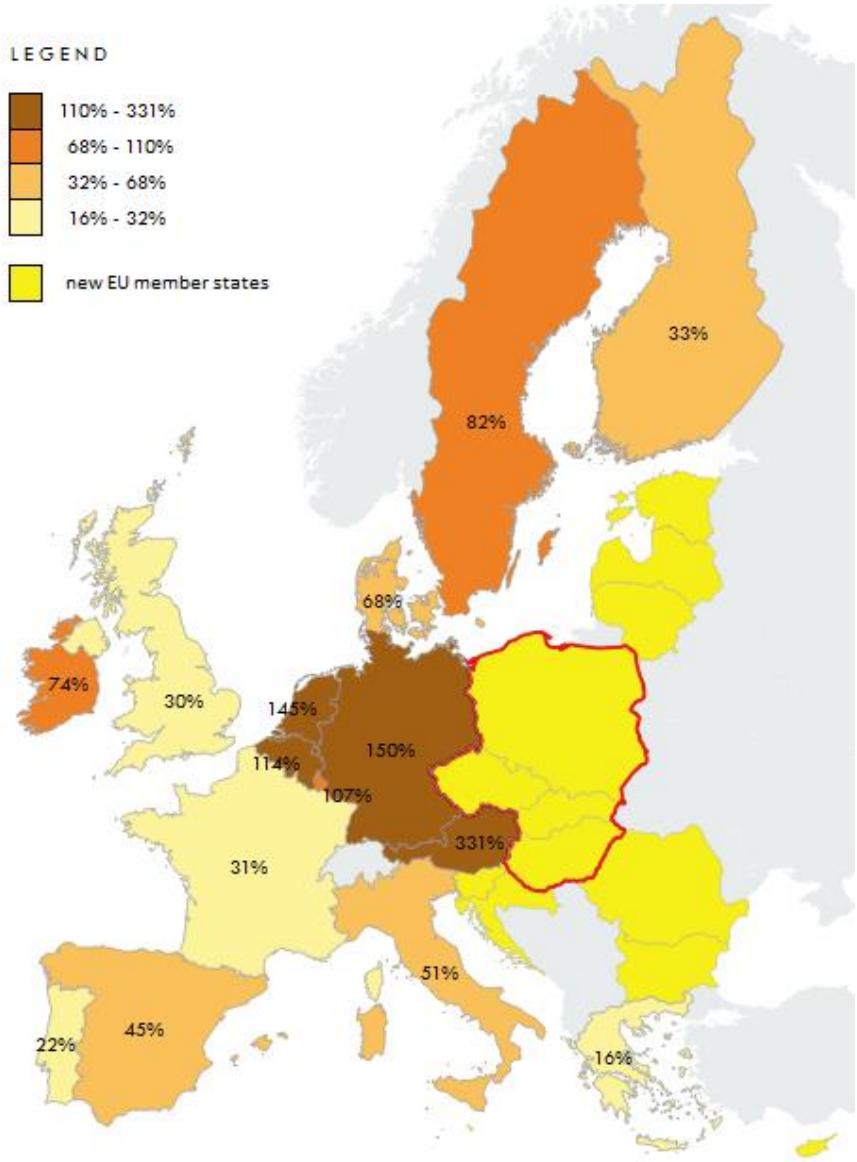
EUR **96.6** billion

total economic benefits to the EU-15 in 2007-2015

The EU-15 MS **contributed** ca. **EUR 120 billion** to the Cohesion Policy in the V4.

The **total economic benefits to EU-15 MS** resulting from implementing cohesion policy in V4 amount to **EUR 96.6 billion**, which is approx. **80% of their contribution**.

Percentages on the map: benefits to each EU-15 country as a % of its gross spending for the cohesion policy in V4 countries in 2007-2015.



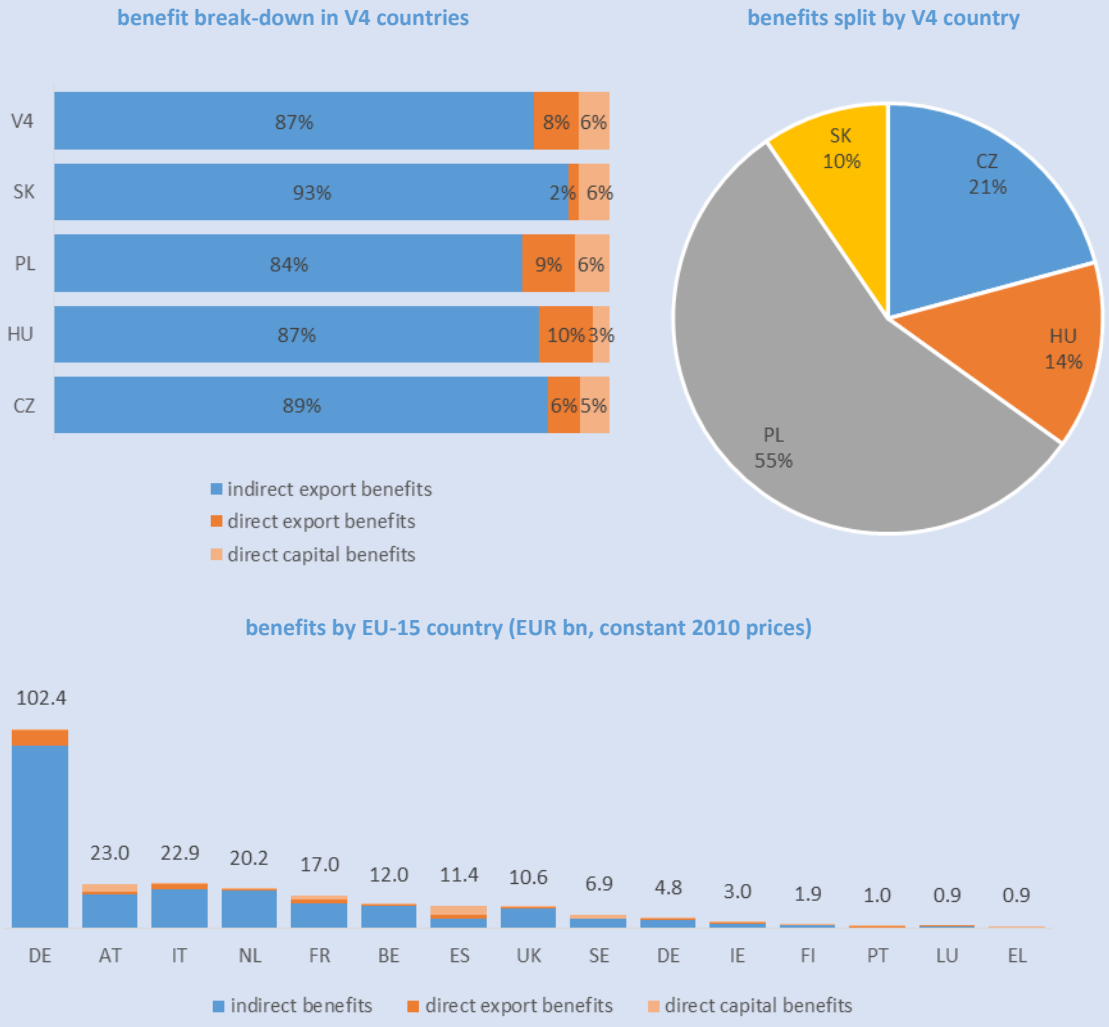
Source: Own elaboration.

Box 9. Forecasted total benefits until 2025.

The available information allows for a preliminary forecast of benefits to be enjoyed by EU-15 countries by 2025, with combined joint impact of the 2007-2013 and 2014-2020 financial perspectives. Aggregating both programming periods in one forecast is recommendable for two reasons. Firstly, the perceived indirect impact of 2007-2013 programme implementations will continue beyond 2015 and will amplify the macroeconomic impact of interventions in 2014-2020. Secondly, when defining direct benefits generated by 2014-2020 programmes, only empirical data from the previous financial perspective may be used.

The total benefits to EU-15 countries from both financial perspectives under review here are estimated at ca. EUR 239 bn, in constant 2010 prices. The break-down of benefits is in principle similar to the evaluation results for 2007-2015. The relatively smaller share of microeconomic benefits is a consequence of the additional impact driver arising after 2015 i.e. the macroeconomic effects of the 2007-2013 programmes once the spending cycle ends. The ratio between the estimated benefit value and the forecasted EU-15 contributions to Cohesion Policy implementation in the V4 is approx. 103%. Apart from the aforementioned additional impact driver, the explanation for this ratio lies in the forecast being extended until 2025.

Figure 51. Forecast until 2025 (joint impact of 2007-2013 and 2014-2020 perspectives)



Source: Own elaboration.

4 Positive externalities

4.1 Externalities

The previous chapter focuses on two mechanisms which yield benefits to the EU-15 as derived from Cohesion Policy implementation in the V4. These are additional exports and direct involvement in contractor or supplier capacity in EU-funded projects. A specific feature of these studies was the ability to identify benefits and to quantify them with a methodologically coherent cross-sectorial and geographical approach.

However, the list of impacts following from the implementation of Cohesion Policy programmes in the Czech Republic, Hungary, Poland and Slovakia is more extensive. In this chapter four groups of positive externalities are investigated in more detail. Here the approach is mainly qualitative. It is based on case studies, and additionally on adequate statistical data and results of a survey conducted among beneficiaries.

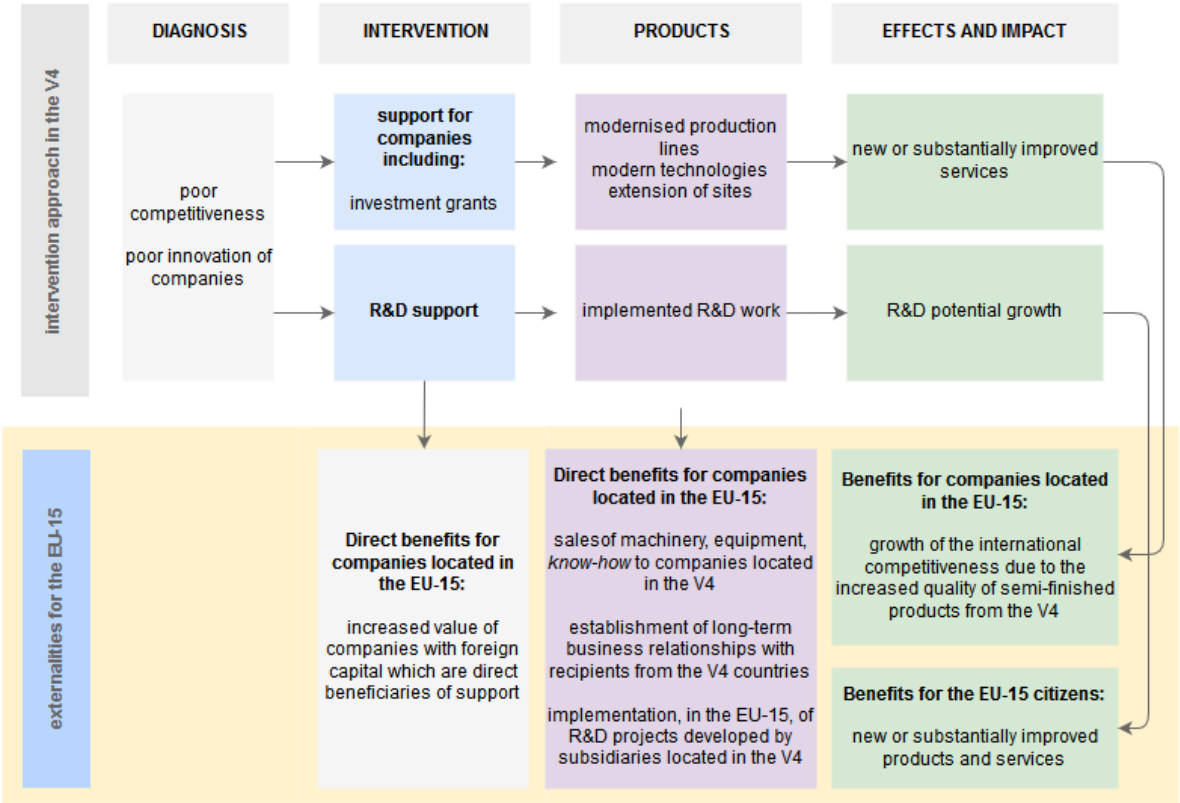
Like with the economic impact, it is noteworthy that from the EU-15 perspective externalities cannot be regarded as a shift of the positive impact of interventions at the expense of V4 countries. Such mechanisms exemplify the mutual benefits gained by both direct beneficiaries of support and co-financing parties.

4.2 Externalities of business support

4.2.1 Intervention logic and impact

In the run-up to the implementation of 2007-2013 operational programmes, companies operating in V4 countries were marked by a relatively low rate of innovations and little R&D investment. In this regard the picture was particularly bleak in Poland and Slovakia; the Czech Republic is at the other end of the spectrum. Despite some differences between countries, during programming of the 2007-2013 financial perspective it was argued that each country needed adequate incentives in place to increase the rate of innovation of businesses located there, plus increase investments in R&D operations. The anticipated support was meant to solve problems with insufficient access to funding in innovative and therefore riskier projects. The long-term objective was to trigger a permanent shift in the approach among businesses which would result in increasing the number of innovative projects and R&D activity in business with no public support. This could lead to the V4 gradually shedding their imitative economic model.

Scheme 4. Intervention logic in the V4: support to business



Source: Own elaboration

Figure 52. Share of funds allocated to boosting business innovation, R&D and ICT take-up in relation to total financial support for the V4[42]

Projects aimed at boosting business innovation, enhancing R&D capabilities and ICT take-up exceeded EUR 16.4 bn, or ca. 10 % of appropriations in the 2007-2013 perspective.

In each V4 country support in this area is comparable with other interventions, with slight differences in favour of Poland and Hungary. Such projects were relatively less present in the Czech Republic and Slovakia.

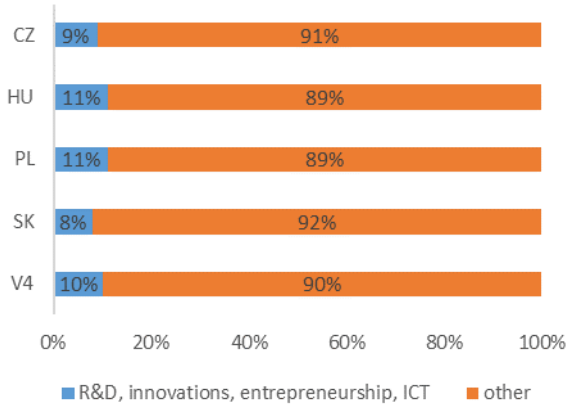
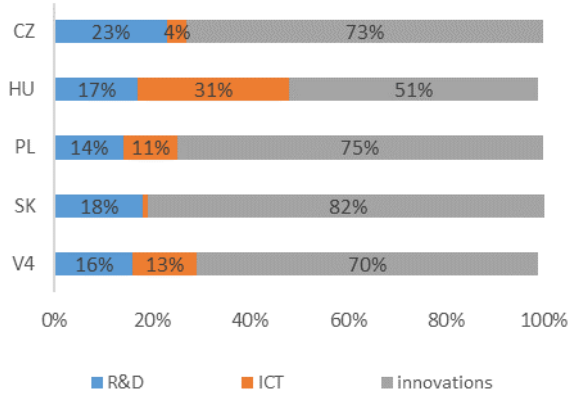


Figure 53. Share of appropriations per type of business development service, excluding energy

Across all the countries most funds went to business innovation, including roll-out of product and process innovation, e.g. to buy state-of-the-art technologies. Approx. 16% of the support was channelled to develop R&D capabilities in businesses and implement the outcomes of R&D work. However, in the Czech Republic this is much more the case: the spending amounts to almost a quarter of the expenditure. The relatively high share of support for ICT development and increased ICT take-up is a result of marked presence of such interventions in Hungary and a little less so in Poland. In the Czech Republic and Slovakia support projects of this kind made up a small figure in total business development investments.



Source: Own elaboration based on EC data.

In 2007-2013, over 60 thousand enterprises in the V4 and 70 thousand projects received support from Cohesion Policy funds in innovation, R&D and ICT take-up. Most grant beneficiaries were located in Poland and Hungary, countries where also the biggest quota of available cohesion funds was assigned to business support services. The value of support per project varied significantly between the V4. Undisputedly, the biggest projects that received support were in Slovakia and the smallest ones in Hungary.

[42] The chart illustrates data for intervention categories 1-9 and 11-15.

Figure 54. V4-based companies which benefited from Cohesion funds in innovation, R&D and ICT take-up

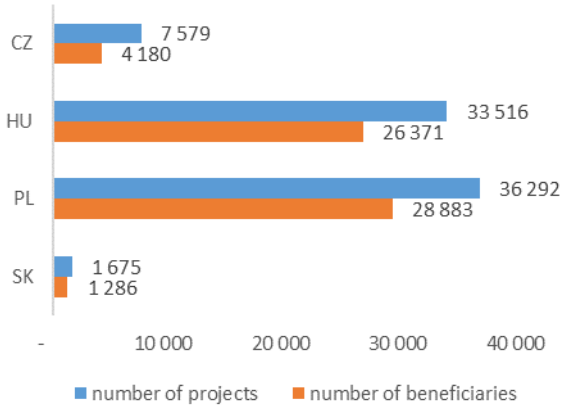
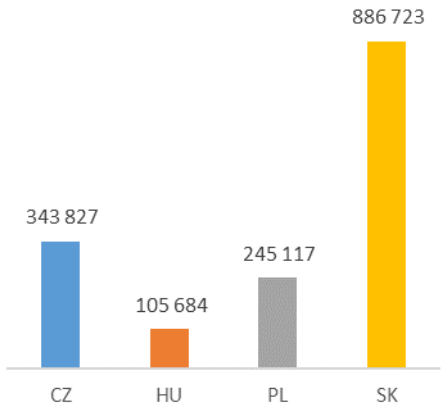


Figure 55. Average support per project (EUR)



Source: Own elaboration based on monitoring data.

In the intervention period, investments in R&D in business soared in all V4 countries. This was particularly apparent in Hungary, a country which in terms of BERD investments in relation to GDP already compares to the Czech Republic. The current BERD/GDP ratio in Poland and Slovakia, which ranked very low in this respect in the initial years of the 2007-2013 financial perspective, is almost twice as high against 2007 figures. The significant direct impact of Cohesion funds on the size of R&D investments is noteworthy. The share of EU investments in R&D projects of businesses in total BERD expenditure in 2007-2014 ranged from 8% in the Czech Republic to 15% in Poland.

Figure 56. Total R&D (GERD) investments to GDP

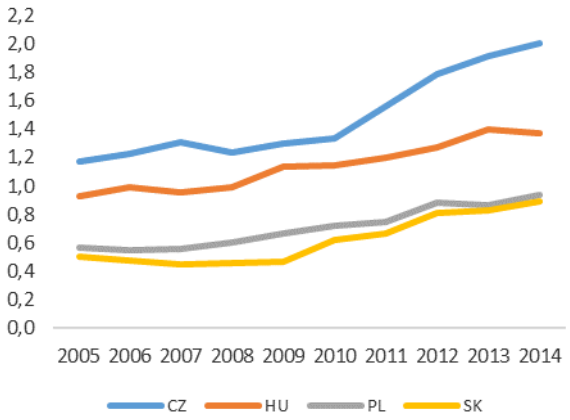
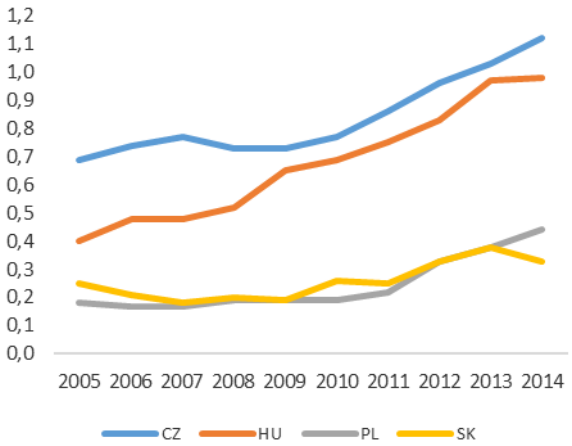
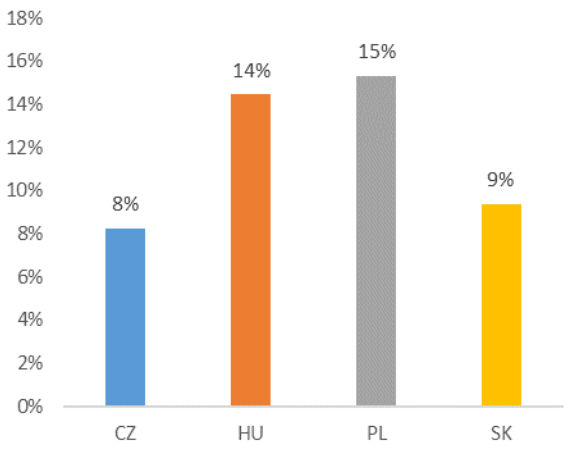


Figure 57. R&D investments in the business sector (BERD) in relation to GDP



Source: Own elaboration based on Eurostat data.

Figure 58. Share of EU support in business R&D projects in total BERD expenditure in 2007-2014



Source: Own elaboration based on beneficiary survey.

In line with the support approach adopted at the programming stage, the positive impact of interventions at the macro- and microeconomic levels is confirmed by numerous assessment studies of innovation and entrepreneurship support programmes implemented in the V4.[43,44]

Businesses located in countries that were direct support recipients (Czech Republic, Poland, Slovakia and Hungary) were primary beneficiaries thanks to relatively large resources dedicated to stimulate innovation and increase R&D. However, as positive externalities materialised, businesses and residents in the EU-15 may also be regarded as beneficiaries of the Cohesion Policy pursued in the V4.

4.2.2 Externalities

Provision of direct support to V4-based economic enterprises was one of the primary tools in Cohesion Policy implementation in 2007-2013. The support was designed to contribute to achieving an EU priority: *support innovation, entrepreneurship and the growth of the knowledge economy by tapping into the opportunities in research and innovation, including new information and communication technologies*.[45]

The key objective of direct support to businesses in the V4 was to increase their innovation, thus improving their products and services on offer, and adjust them to consumers' evolving needs. Thanks to the support, V4-based enterprises could increase their competitiveness in internal and external markets and contribute to consolidating the growth foundations of local economies. This in turn could have positive impact on the pace of convergence in the least-developed EU regions.

[43] *Evaluation of economic effects and programme settings – support programmes in Innovation, Cooperation and Potential – Operational Programme for Enterprise and Innovations*, Prague 2011.

[44] *Assessment of the Operational Programme: Innovative Economy for the Improvement of Business Innovation* commissioned by the Ministry of Infrastructure and Development, Warsaw 2014.

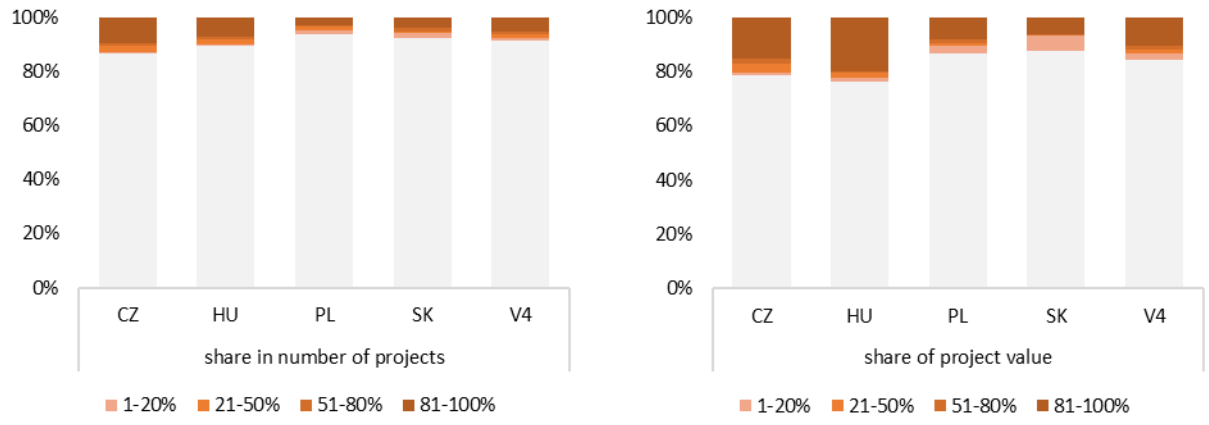
[45] Council Decision of 6 October 2006 on Community strategic guidelines on cohesion (2006/702/WE).

Benefits to foreign-owned beneficiaries

The most apparent category of benefits concerns V4-based businesses owned by foreign investors which were also direct Cohesion fund beneficiaries. Bigger manufacturing assets reflect onto their increased shareholding value. Additionally, upgraded production lines and new technologies yield more labour productivity. This works to the benefit of foreign investors in additional earnings. Furthermore, thanks to EU funds, enterprises may strengthen their position in V4 markets. This in turn guarantees long-term benefits such as increased revenue streams. In the case of V4 subsidiaries of foreign corporations, the outcome of R&D, innovative products and other solutions introduced in the business of enterprises which implement projects in a V4 country may also be enjoyed by their EU-15 based parent company. As a result, foreign corporations may benefit R&D carried out by V4-based researchers and experts at a much lower cost than what they would otherwise have to incur in the EU-15[46]. This has a positive domino effect throughout the parent company.

The survey shows that companies with a foreign capital stake got 16% of all funds designed for innovation support, R&D and ICT take-up in V4 countries. Their share was significantly higher in the Czech Republic and Hungary (over 20 %), and relatively lower in Poland and Slovakia (13 %). It is worth noting that the share of enterprises with foreign equity is much higher in terms of project value than in the number of projects. This implies that on average they would secure funding for projects of a greater value than domestic companies. However, the sectorial analysis shows that the share of (partly) foreign-held companies in the value of foreign projects in industry and construction was high (30 %), while it was much lower in the service sector (12 %).

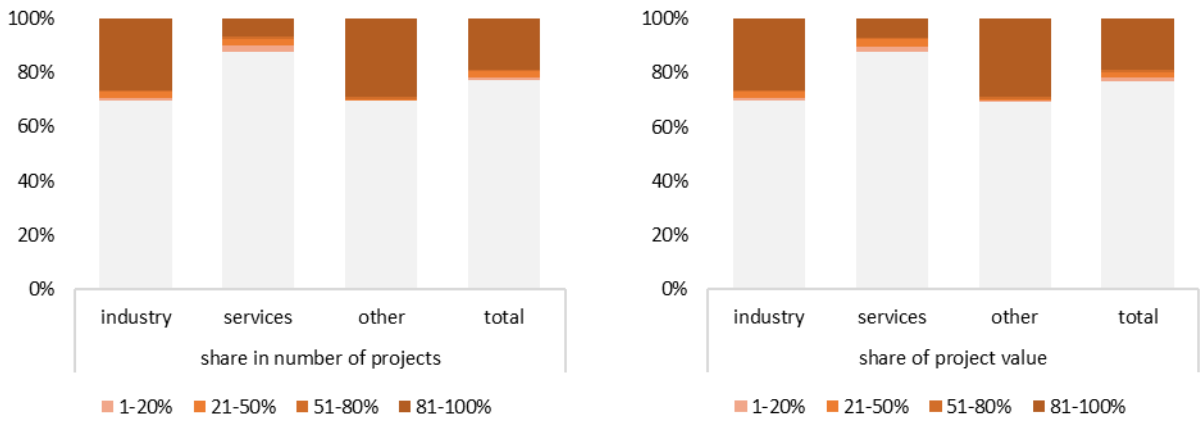
Figure 59. Share of companies with foreign ownership among beneficiaries in the V4



Source: Own elaboration based on beneficiary survey.

[46] According to a European Commission study, in 2007 the average annual researcher remuneration in the V4 ranged from EUR 9.2 thousand in Slovakia to 19.6 thousand in the Czech Republic, while in the EU-15 it varied between EUR 25.7 thousand in Greece and EUR 63.9 in Luxembourg. After: European Commission Research Directorate, *Remuneration of Researchers in the Public and Private Sectors*, Brussels 2007

Figure 60. Share of companies with foreign ownership among V4-based beneficiaries, by sector



Source: Own elaboration based on beneficiary survey.

One example of a company with a dominant EU-15 capital share is Continental Automotive Czech Republic s.r.o., a tyre manufacturer. It is owned by Continental AG, German leader in that sector. The company implemented as many as 11 projects supported with EU funds for a total of CZK 309.7 mn (EUR 11.5 mn) (see box - Case study - Continental). The direct advantage for the parent company is in bigger assets of the Czech subsidiary which may thus generate greater revenue in effect of project implementation. Additionally, innovative products and R&D work outcomes will be enjoyed by the parent company in Germany and in all its manufacturing sites across the EU-15.

Box 10. Case study – Continental

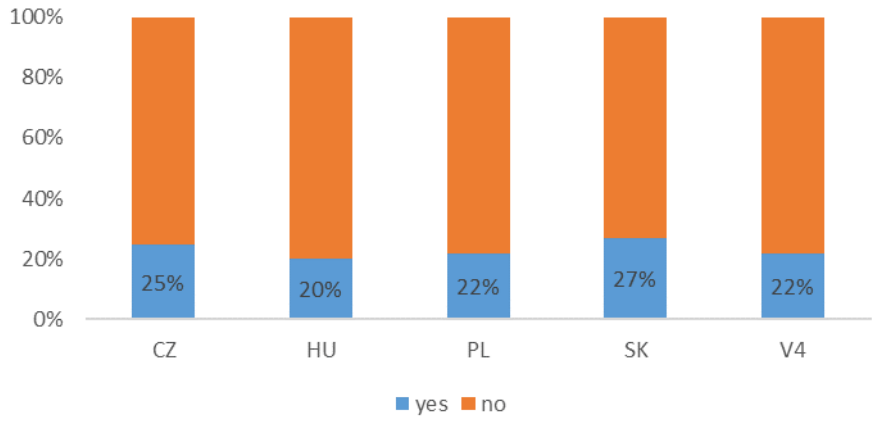
Projects	**11 projects supported with EU funds**
Beneficiaries	**Continental Automotive Czech Republic s.r.o., Czech Republic**
Programme	**OP Podnikání a inovace (ERDF)**
Project value	**EUR 35.4 mn**
EU funding	**EUR 11.5 mn**
Continental Automotive Czech Republic s.r.o. is a subsidiary of Continental AG from Germany, the world's fifth supplier to the automotive industry specializing in vehicle tires. Currently, one in three European cars drives on Continental tires. The Czech subsidiary has six manufacturing sites and one research centre with 12.5 thousand employees in total.	**Beneficiary**
Project scope	In 2007-2013, Continental Automotive Czech Republic carried out 11 projects supported with EU funds. One of them was *The expansion of laboratory R&D of Continental in the Czech Republic*. The project's objective was to increase the manufacturing capacity of Continental's laboratories used for research in and production of i.a. new motor vehicles, on-board systems, air conditioning panels, radio sets, navigation systems, brake discs, brake assist systems, ventilation and air conditioning. The project was rolled out in four Czech factories: Brandýs nad Labem, Trutnov, Jičín and Adršpach. The laboratories were equipped with new machinery and essential software.
The R&D centre expansion in the Czech Republic enhances the technological advancement of the company's products and contributes to creating quality jobs in R&D. Additionally, the diffusion of knowledge mechanisms may contribute to technology transfer to other	**Outcomes of the V4 project**

	automotive manufacturers. As an international business, Continental will be able to gradually step up R&D investments in the Czech Republic. This could substantially boost future demand for labour in this segment. In connection with the project, the company is planning to expand cooperation with the University of West Bohemia in Pilsen and secure new partners in higher education institutions to develop cooperation in car equipment R&D. Funding research in higher education institutions and for graduate programmes will also be part of the cooperation with academia.
Externalities	The direct advantage for Continental AG spawned by the implementation of all 11 Cohesion funds-supported projects lies in greater asset value of the Czech subsidiary which adds value to the entire company with its new additional earnings capacity. Also, innovative products and solutions developed in newly expanded R&D laboratories will be enjoyed by the German parent company and other entities across the EU-15 where the corporation has its manufacturing sites. With the expanded R&D centre in the Czech Republic, the company may benefit R&D activity carried out by experts at a much lower cost in comparison with the EU-15. This boosts international competitiveness for Continental AG.

Benefits from direct participation in project implementation and from new business relations

Another set of benefits are EU-15 enterprises' sales of high tech products to project beneficiaries in Poland, Czech Republic, Slovakia and Hungary. V4-based enterprises used the funds to replace and upgrade their plant and machinery and buy state-of-the-art technologies. As a result, they could radically boost their production capacity and product quality, thus increasing their competitiveness in domestic and international markets. As the survey indicates, over 20% of Cohesion Fund beneficiaries used the funds to procure equipment, plant and know-how from EU-15 based entities, which contributed to their bigger exports, helped to generate earnings and promote jobs in the EU-15. A good example is Grupa Kęty S.A. from Poland. As part of an EU-financed project, it bought plant and machinery from EU-15 based sellers for ca. PLN 38 mn. The company also set up a R&D centre to develop new technologies for extrusion and manufacturing of casting alloys. Eventually, Grupa Kęty S.A. began supplying components to leading automotive (Porsche, Ferrari, Volvo) and rail (Alstom, Siemens) manufacturers in the EU-15.

Figure 61. Share of businesses which bought plant, equipment, appliances or software from EU-15 manufacturers with project support.



Source: Own elaboration based on beneficiary survey

In some cases new business relations with EU-15 companies established during project implementation may be reasonably expected to continue in future. The survey indicates that almost 60 % of those who received support and procured goods or services from EU-15 based entities continued to transact with the same supplier after their project was complete. It suggests that thanks to project implementation long-term business ties have been established between V4 and EU-15 businesses. Additionally, in the plant and equipment category, contracts are often followed by after-sales service, i.e. maintenance and repair of the equipment purchased, plus sales of spare parts.

Figure 62. Share of support recipients who continued business with the same EU-15 based supplier/ contractor before the project started

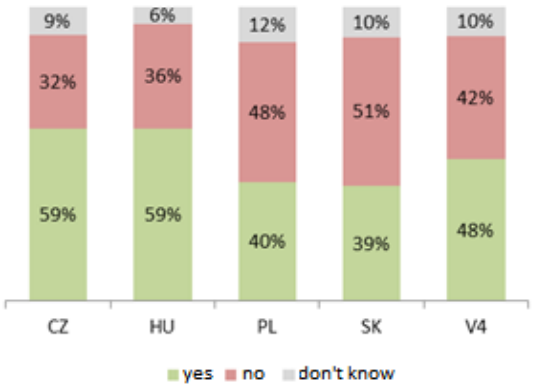
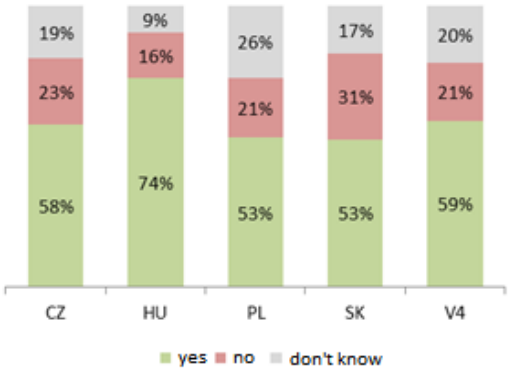


Figure 63. Share of support recipients who continued business with the same EU-15 based supplier/ contractor following project completion

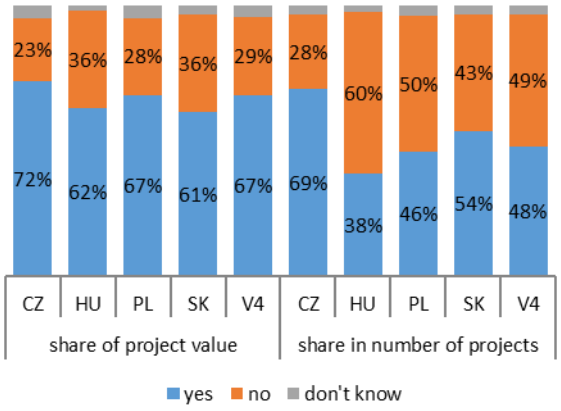


Source: Own elaboration based on beneficiary survey

New products and services in EU-15 markets

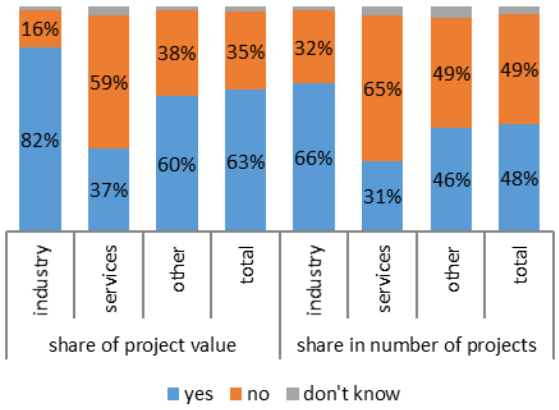
Supporting innovation and growth of the R&D capacity of V4-based enterprises, especially those exporting to the EU-15 is to the benefit of their product and service consumers. Both businesses and consumers enjoy better quality products at affordable prices.

Figure 64. Share of beneficiaries who export products or services to the EU-15



The survey shows that in the population of Cohesion Policy beneficiaries there is quite a large share of exporters to the EU-15. Across the whole V4, they represent nearly half of the supported beneficiaries and their share in the total value of subsidised projects was 67%. Sectorial diversity should be pointed out here – the share of beneficiaries who export to EU-15 countries is much higher in industry and construction than in services.

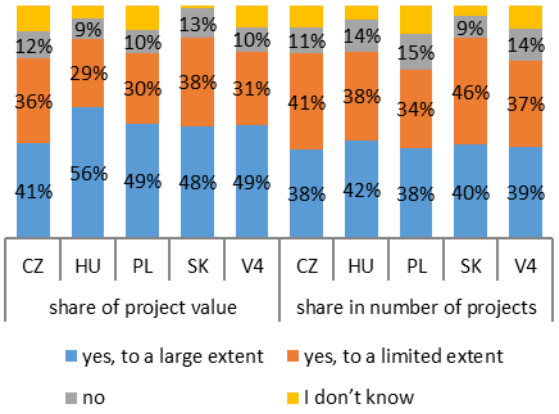
Figure 65. Share support beneficiaries who export products or services to the EU-15, by sector



Importantly, in more than 75% of the cases, the implementation of Cohesion Policy co-funded projects contributed to boosting exports to the EU-15. Out of this, 40% of companies found it to be a considerable growth.

Among the resulting major comparative advantages in the European markets respondents quoted superior quality or better functionality of products.

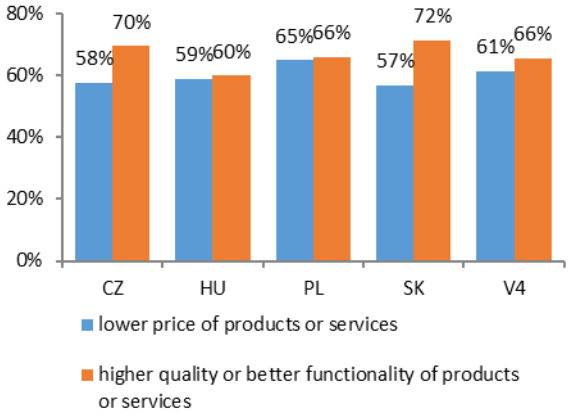
Figure 66. Share of support beneficiaries with boosted exports to the EU-15 thanks to project implementation



This was particularly frequently referred to by Czech and Slovak beneficiaries (over 70%). Consumers from EU-15 countries benefited by having quality affordable products, which increased their domestic purchasing power.

Of particular value here are brand new products that were previously unavailable in the EU-15 and were developed in the V4 thanks to Cohesion fund support.

Figure 67. Major competitive advantages to economic beneficiaries in EU-15 markets



Source: Own elaboration based on beneficiary survey

An industry of particular importance for EU-15 member state nationals is medical services. This is due to the progressive aging of the European population. Innovations that may enhance the quality of care, improve the quality of patients' life or increase safety of care protocols and therapies are an enormous benefit. Innovative solutions developed in the V4 within Cohesion Policy projects and their implementation in the European medical market are therefore a potential medical benefit for people across the EU-15. Thanks to EU subsidies, Chirana Medical a.s. from Slovakia conducted research on diagnostics, control and channelling artificial respiration used in intensive care and anaesthesiology. As a result, AUTOLungs, a new innovative system was developed. It is being applied in VENAR TS and Chirana Aura V, both anaesthetic and intensive care appliances. Their use in hospitals, including those in the EU-15, will help reduce mortality among the most vulnerable patient category (those awaiting transplants, or subject to complex cardiology and neurosurgery procedures with potential brain damage caused by oxygen deficiency). Simplified procedures will also now be available to older people where previously they were excluded because of the risk of damage to the cardiovascular system and other anaesthetic-related risks.

Digiterm from Hungary is another example. Thanks to EU funds Digiterm developed Dia Care, an innovative armchair for dialysis, and modernised the range of Comfort-4 armchairs used in dialysis stations in many EU countries. The armchairs are equipped with intelligent control systems and other electronic solutions. They contribute to enhanced comfort of patients coupled with the safety and effectiveness of the procedure. They also facilitate the work of medical staff.

Map 1. Case studies - business

Type of externality	Project
Market for high-tech products and services from the EU-15	***(1) Implementation of innovative AlMgSi alloy extrusion technology in Grupa Kęty and (2) Establishment of R&D Centre in Grupa Kęty S.A.***
	Grupa Kęty S.A. (operating as Zakłady Metali Lekkich „Kęty" before the year 2000) is a leader in aluminium processing in Poland. As a part of the project called *Implementation of the innovative AlMgSi alloy extrusion technology,* a production line was supplied by Turla from Italy. This innovative alloy extrusion technology also involves a gas billet preheater by Extrutec, a German supplier, and a front-loading press by Presezzi from Italy. The enterprise spent ca. PLN 38 mn on the equipment, thus directly increasing exports of high tech products by German and Italian companies to Poland. Thanks to the new R&D centre, new technologies for extruding and producing casting alloys were put in place. Hence, the company started cooperating with leading automotive (Porsche, Ferrari, Volvo) and rail (Alstom, Siemens) manufacturers based in the EU-15. Grupa Kęty supplies high quality aluminium

components.

***Research in automated and semi-automated diagnostics, control and channelling of artificial respiration systems used in intensive care and anaesthesiology* – Chirana Medical a.s.**

Innovative quality products available to EU-15 users

Chirana specializes in dental care units and aesthetic equipment and respirators. The project encompassed R&D work on automated and semi-automated diagnostics, control and directing of artificial respiration systems used in intensive care and anaesthesiology, and practical roll-out of the research programme outcome.

AUTOLungs, a new innovative system was developed in the project. It was used as a component in VENAR TS anesthetic equipment and in Chirana Aura V apparatus used in intensive care. Its use in hospitals, including across the EU-15, will help reduce mortality among the most vulnerable patients (those awaiting transplants, or subject to complex cardiology and neurosurgery procedures with a potential risk of brain damage due to oxygen deficiency). It will also help simplify protocols performed on older patients which previously could not be carried out due to the risk of damage to the cardiovascular system and other anaesthesia-related risks.

In addition, the new equipment helps to combat the impact of world-wide viral pandemic and improve the safety of medical staff in hospitals.

***Comprehensive technological innovations in Digiterm to upgrade, manufacture and sell world-class medical equipment* – Digiterm Kft.**

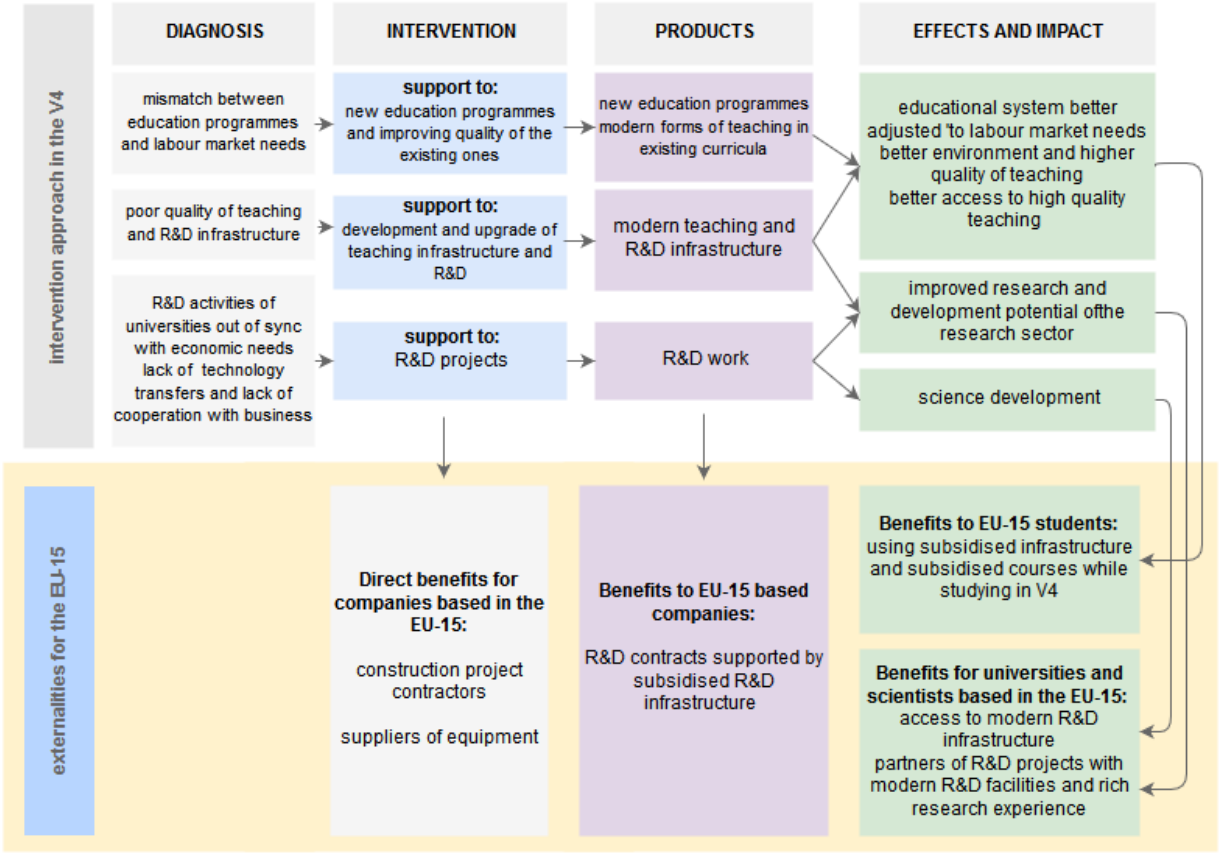
Digiterm was established in 1991. Its key business areas are the manufacturing of medical equipment and IT systems development. A prototype of the Dia Care dialysis armchair was designed and built as part of Cohesion Policy project implementation. It is in line with modern ergonomic design trends, and its modular structure makes it adaptable to user needs. Comfort-4 armchairs upgraded within the project implementation have gained customer recognition as some of the most reliable products. They are currently exported from Hungary to many EU-15 counties including Austria, Belgium, France, Germany, Greece, Ireland, Spain, Sweden and the UK.

4.3 Externalities of support to universities and higher education institutions

4.3.1 Intervention approach and impact

In the initial years of the 2007-2013 financial perspective, research and higher education in all V4 countries suffered from similar problems which included bureaucracy and limited interest in cutting-edge research. Yet, the main challenge was that of years of underinvestment and the resulting poor quality of teaching and R&D infrastructure. This in turn sapped R&D potential in the V4 as set against the EU-15, with ensuing stagnant research. The stock-taking exercise before the preparation of national strategic reference frameworks highlighted the mismatch between graduates' skills and employers' expectations combined with little cooperation between business and research. Consequently, knowledge transfer into the economy was modest.

Scheme 5. Intervention logic in the V4– support to universities and other higher education institutions



Source: Own elaboration.

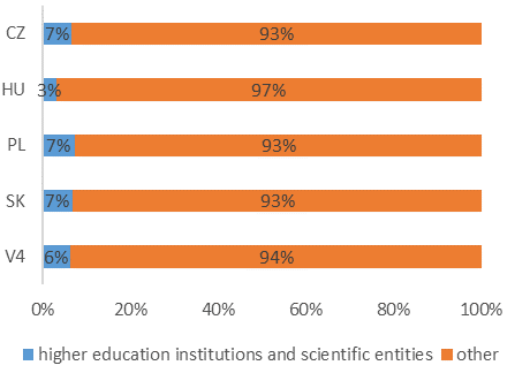
Ensuring adequate scientific research, innovation and education is key for long-term economic growth in the EU. For many years member states strived to develop science and technology to support the growth of knowledge economy by means of stand-alone domestic measures. This has led to research overlap in some areas and untapped research capacity in others. Thus, the European Union set about strengthening the European scientific and technological base to achieve a strong international position. In the early

2000's a process was launched to create the European Research Area (ERA). ERA priorities include also *striving to optimise international cooperation using a common research infrastructure*.[47]

In 2007-2013, Cohesion Policy funds triggered the development of science and cooperation in V4 countries. The unprecedented flow of support to universities and research institutes drove investments which had a great impact on improving the teaching environment and R&D work.

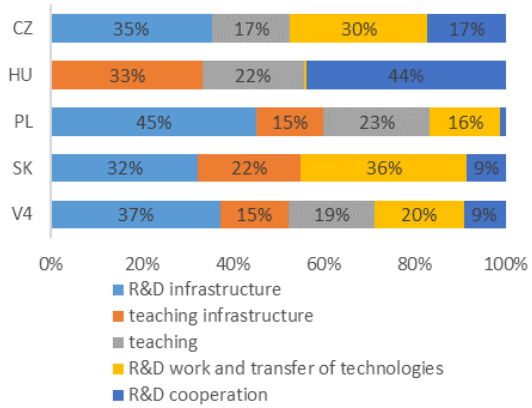
Over EUR 9 bn was allocated to support V4-based higher education and research institutions in didactics and/or R&D.[48] This accounts for approx. 6% of all support granted to these countries. Poland, the Czech Republic and Slovakia assigned ca. 7% of the funds each for this purpose. Against this background, Hungary clearly falls behind with 3% of allocated financing. Differences in the approach to supporting science and higher education are also visible in the break-down of expenditure.

Figure 68. Share of funds allocated to research institutions in total allocations in 2007-2013



The examination shows that across the V4 most funds were allocated to supporting R&D capacity of universities. Over 65% of all funds were distributed to infrastructure, R&D work and cooperation on R&D projects. Although in Poland, the Czech Republic and Slovakia priority was clearly given to supporting R&D capacity growth, in Hungary stronger emphasis is placed on enhanced didactics (infrastructure and better quality of education account for 55% of the financing) and cooperation between researchers and research centres.

Figure 69. Share of funds allocated to research institutions in total allocations in 2007-2013



Source: Own elaboration based on monitoring data

Thanks to effective project implementation at 2013 year-end, and with support from ERDF and the Cohesion Fund, 35,000 new full-time research positions were created and research institutions conducted 26,700 projects in cooperation with the private sector (of which 790 in Poland, 514 in the Czech Republic, 623 in Hungary and 262 in Slovakia). Over 6 mn students benefited the improved

[47] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: "A reinforced European Research Area partnership for excellence and growth."

[48] The examination presented in this chapter covers projects qualified for specific intervention categories. For further details see the appendix.

research and teaching infrastructure (including 1.2 mn in the V4).[49] Further conclusions may be drawn from national assessments of higher education and R&D. As noted in Hungary for example, more funding streams available to researchers spawned more publications and higher revenue growth from research-, development- and innovation-related activities.[50]

4.3.2 Externalities

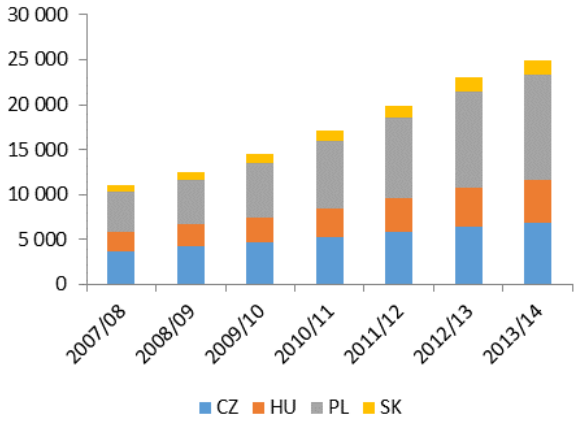
Benefits resulting from support to university teaching

The growing popularity of student exchange programmes, including the most popular Erasmus programme, and the fact that students from outside Poland, the Czech Republic, Slovakia or Hungary more and more often study in the V4 all indicate that EU-15 students also benefit from the impact of projects carried out by higher education institutions in V4 countries.

The main instrument in such cooperation has been the Erasmus programme which kicked off in 1987. Hundreds of thousands of Erasmus students and academics participate each year in international exchanges between higher education institutions throughout Europe. Erasmus is in line with the *Strategic framework for European cooperation in education and training* report (ET 2020). This document sets out long-term objectives in the area of education, to be achieved by 2020. Life-long learning and mobility are among the main guiding lines in ET 2020. The document points out that an important element of life-long learning and an effective way of increasing the employability and adaptability is the mobility of learners and research personnel. Mobility should be enhanced so that temporary studies abroad become a permanent feature in training curricula.[51]

The number of students coming to V4 countries in the framework of exchanges is growing from year to year. In the 2007/08 academic year, a total of 11 thousand foreign students travelled to Poland, Hungary, the Czech Republic and Slovakia thanks to Erasmus. Seven years later, their number was close to 25 thousand. This demonstrates not only increased mobility of the youth in Europe, but also the growing appeal of these destinations. The number of students coming to these countries every year has doubled since 2007 (and nearly tripled in Poland).

Figure 70. Students travelling to V4 countries under the Erasmus programme (2007-2013)



Source: Own calculations based on European Commission monitoring data (Erasmus+ statistics 2014).

[49] Final Report Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and Cohesion Fund (CF).
http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2013/wp0_inception_report.pdf

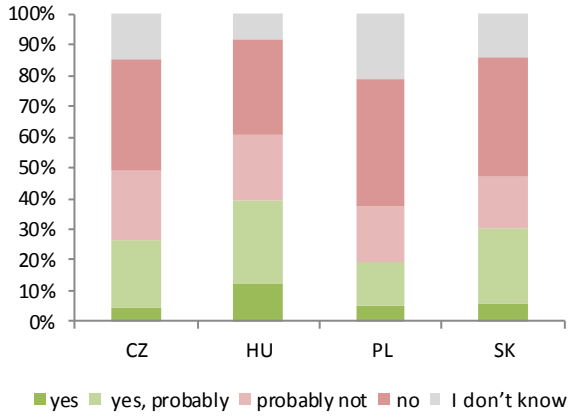
[50] Evaluation of programmes targeting higher education – Executive summary of the evaluation report. Hétfa Research Institute and Revita Foundation, National Development Agency, Hungary 2013

[51] Council conclusions on a strategic framework for European cooperation in education and training (ET 2020).

Students from Spain, Germany, France, Italy and Portugal come to V4 countries the most. Also, many Austrians go to Hungary, and Czechs often host UK students at their universities. Slovakia is also popular among its neighbours: the Czech Republic and Poland.

The impact of Erasmus on greater internationalisation of higher education institutions is not just a direct outcome of the programme's operation; indirectly it follows from the implementation of Cohesion Policy projects. On average, one in five projects in teaching elicited interest in an exchange among students or faculty staff. As a result, the number of exchange students has increased in the Czech Republic, Hungary, Poland and Slovakia, countries which have been increasingly appealing to students and academics from the EU-15.

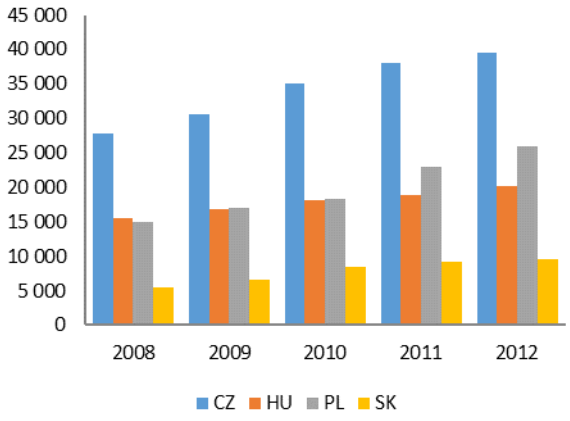
Figure 71. How project implementation has contributed to increasing the number of EU-15 students in exchange programmes (e.g. Erasmus).



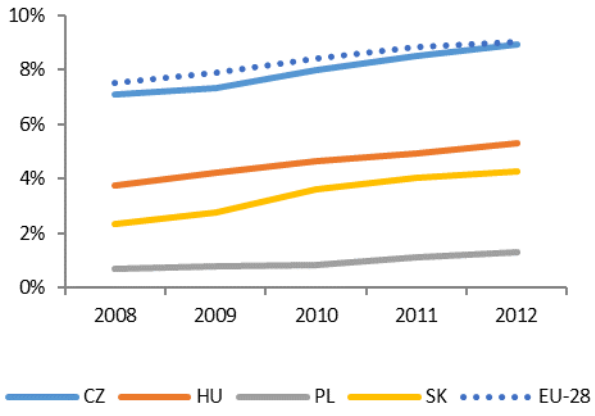
Source: Own elaboration based on beneficiary survey.

Every year, many foreigners study at Czech, Polish, Hungarian and Slovakian higher education institutions. Many foreign students come to the V4 for their entire course. By far, foreign students tend to choose Czech universities (ca. 40 thousand). There, the share of foreign students is on par with the EU average. In the other V4 countries the percentage of foreign students is much lower, although the upward trend continues. Their numbers are also regularly growing.

Figure 72. Foreign students in absolute numbers - First and second stage of tertiary education (levels 5 and 6)



F Figure 73. Foreign students as % of student population in the host country (%) (levels 5 and 6)



Source: Own elaboration based on Eurostat data [educ_mofo_fld].

The popularity of the Czech Republic among foreign students is a consequence of the country's teaching provision. Many institutions with teaching projects had already been offering studies in foreign languages. This was slightly less the case in the other V4 countries, where universities only started

developing their teaching provision thanks to Cohesion funds. Although most foreigners study at Czech universities, academic centres in all V4 countries have engaged, too, in new teaching programmes in English or another EU-15 language. Thanks to such programmes, both local and foreign students gained new opportunities for extending their knowledge and raising their language competency.

Figure 74. Percentage of universities with studies in English or another EU-15 language before project implementation

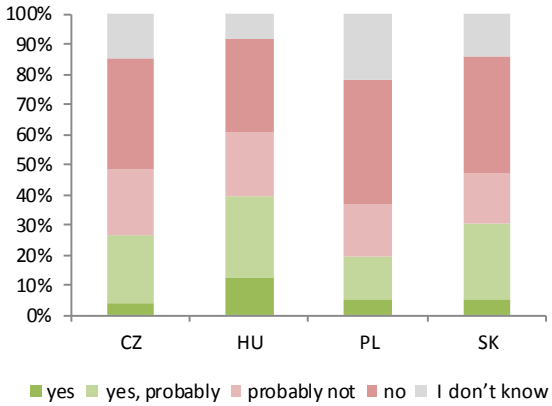
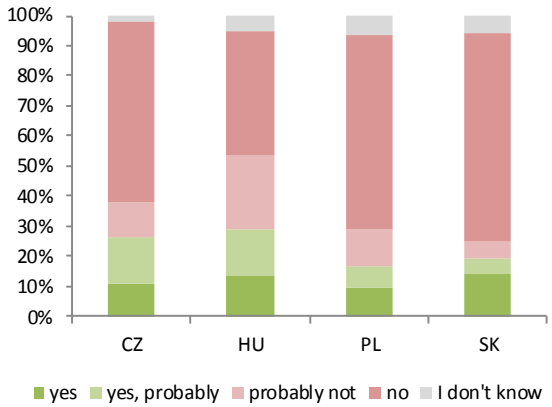


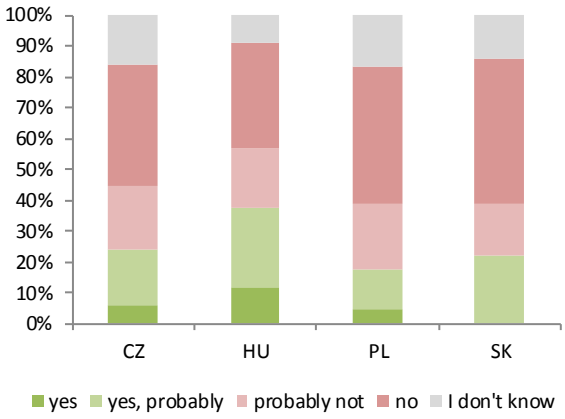
Figure 75. Project impact on launching new educational curricula in English or another EU-15 language



Source: Own elaboration based on beneficiary survey – institutions implementing teaching projects.

Cohesion funds helped higher education institutions to improve the teaching environment and quality, support educational facilities, modernise the teaching process at existing faculties and open the teaching provision to new areas of specialisation. As declared by representatives of project-implementing higher education institutions, an enhanced teaching provisioning and better teaching facilities had an impact on the number of potential students from EU-15 countries. On average, one in five projects implemented by universities to improve teaching quality, set up new faculties or improve teaching infrastructure added to increasing the number of EU-15 students.

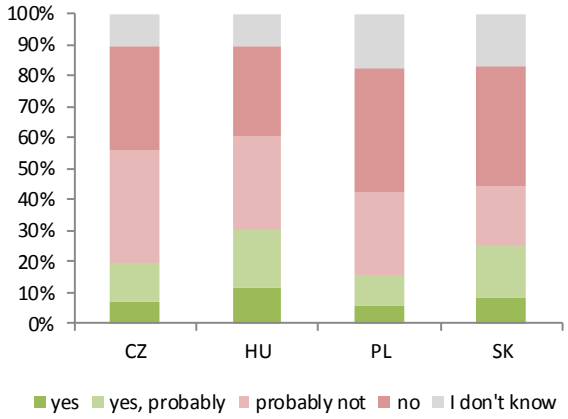
Figure 76. Project impact on increased number of EU-15 students at higher education institutions.



Source: Own elaboration based on beneficiary survey – institutions implementing teaching projects.]

Figure 77. Project impact on developing a unique teaching programme in the whole EU

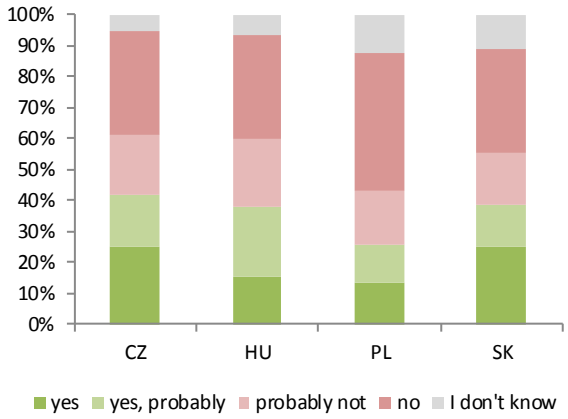
New teaching curricula that are unique to the whole EU were not an insignificant factor contributing to the popularity of universities among foreign students. New faculties and specialisation fields were set up (e.g. conversion of renewable energy, tester-programmer) and interdisciplinary studies were enabled (e.g. Electronics combined with Photovoltaics and Entrepreneurship, Medicine combined with Chemistry). Students were offered teaching curricula with the option of international certificates in their area of study.



Source: Own elaboration based on beneficiary survey – institutions implementing teaching projects

Figure 78. Project impact on the increased number of lecturers/academics from EU-15 countries involved in teaching or research at higher education institutions.

Cohesion Policy projects are also conducive to collaboration with other universities and scientific institutes from abroad. The results of the beneficiary survey show that projects led not only to the implementation of common research and development undertakings, but also to increasing the number of lecturers and academics from EU-15 involved in teaching or research at higher education institutions in the V4 countries.



Source: Own elaboration based on beneficiary survey – institutions implementing teaching.

An example of a project which, thanks to an enhanced teaching provision, has led to opening the opportunities for EU-15 students and academics is the operation implemented by Constantine the Philosopher University in Nitra under the "Operational Programme: Education, Measure 1: Reform of the Education and Vocational Training System, Sub-measure 1.2: Tertiary Schools and R&D as the Driving Forces in the Development of the Knowledge Society." The goal of the sub-measure was to promote better quality education and develop human resources for R&D in order to adapt tertiary education to current and future needs of the knowledge society. A new study field was developed thanks to the project: the inter-departmental Mass Media Studies with Integrated French Language Learning, which

helped the university in establishing intensive contacts with higher education institutions in France and Belgium and led to student and faculty exchanges.

Map 2. Case studies on higher education institutions

Externality type	Project
development of the teaching offer for EU-15 students	***Setting up a teaching programme for Mass Media Studies with Integrated French Language Learning using ICT (Tvorba študijného programu medziodborové štúdium masmediálne štúdiá-francúzsky jazyk s využitím IKT)*** **- Constantine the Philosopher University in Nitra**
	A new area of study was opened thanks to the project: Mass Media Studies with Integrated French Language Learning with an inter-departmental curriculum. Specialist language courses were organised for lecturers to let them teach in French and to liaise with partners from French-speaking higher education institutions. Students and faculty staff from Université de Lorraine and Université Lyon (France) and IHECS in Brussels (Belgium) came to Nitra for one semester exchanges. Thanks to staff exchanges, equivalent teaching curricula were developed between the UKF and the aforementioned universities (study courses with a double, Slovak-French diploma), and joint research and publications continue. The universities are continuing their collaboration notwithstanding project completion.
Type of externality	**Project**
development of the teaching offer and R&D potential	***Enhancing the quality of higher education at the University of Debrecen through the development of R&D, innovation and education functions (A felsőoktatás minőségének javítása a kutatás-fejlesztés-innováció-oktatás fejlesztésén keresztül a Debreceni Egyetemen)*** **– University of Debrecen – Research Programme**
	The aim of the project was to improve the quality of R&D in line with leading European educational institutions. Research work was launched involving a total of 118 teams. • From 2009 to 2015, the university attracted ca. 40% more students from the EU-15 (globally, i.e. including also bodies other than those participating in the project), in particular from France, Ireland, Italy, Portugal, Spain and the UK. • Joint research work was carried out with EU-15 institutions and researchers, leading to the publication of a number of joint articles. • Equipment purchased under the project is used for R&D work commissioned by EU-15 clients. The project has enabled research in key medical areas (the circulatory system, the locomotive system, oncology and genetics) of large potential clinical significance, whose results may also be used outside Hungary.

Another interesting example of teaching provision and teaching infrastructure projects with resounding impact are initiatives put into operation by the Faculty of Physics at the University of Warsaw (FUW). The projects were carried out within the 'Infrastructure and Environment' Operational Programme supplemented by grants given by the Polish Science Foundation which is implementing the systemic project entitled *International PhD Programme – Projects implemented during doctoral studies in Poland within international cooperation among research institutions* in the scope of Measure 1.2 *Strengthening the human resources potential of science OP IE*. Apart from affecting positively domestic Polish students, teaching and learning infrastructure improvements at the Faculty of Physics have also resulted in more intense cooperation and exchanges with foreign universities.

Box 11. Case study – development of teaching provision – University of Warsaw, Faculty of Physics (FUW), PL

Projects	**Cluster of projects:** **Projects to expand and upgrade teaching and R&D facilities:** • New Technologies Centre (2 buildings, including one for the Faculty of Physics) **Projects to enhance teaching and research capacity:** • International PhD studies at the Faculty of Physics, University of Warsaw52,
Beneficiaries	**Physics as the foundation of new technologies - modern research infrastructure at the Faculty of Physics, University of Warsaw**
Programme	**University of Warsaw, Faculty of Physics (FUW)** **OP Infrastructure and Environment, OP Innovative Economy**
Value of project	**EUR 91 mn**
EU funding	**EUR 75 mn**

To ensure more effective teaching, classes had to be moved from three locations into a single modern teaching facility beefed up by new R&D facilities. The university's authorities aimed to expand teaching provision and enhance R&D capacity. The Faculty of Physics at Warsaw University also intended to expand previously insufficient teaching in English, with the ultimate goal of totally internationalising PhD studies.53	**Beneficiary**
Project scope	A new Physics Faculty building was erected, with modern lecture and seminar rooms and educational laboratories for first, second and third cycle students. The grant from the 'International PhD Programme: Projects' implemented during doctoral studies in Poland within international cooperation with research institutions (also known as MPD) made it possible for the Faculty of Physics at the University of Warsaw to start an international PhD programme delivered in English.
• The teaching and R&D facilities of the Faculty of Physics at the Warsaw University were expanded. The faculty was moved to a single building, which facilitates the teaching process for students and staff. • Academics and students carried out new research projects using advanced instruments. • A modern doctoral studies programme open to foreign students was prepared to fulfil the objectives set out in the Faculty of Physics Strategy. • Cooperation with the university's foreign partners was reinforced.	**Outcomes of the V4 project**
Externalities	The teaching infrastructure improvement for Polish physics students at the University of Warsaw is also to the benefit of foreign students and academics who cooperate with the faculty. • International PhD studies are put into effect together with foreign higher education institutions, including those from EU-15 countries, chiefly from Germany and France, e.g. Johannes Gutenberg-Universität Mainz, Leibniz Institute for Neurobiology, Special Laboratory for Noninvasive Brain Imaging, Magdeburg, The Grenoble High Magnetic Field Laboratory, The Montpellier University, Ecole Normale Supérieure de Cachan,

[52] Project supported with a grant given by the Polish Science Foundation, which is implementing the systemic project entitled *International PhD Programmes – Projects implemented during doctoral studies in Poland in international cooperation of research institutions (called MPD)* in the scope of Measure *1.2 Strengthening the human resources potential of science OP IE.*

[53] Faculty of Physics, University of Warsaw, *The Mission and Development Strategy of the Faculty of Physics, University of Warsaw*, Warsaw 2011.

Institut, Université de la Méditerranée Centre de Physique Théorique, Institut Universitaire de France and La Sapienza University from Rome.54

- The first PhD thesis under the new programme was prepared at FUW and defended by a French national; three more are in the pipeline, to be submitted by students from Italy, Finland and France.
- Several publications were drafted with the participation of academics from Italy, Austria, Spain and the UK.

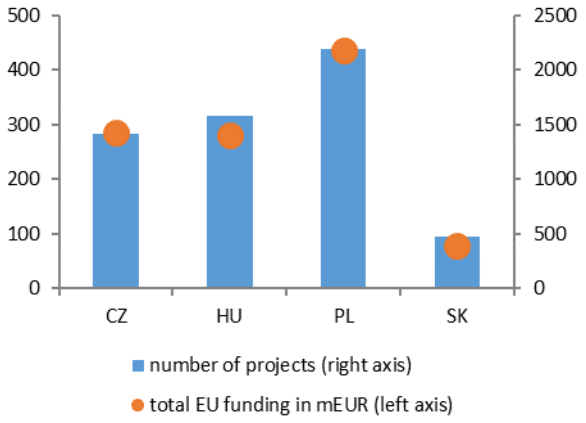
The faculty has plans to take in more students, in particular foreign ones. This will be possible thanks to the newly expanded teaching facilities at FUW. To fulfil this objective, the Faculty Board are preparing new 1st and 2nd cycle study curricula in English ending with double diplomas and delivered in cooperation with higher education institutions from Germany, France and Denmark (in meteorology, forensics, photonics).

Benefits from supporting research

Apart from the benefits related to improving teaching provision, an equally important area of support with potential positive impact for research communities and businesses from the EU-15 are project outcomes focusing on developing R&D capacity in higher education institutions and research centres in the V4. As joint research projects and exchanges of experience between researchers and centres from across the EU are increasingly popular, enhanced research infrastructure in one university has a knock-on effect for the whole research community and for partners who cooperate with entities that put Cohesion Policy projects into operation now or who will do so in future. The stronger the cooperation and exchange between universities, the better the use of capacity. The implementation of investment projects (R&D infrastructure development) and soft schemes (e.g. participation in international projects) has raised their appeal as partners in international research consortia. This goes for all V4 countries.

The enhancement of laboratory facilities at the university thanks to the infrastructure projects that were put in place, combined with new equipment supplies for laboratories procured with Cohesion funding has boosted the university's profile as partner in international research projects. Entire teams benefit such projects, not excluding EU-15 research communities. Thus, many entities could continue their advanced scientific work in other programmes, e.g. under the 7th Framework Programme (cf. box), followed by Horizon 2020 in the 2014-2020 period.

Figure 79. V4 participation in the 7th Framework Programme.



Source: EC, Country Profile and Featured Projects, https://ec.europa.eu/research/fp7/index_en.cfm?pg=country-profiles

54 More on foreign partners in the project: http://www.fuw.edu.pl/~mpd/partners.htm

Box 12. 7th Framework Programme

The 7th Framework Programme (FP7) is the largest mechanism for financing and guiding scientific research in the EU in the 2007-2013 programming period. It has a budget of EUR 54 bn. Research institutions (universities, institutes) may apply for funds.

FP7 is the basis for implementing the strategic objective of *transforming the EU into the most competitive and dynamic knowledge-based economy, capable of ensuring sustained economic growth, achieving greater social cohesion and creating more and better jobs.* FP7 serves the following objectives:

- promote cross-border cooperation in all areas of research and technology growth,
- boost the drive, creativity and excellence of European research at the vanguard of science,
- multiply human potential in research and technology by providing better education and training, facilitating access to research capabilities and infrastructure, raise the profile of the researcher profession, and encourage researchers into mobility and advancing their career,
- step up dialogue between science and society in Europe, and raise public confidence in science,
- sustain widespread application of outcomes and circulate knowledge generated thanks to research financed with public money.

The impact of Cohesion projects on cooperation in research is corroborated by the beneficiary survey. As indicated by a survey among the representatives of R&D project implementing bodies, Cohesion Fund-supported initiatives have served to step up V4's cooperation with research and higher education institutions based in the EU-15. Many launched their cooperation with new partners or strengthened existing ties. Many investment projects helped to improve research infrastructure and paved the way for subsequent international operations with a more resounding impact.

Figure 80. Project impact on stronger cooperation with EU-15 research /higher education institutions.

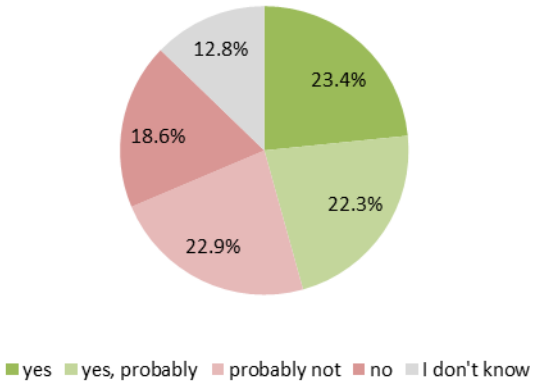
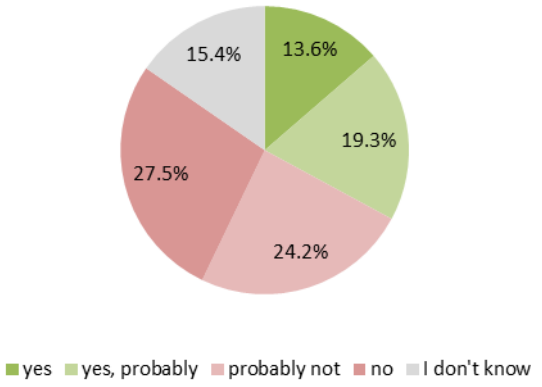


Figure 81. Project impact on adding new EU-15 based research collaborators involved in research and teaching.



Source: Own elaboration based on beneficiary survey: bodies implementing R&D projects.

The impact assessment of some projects provides a number of examples of how infrastructure development in the V4 fostered better R&D environment for EU-15 institutions and companies, including in joint R&D projects.

An interesting example of how supporting R&D helps in launching greater international cooperation is a University of Debrecen project, plus a cluster of projects to build and expand the Polish power grid

infrastructure. The PL-Grid Consortium[55] is the beneficiary of operations which involve the provision of domain-specific high-powered computing capacity. With Cohesion Policy support,[56] computing infrastructure was developed in Poland with the support of high power computers. Successive projects have served to set up infrastructure linking Polish research communities and enabling the use of such computing resources by researchers with no prior access to high power computers. The infrastructure is designed to assist the research community in advanced computing in key scientific areas.

In the Czech Republic, projects implemented by R&D institutions operating in Brno, such as the International Clinical Research Centre of St. Anne's University Hospital Brno and the CEITEC Central European Institute of Technology may be also be said to bring benefits to researchers in the EU-15 and to EU residents at large. Both projects were put into operation as part of a measure that focused on supporting European excellence centres. Thanks to Cohesion funds support, the first aforementioned beneficiary expanded its research centre infrastructure followed by several associated projects to use the infrastructure capacity to a maximum. Researchers from EU-15 countries work and carry out research using infrastructure supported through Cohesion funds.

Box 13. Case study – supporting research activity – CEITEC – Central European Institute of Technology in Brno, CZ

Projects	**CEITEC – Central European Institute of Technology (CEITEC - středoevropský technologický institut)**
Beneficiaries	**Masarykova univerzita (Masaryk University with partners from the Brno University of Technology, Mendel University in Brno, University of Veterinary and Pharmaceutical Sciences in Brno, Veterinary Research Institute and Institute of Physics of Materials of the Czech Academy of Sciences)**
Programme	**OP R&D for Innovations (OP Výzkum a vývoj pro inovace)**
Value of project	**Ca. EUR 240 mn**
EU funding	**Ca. EUR 160 mn**
The Masaryk University (Brno, Moravia) is the second-largest public university in the Czech Republic. It comprises nine faculties with over 200 departments, institutes and clinics. One of its top priorities is science research, and it is being pursued through participation in a wide range of mobility activities and research programmes in the EU. The University is geared towards multinational cooperation. It hosts more than foreign 1,000 students as of 2013/14.[57]	**Beneficiary**

[55] It includes research bodies from across Poland: Cyfronet AGH Academic Computer Centre (with ACK as coordinator), Gdańsk Academic Computer Centre, Warsaw Interdisciplinary Centre for Mathematical and Computational Modelling, Poznań Supercomputing and Networking Centre affiliated with Bioorganic Chemistry Institute of the Polish Academy of Sciences, Wrocław Centre for Networking and Supercomputing.

[56] Projects include: Polish Infrastructure for Supporting Computational Science in the European Research Area – PL-Grid (1), Domain-oriented services and resources of the Polish Infrastructure for Supporting Computational Science in the European Research Space – PL-Grid Plus (2), Distributed Computer and Data Infrastructure Competence Centre – PLGridCore (3) and New Generation Domain-Specific Services in the PL-Grid Infrastructure for Polish Science (4).

[57] University's official web page: http://www.muni.cz/general/about

Project scope	The goal of the project was to start a R&D centre. A building equipped with state-of-the-art research equipment had to be erected for the purpose. • A space of 25 000 sq ms was built to host cutting-edge laboratories on the Masaryk University Campus at Bohunice, Brno and at the Brno University of Technology, where 61 research groups started research in 7 programmes. • Nearly 700 high class dedicated appliances and instruments were purchased for research teams.
Outcomes of the V4 project	• CEITEC is the first R&D centre in the Czech Republic to combine such extensive research in biological sciences with advanced materials and technologies. The CEITEC project generated top quality infrastructure and excellent environment for hiring world class scientists. • High tech instruments assist research at all levels, from single atom to molecules and molecule clusters to cells and entire organisms. The equipment now available to researchers may be used in specialist research in many areas, including multidisciplinary studies.
Externalities	CEITEC is now a world-class breeding ground for science which makes the most of its research and technological potential in cooperation with facilities from EU-15 countries: • CEITEC research teams liaise with other research centres, including those in EU-15 countries. Once it was put to work, the project helped to consolidate the existing cooperation both among scientists and partner institutions. • New agreements have been signed with the EMBL European Molecular Biology Laboratory, Imperial College London (United Kingdom), Elettra Trieste (Italy) and Vienna Biocenter Core Facilities (Austria). • CEITEC cooperates with EU-15 countries both in producing new technologies and in opening access to research infrastructure, among others in biotechnology. The institute is present in international research projects; it is a member of the European EU-LIFE syndicate composed of 13 top research institutes across Europe, including the Centre for Genomic Regulation (Spain), VIB (Belgium), Institut Curie (France), Max Delbrück Centre for Molecular Medicine in the Helmholtz Association (Germany), Instituto Gulbenkian de Ciência (Portugal), Research Centre for Molecular Medicine of the Austrian Academy of Sciences (Austria), European Institute of Oncology (Italy), The Netherlands Cancer Institute (the Netherlands), Institute for Molecular Medicine Finland, Biotech Research and Innovation Centre (Denmark), Babraham Institute (UK).

Externality type	Project
development of the teaching offer and R&D potential	***Enhance higher education provision at the Debrecen University by fostering R&D, innovation and education functions (A felsőoktatás minőségének javítása a kutatás-fejlesztés-innováció-oktatás fejlesztésén keresztül a Debreceni Egyetemen)* – Debrecen University – Research Programme** The project aimed to upgrade R&D work to put it on par with leading European educational institutions. Research work was launched involving a total of 118 teams. • From 2009 to 2015, the university attracted ca. 40% more interest from EU-15 students globally (including others than project participants), in particular from France, Ireland, Italy, Portugal, Spain and the UK. • Joint research was carried out together with EU-15 institutions and researchers, leading to the publication of a number of collaborative articles. • Equipment and appliances procured in the project are used in R&D work commissioned by EU-15 based contracting entities. The project has enabled research in key medical areas (the circulatory system, the locomotive system, oncology and genetics) of potentially considerable clinical significance, whose results may be used also outside Hungary.

4.4 Externalities of transport infrastructure support

4.4.1 Intervention logic and impact

Although the 2004-2006 financial perspective and the corresponding domestic-funded measures catered for large-scale transport investment projects, inferior quality infrastructure remained a key barrier in V4 countries' development in the run up-to the execution of the 2007-2013 operational programmes.

- With its relatively dense road network, the Czech Republic faced substantial problems related to its state of repair. Also, transit connections with neighbouring countries were insufficient, which had a negative effect for access to external transport routes. Poor state of rail infrastructure hindered growth opportunities in multimodal transport.[58]

- Hungary's prime location at the intersection of North-South and East-West transport routes offered opportunities for building more international transport and logistics. Regrettably, low capacity and the poor state of many road sections and rail networks were major barriers for tapping fully into this potential.[59]

- Transport infrastructure in Poland fell below both average EU and V4 standards. The greatest difficulties resided in outdated and inadequate linear infrastructure (especially in TEN-T Core Network Corridors), poor quality of connections between major urban centres and insufficient land and sea access to maritime ports.[60]

- The weakness of Slovakia's road was that access to domestic and international transport infrastructure (express roads, motorways) was inadequate. Rail transport, quite rarely used because of its bad state, was yet another challenge.[61]

All these development barriers underpinned the decision to allocate a substantial envelope to refurbishing transport infrastructure in all four V4 countries in the 2007-2013 programming period.

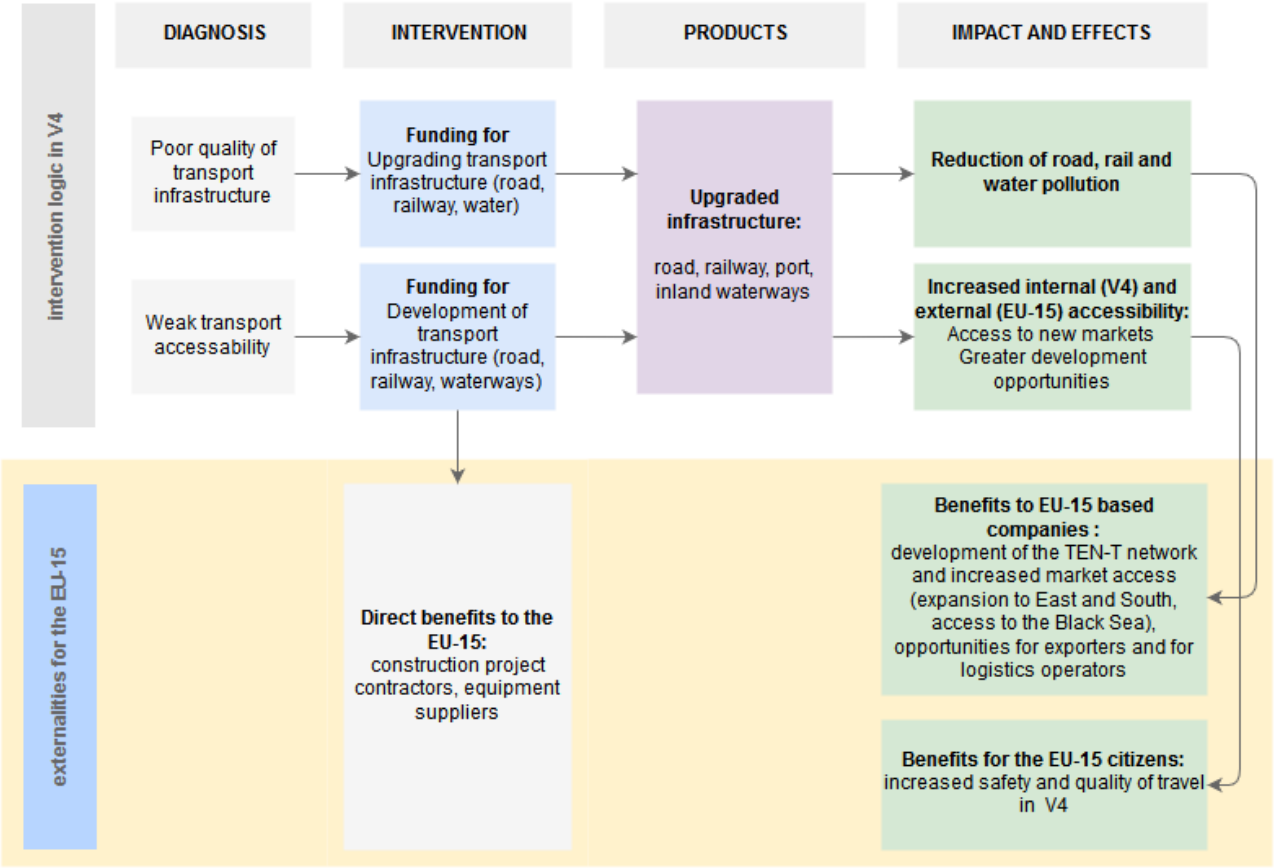
[58] Ministry of Regional Development, National Strategic Reference Framework of the Czech Republic 2007 – 2013, Prague 2007

[59] *The New Hungary Development Plan, National Strategic Reference Framework of Hungary 2007–2013, Employment and Growth,* Budapest, 2007.

[60] Ministry of Regional Development, *National Strategic Reference Framework 2007–2013 in support of growth and jobs,* Warsaw 2007.

[61] Ministry of Construction and Regional Development, *National Strategic Reference Framework of the Slovak Republic for 2007 – 2013*, Bratislava 2006.

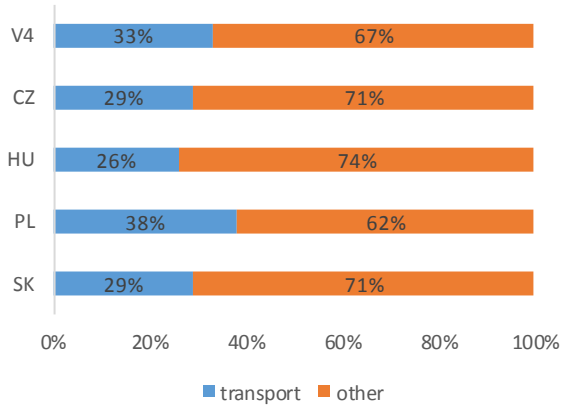
Scheme 6. Intervention logic in V4 countries – transport infrastructure



Source: Own elaboration.

The transport infrastructure sector received the brunt of funds available under the Cohesion Policy in the 2007-2013 programming period, i.e. over EUR 43 bn or 33% of total expenditure. In infrastructure spending Poland ranks first, where almost 40% of the funds available for transport investments was spent and where spending was the highest both in absolute terms and in relation to total expenditure. In the other countries, interventions in this sector did not reach 30% of the allocations.

Figure 82. Share of appropriations to transport infrastructure in the total value of appropriations in the V4.



If broken down by target investment area, investments concentrated mainly on road projects, where over 60% of total V4 appropriations were expended and almost 70% of those were spent in Poland. When set against the largest Visegrad country, a larger share (10-13%) of railway investments went to the other countries of the Group. The other modes of transport received much smaller support. In Hungary, considerable monies were spent on multimodal transport. Poland benefited financial support for upgrading its port infrastructure, whereas the Czech Republic used funding to improve its inland waterways. Also, 6% of the appropriations were spent on other transport projects including urban transport and intelligent transport systems (ITS).

Figure 83. Funding by mode of transport

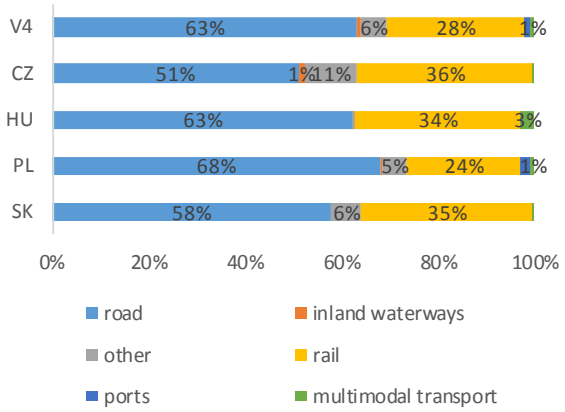


Figure 84. Allocations by road category

Nearly half of the funds available for road infrastructure were allocated to the TEN-T network. Yet, there is a noticeable difference between Poland and Slovakia, countries where TEN-T investments prevailed over other types of roads, and the Czech Republic and Hungary display a reverse pattern.

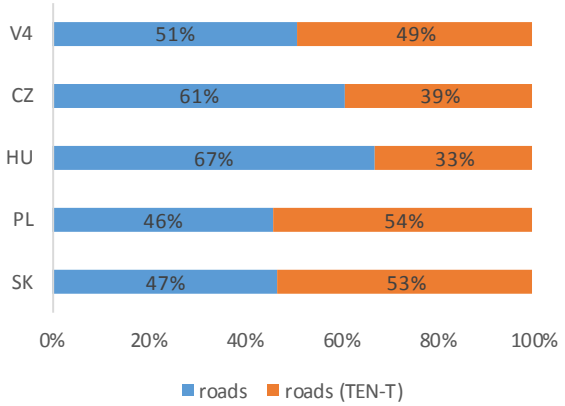
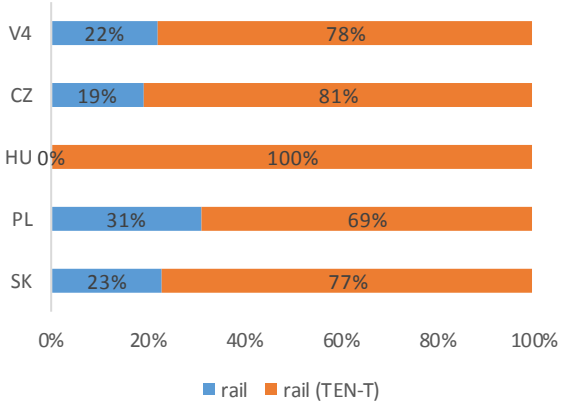


Figure 85. Allocations per railway category

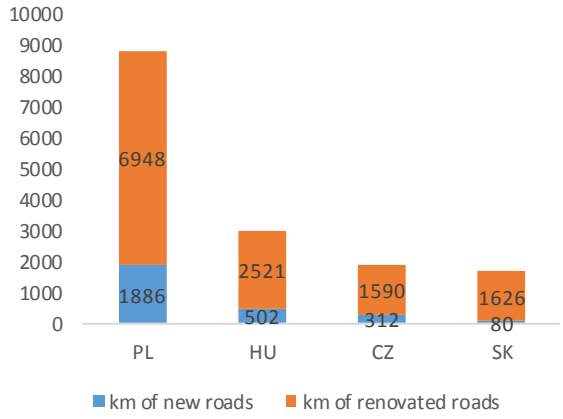
On closer inspection, rail infrastructure investments reveal a clear prevalence of those made in the TEN-T network; other types of railway lines are less important. In contrast to road infrastructure, Poland and Slovakia gave relatively less support to trans-European corridors, while Hungary and the Czech Republic allocated 100% and over 80%, respectively, of the available railway infrastructure funds to TEN-T.



The investments in the 2007-2013 financial perspective supplemented nationally funded activities and contributed to a substantial development and significant upgrade of transport infrastructure in the V4, both in road and rail. Evaluations confirm that the interventions reached their goals by noticeably improving connections between the Czech Republic, Hungary, Poland and Slovakia and key economic centres of the European Union. Therefore, the impediments caused the relatively peripheral location of the V4 have been successfully overcome.[62]

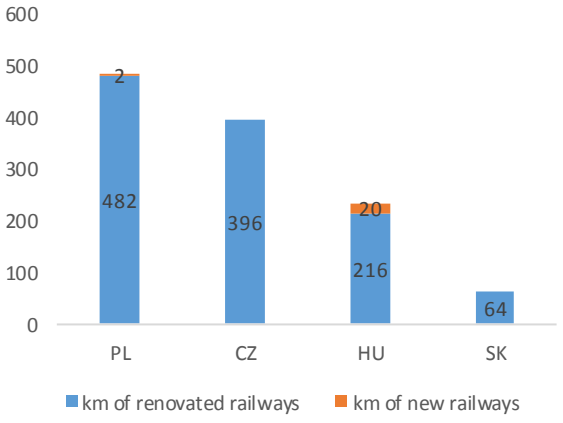
Cohesion Policy funds added to building nearly 2,800 kilometres of new roads in the V4, of which almost 1,100 km are TEN-T roads feeding into the European transport corridors that cross Poland, Hungary, the Czech Republic and Slovakia. Moreover, road repairs and upgrades improved the state of repair, safety and capacity of nearly 12.7 thousand km of existing connections.

Figure 86. Length of built/renovated roads in the V4



Given the specific nature of rail transport support, almost all the projects in this category were aimed at upgrading the existing links of the total length in excess of 1,150 kilometres, including 320 km within the TEN-T network. The projects put into service were designed to increase passenger and freight traffic capacity. Money spent on new lines was only a fraction of the railway investments expended in Poland and Hungary, and in the Czech Republic or Slovakia there were no such projects at all. Parallel to structural investments, the Cohesion Policy also helped all four V4 countries to overhaul their rolling stock.

Figure 87. Length of built/renovated roads in the V4



Source: Own elaboration based on ex-post evaluation of ERDF and CF.[63]

[62] Institute of Geography and Spatial Organization, Polish Academy of Sciences, *Impact of the Construction of Motorways and Expressways on the Social, Economic and Territorial Development in Poland,* report commissioned by the Ministry of Regional Development, Warsaw 2013.

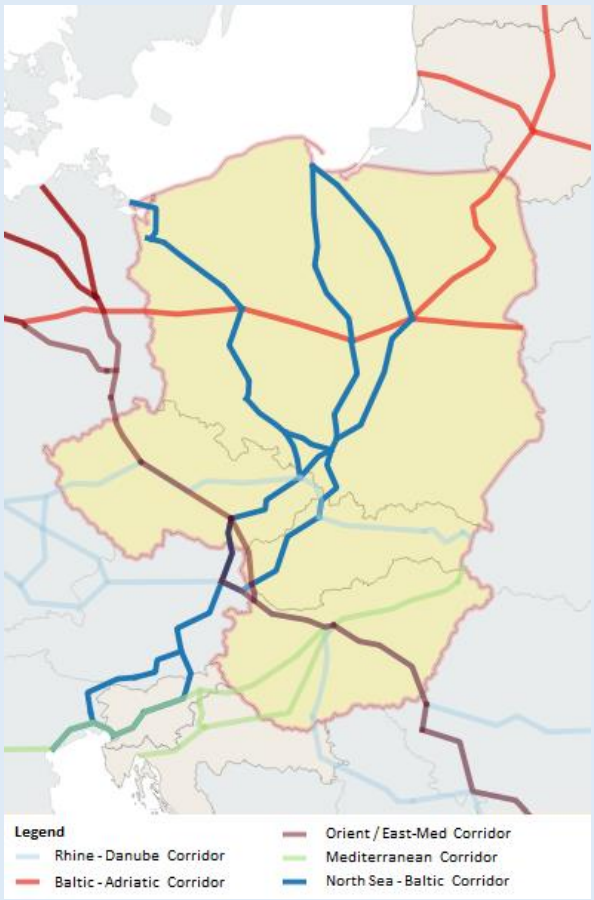
[63] Ex-post evaluation of cohesion policy. *Work package 0 - Data Collection and Quality Assessment. WP0 Database 2 - full database including all core indicators and programme specific indicators.* Available at: http://ec.europa.eu/regional_policy/en/policy/evaluations/ec/2007-2013/#1

Investment support for water transport, which covered ports (including sea ports) and inland waterways, focused on investments in nodal infrastructure. In Poland, most was spent on expanding and modernising infrastructure in crucial maritime ports in Gdynia, Gdańsk and Świnoujście-Szczecin that are part of the TEN-T network and its Baltic-Adriatic corridor. In the Czech Republic, support was granted to investments in Vltava waterways.

4.4.2 Externalities

Cohesion Policy-financed projects and complementary measures financed by member states translated into improved internal and external transport accessibility in the V4. The intervention was also very significant for the cohesion of the entire transport system of the European Union. It improved transport connections between southern and eastern parts of Europe and the social and economic centres of the continent. This, in turn, has entailed quantifiable benefits to people and businesses from the EU-15 who use trans-European transport networks. As many as five such networks run through the V4.

Box 14. Trans-European Transport Networks (TEN-T)



This EU initiative has been developed since the 1980s in answer to problems resulting from development imbalances in European transport infrastructure. The aim of TEN-T is to modernise and interconnect transport systems of member states into a single cohesive network and use all modes of transport in an optimal manner. The TEN-T network consists of the core network (transit corridors), supplemented by a comprehensive national and regional route network.[64]

Putting new transport routes within the TEN-T network brings the European Union closer to establishing a *competitive and resource efficient transport system*. The *White Paper on Transport*, a strategic EU document, stresses that: *transport is fundamental to our economy and society. Mobility is vital for the internal market and for the quality of life of citizens as they enjoy their freedom to travel. Transport enables economic growth and job creation.*[65]

Source: Own elaboration.

[64] EC, *The EU explained. Transport*, Brussels 2014
[65] EC, *The White Paper on Transport*, Brussels 2011

In its previous edition, the study stressed the importance of growing road and rail infrastructure in order to increase transport accessibility. It also indicated the benefits due to lower road accident rates in the V4 and the resulting improved safety of EU-15 residents who use infrastructure that benefited support.[66] Based on the findings included in the previous evaluation, this study focuses on specific examples of economic benefits gained by EU-15 based logistics and transport companies. It also indicates how European funds invested in the V4 bring the EU closer to achieving its sustainable transport development objectives.

Box 15. Overall benefits to the EU-15 due to expanding transport infrastructure in the V4 - key findings of the 2011 evaluation

The global impact of investments in expanding and upgrading transport infrastructure in the V4, as financed under the Cohesion Policy and seen from the EU-15 perspective, was covered extensively in the 2011 study. Five years on, the conclusions remain valid and are relevant at the implementation closure of 2007-2013 operational programmes. Benefits to the EU-15 are in three impact drivers: improved transport accessibility, increased safety and reduced pressure of the transport sector on the environment.

Both in 2011 and now, transport accessibility is one of the major developmental challenges for the V4 and its regions. Although investments put into effect in the programming period helped significantly to improve the situation, the accessibility indicators are still quite low[67] in comparison to the rest of the continent, in particular for Poland and Slovakia.[68] From the EU-15 perspective, expansion of latitudinal transport corridors was of particular importance. In this study's previous edition, expectations were formulated that both the anticipated and implemented investment projects would increase the appeal of the Visegrad area to foreign logistic companies. Examples quoted here seem to confirm that the interventions lead to achieving these objectives.

The second aspect of investment impact on the V4 transport infrastructure has been the improved safety of road traffic, another important issue for people and businesses based in the EU-15. Recent years' statistics show decreasing road accident rates in the Czech Republic, Hungary, Poland and Slovakia. To a large extent, this is attributable to Cohesion Policy investments.

The 2011 report also indicated the third impact driver, i.e. reduced pressure of the transport sector on the environment. Although recently changes in the sector-by-sector structure of passenger and freight transport in the V4 have been relatively slow, a number of investment projects subsidised during the 2007-2013 financial perspective should spur a more dynamic evolution in future. The case studies presented in this report quote examples of such changes.

Source: Own elaboration.

[66] IBS, *Evaluation of Benefits to the EU-15 of Cohesion Policy Implementation in the V4*, Warsaw 2011.

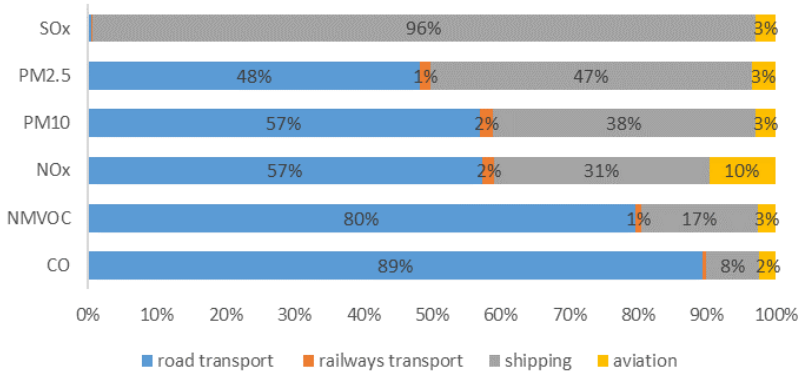
[67] ESPON, *TRACC Transport Accessibility at Regional Local Scale and Patterns in Europe*. Final Report, 2013.

[68] Institute of Geography and Spatial Organization Polish Academy of Sciences, *The Impact of the Construction of Motorways and Express Roads on the Social Economic and Territorial Development in Poland*, report contracted by the Ministry of Development, Warsaw 2013.

The *White Paper on Transport,* a strategic EU document containing a roadmap for a Single European Transport Area, indicates *ten goals for a competitive and resource efficient transport system.69* They are divided into three groups: the first one is related to the need to reduce consumption of conventional fuels (goals 1 and 2), the second includes optimising the performance of multimodal logistic chains (goals 3-6), and the last one focuses on using transport and infrastructure more efficiently (goals 7-10). To achieve these goals, measures need to be taken in each EU member state to remove main infrastructure impediments for transport routes and modes of transport, among others. With a view to establishing a more sustainable freight transport, goals related to optimising the performance of multimodal logistic chains are of key importance.

In order to improve the efficiency of multimodal logistic systems, access to good quality rail and waterway connections (both inland and sea waterways) as well as to intermodal interchanges is essential. By supporting the infrastructure of these transport modes in each V4 country, the Cohesion Policy programmes were conducive to fostering an environment for a gradual shift in the modal structure of freight and passenger transport towards road transport alternatives. Both rail and inland waterways produce far less air pollution than road transport. Increased use of these modes for shipping freight is among the goals indicated in the *White Paper on Transport.*

Figure 88. Air pollutant emissions by mode of transport



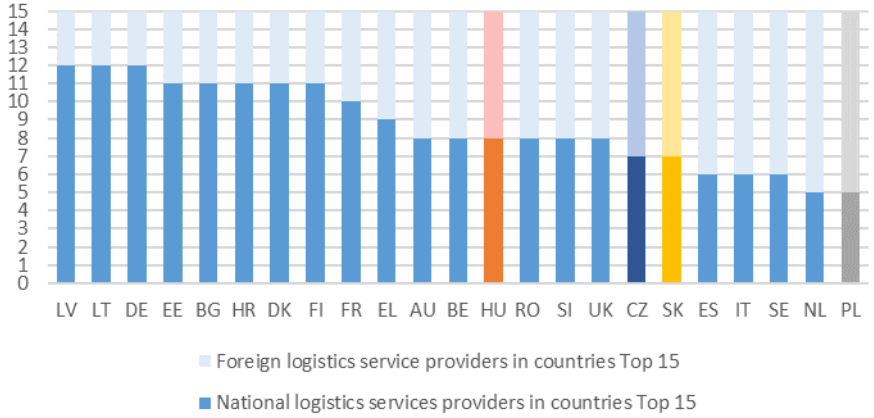
Source: Own elaboration study based on European Environment Agency data.

A well-developed transport infrastructure is essential for carriers and logistics companies alike. Since transport routes crossing the V4 connect Western and Eastern Europe and the north with the south, many foreign companies, also those based in the EU-15, inevitably use transport infrastructure in Poland, the Czech Republic, Slovakia and Hungary. This is validated by figures illustrating the origin of top logistics service providers in the V4: 10 out 15 biggest companies in Poland are foreign. In the Czech Republic and Slovakia the ratio is similar, with a slight shift in favour of domestic companies. The Hungarian market is the only one where domestic companies prevail among the largest entities.[70]

[69] European Commission, The White Paper on Transport, Brussels 2011

[70] *Top 100 in European Transport and Logistics Services 2013-2014, based on Ecorys, Fraunhofer, TCI, Prognos and AUEB-RC/TRANSLOG (2015), Fact-finding Studies in Support of the Development of an EU Strategy for Freight Transport Logistics Lot 1: EU Logistics Sectoral Survey.*

Figure 89. Ownership structure of top 15 logistics providers in the EU



Source: Own elaboration based on Top 100 in European Transport and Logistics Services 2013-2014, based on Ecorys, Fraunhofer, TCI, Prognos and AUEB-RC/TRANSLOG (2015), Fact-finding Studies in Support of the Development of an EU Strategy for Freight Transport Logistics Lot 1: EU Logistics Sector Survey.

As the Polish economy ranks among EU's largest, the Polish market is particularly prospective for foreign enterprises who are set on expanding their presence in logistics. Studies of the logistics environment in Europe indicate that the central location of the Czech Republic, Hungary and Slovakia also makes them a very attractive and prospective area for logistics companies, especially those from neighbouring countries.[71] This is particularly true for big enterprises. Remarkably, companies like the Deutsche Post DHL and DB Mobility from Germany are present in all V4 countries. The appeal of V4 markets is substantiated both by the above-mentioned statistics, as broken down by the company's country of origin, and by the gradual growth of road transport volume. Since 2006, the global share of transport markets of the Czech Republic, Poland, Slovakia and Hungary has increased by 3-4% against the EU-28. By far, the biggest change has taken place in Poland, where the volume of transport has grown by over 50% since 2006. An increase, although at a smaller scale, is also noted in the Czech Republic and Slovakia. Hungary is the only country where the volume of road transport (expressed in tonne-kilometres) has decreased since 2006. However, an upward trend has also been visible there since 2012.

[71] Ecorys, Fraunhofer, TCI, Prognos and AUEB-RC/TRANSLOG, *Fact-finding Studies in Support of the Development of an EU Strategy for Freight Transport Logistics Lot 1:EU Logistics Sectoral Survey*, 2015

Figure 90. Change in the share of road transport in V4 in the volume of transport in EU-28

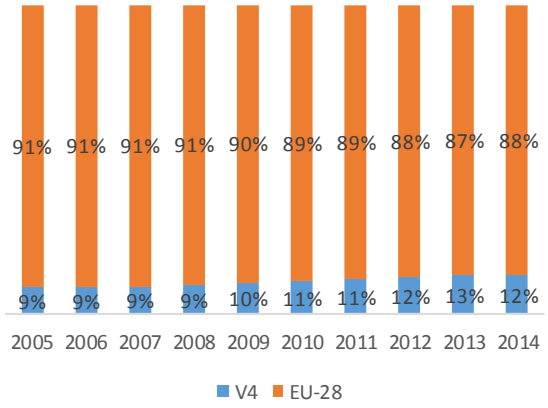
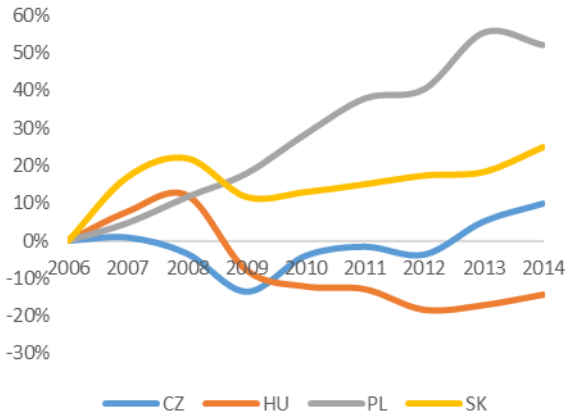


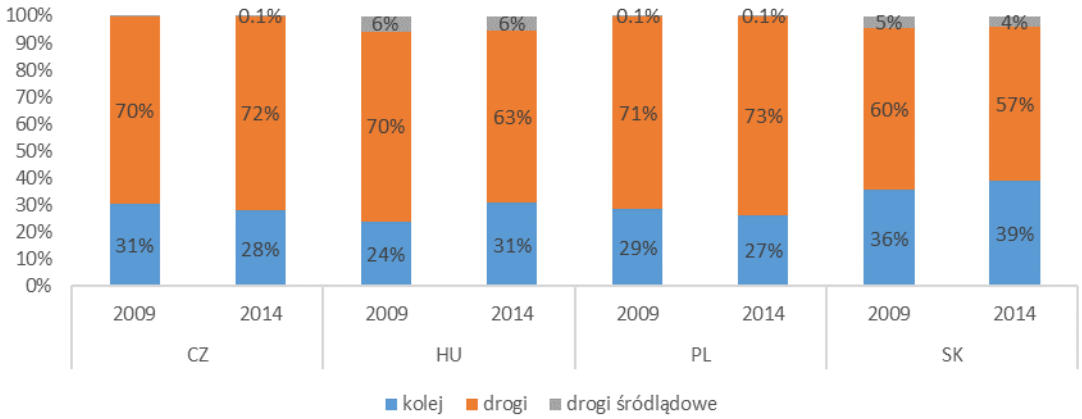
Figure 91. Change in the volume of road transport in V4 against 2005 benchmark.



Source: Own elaboration based on Eurostat data.

In Hungary, the decrease in the share of road freight lasting until 2012 has been offset in recent years by increased rail freight (by 7% since 2009). A similar tendency can also be observed in Slovakia, although to a much lesser degree.

Figure 92. Transport of goods: change in break-down by mode of transport



Source: Own elaboration based on Eurostat data.

As the V4 markets are attractive for foreign logistics and transport companies, poor transport networks in these countries caused problems for domestic and foreign companies alike. The projects implemented thanks to Cohesion funds notably improved transport infrastructure in the V4. For foreign logistics companies wishing to expand their business there, improving the road network was crucial, particularly putting in more transit routes including express roads and motorways, which would significantly cut transit times between major economic hubs.

Clearing bottlenecks on existing transport routes was also highly important. Many hampered growth opportunities for EU-15 based businesses operating in the Czech Republic, Hungary, Poland and Slovakia. As a consequence, EU-15 based companies could not respond to growing demand as the ailing transport

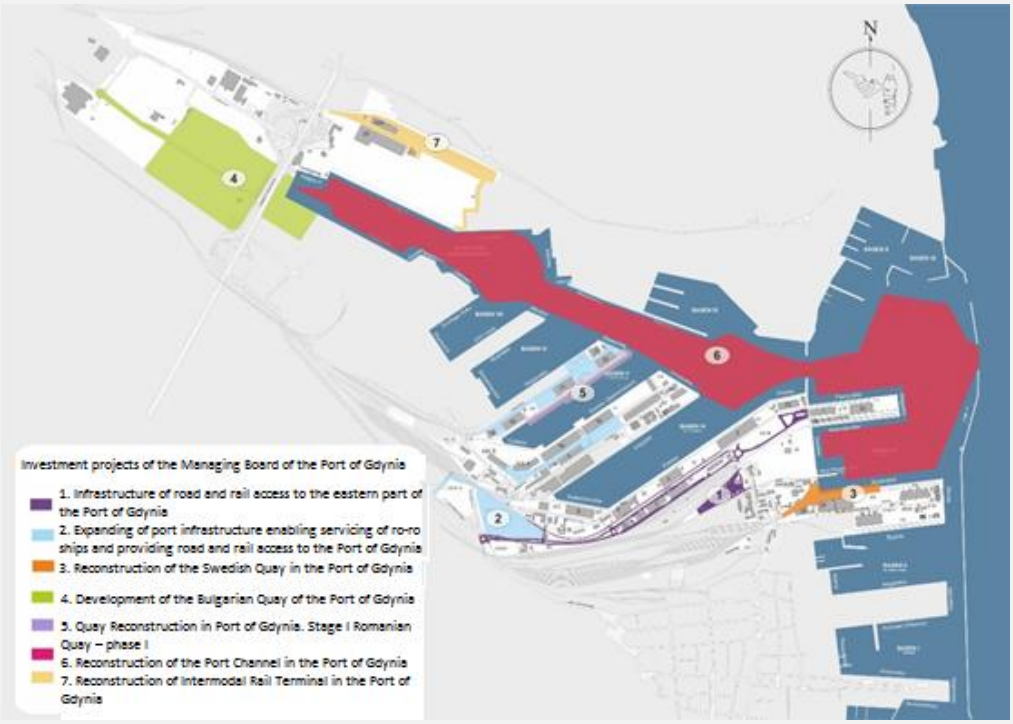
infrastructure prevented them from scaling up their operations. This applied also to the Port of Gdynia, which specialises in general cargo and ferry connections. Infrastructure limitations caused by the shallow port channel, the narrow port entrance and the surrounding infrastructure shortcomings (access roads, railway infrastructure) hindered the growth of shipping companies and logistics providers at the port. These barriers were partially eliminated thanks to a comprehensive Cohesion Policy-financed investment package.

Box 16. Case study – Port of Gdynia

Projects	***Road and rail access infrastructure in the eastern part of the port of Gdynia (1)*** ***Expand port infrastructure to enable the handling of of ro-ro ships and provide road and rail access to the port of Gdynia (2)*** ***Refurbish the Swedish Quay, port of Gdynia (3)*** ***Develop the Bulgarian Quay, port of Gdynia (4)*** ***Quay refurbishment in the port of Gdynia. Stage I: Romanian Quay – phase I (5)*** ***Renewal of the Port Channel, port of Gdynia (6)*** ***Renewal of the intermodal rail terminal in the port of Gdynia (7)***
Beneficiaries	**Management Board, Port of Gdynia S.A.**
Programme	**Operational Programme: Infrastructure and Environment**
Project value	**ca. EUR 150 mn**
EU funding	**ca. EUR 76.5 mn**
Problem addressed in the project	The port of Gdynia specialises in handling mainly unitized container-shipped cargo and in the ro-ro (roll-on/roll-off) system, plus ferry connections. It is a premier Baltic port in the European South-North Transport Corridor. To maintain its strong competitive edge, the port authority decided to expand port and related infrastructure, which included dredging the port basin and channels, redeveloping port quays and rail systems and improving road access.
Project scope	The projects initiated by the of the port of Gdynia's Management Board involved: • refurbishing and dredging the port channel down to 13.5 m, with the option to descend to 15.5 m; • refurbishing the Swedish Quay and adjacent infrastructure by dredging the bed down to 13.5 m and extending the quay to 392 m; • building the Bulgarian Quay and adjacent infrastructure, with depth of 13.5 m and length of 192 m; • redevelopment of the Swedish Quay and adjacent infrastructure, down to 13.5 m and extending it to 369 m; • renewal of the intermodal rail terminal, including the extension of usable tracks to 687 m and of the overhead crane track to 685 m, with added surface renovation and construction of crane rails;[72] • construction, refurbishment and upgrade of road and rail infrastructure which connects the port of Gdynia with the national transport network.[73]

72 *Source:* http://www.port.gdynia.pl/files/wydarzenia/aktualnosci/1512070/07.12.2015.pdf (DOA: 25.01.2016).
73 *Source:* http://www.port.gdynia.pl/pl/realizacja-inwestycji-infrastruktura/327-infrastruktura-dostepu-drogowego-i-kolejowego-do-wschodniej-czesci-portu-gdynia-zakonczenie-realizacji-projektu (DOA: 25.01.2016).

Graph 1. Investments in the Port of Gdynia



V4 project outcomes	Enhanced competitiveness of the port and better infrastructure for multimodal transport development. Maximum permissible draught of ships increased vis-à-vis previous port capacity by additional 1.5 m (to 13.0 m) and new operating depth of quays contributed to improving the port's transhipment capacity by 0.5 mn tonnes. The development of road and rail infrastructure at the port and in the access roads helped improve its transhipment capacity and total terminal productivity, in particular by facilitating freight transhipments.
Externalities	The port of Gdynia is part of the TEN-T Baltic-Adriatic Corridor, which crosses the Czech Republic, Slovakia and Austria and leads to the Slovenian port of Koper and Italian ports in Trieste, Venice and Ravenna. Consolidation of the port's intermodal infrastructure contributes to upgrading TEN-T network parameters and developing more environmental-friendly freight shipment patterns between northern and southern Europe. Investment projects in the port of Gdynia also played their part in developing the Gdynia-Karlskrona motorway of the sea, thus channelling increased trade volumes between Sweden, Poland and other European countries. In the long run, the motorway will become a freight route between the Nordic countries and the Adriatic Region. Apart from the projects' substantial contribution to developing trans-European transport corridors and opening multimodal transport potential, notable benefits are derived by companies using port infrastructure. These include ship owners such as MSC from Switzerland, CMA-CGM from France, Transfennica and Finnlines from Finland and Spliethoff from the Netherlands, and logistics businesses present in the port including DB Schenker and Polzug from Germany (the latter is a Polish company owned by the German Hafen und Logistik AG). In particular, Finnlines and Transfennica benefited from the entire redeveloped ro-ro ship service infrastructure. Thanks to the two-level ramp put into operation at the ro-ro handling station Finnlines can utilise the full transport capacity of ro-pax ships. Improved road and rail access to the port, financed in the years 2007-2013 with an added new

ferry terminal construction project (due in for execution in the 2014-2020 perspective), will foster excellent conditions for the Swedish carrier Stena Line to develop its operations. Before project completion, the carrier used Hel Quay II at Basin VIII, and could not fully cater to the growing demand for its services, as the length of the quay (170 m) practically prevented it from handling large ferries (240 m). Using such ferries could help quench demand for the Gdynia-Karlskrona ferry transport.

The renewal of the intermodal rail terminal ensures streamlined operations and substantially increased the transhipment and container handling capacities at the port of Gdynia, whose turnover depends on ship owners such as MSC from Switzerland. Meanwhile, further dredging will help to upgrade the port and bring it among top European ocean shipping container class of ports.

Cohesion Policy co-financed projects helped eliminate development barriers for individual companies, which also affected the relative appeal of entire transport modes. The above-mentioned White Paper expressly states that there is a need for ensuring a more balanced structure of freight transport modes, as well as a need for guaranteeing that modes other than road transport enjoy at least a 30% share in freight shipments by 2030 and a 50% share by 2050.[74] In order to make this objective a reality, rail infrastructure, inland waterways and intermodal nodes need to be adequately prepared. However, in V4 countries the state of these transport modes leaves much room for improvement.

Two factors add to the appeal of inland waterway transport. First, it offers lower unit freight costs.[75] Secondly, inland waterway transport is far less emissive. Yet, inland waterways will not be competitive until certain shipping parameters are met, including maximum vessel size limits per waterway, and clearance underneath bridges and other intersecting infrastructure. This, in turn, determines maximum volume of transported freight, including the number of permitted container layers. These are the preconditions for deciding whether water transport is viable as compared to road and rail transport.[76]

The Danube, which passes through Slovakia, the Czech Republic and Hungary, displays vast potential for boosting inland waterway transport. The capacity of the river, which is one of the major inland transport corridors (Rhine-Danube), is still latent due to infrastructural barriers. Available figures illustrate that freight transport via the Danube has been a mere 10-20% of the figure for total freight transport along the Rhine.[77] According to European Commission findings, the Old Bridge in Bratislava as a major bottleneck on this transport route. Due to its clearance and span, the structure of the bridge prevents the passage of category VI vessels.[78] This problem was solved by a project executed under the Cohesion Policy.

[74] EC, *Transport White Paper*, Brussels 2011

[75] In general, carriers do not bear costs of inland waterway use. The only costs they incur are fees for using port infrastructure. This is the main feature that sets inland waterways apart from road and rail transport, where carriers are obliged to e.g. purchase vignettes and pay access charges for using highways.

[76] OECD, *Report on the Current State of Combined Transport in Europe*, by European Conference of Ministers of Transport, 1998.

[77] Information on the project *Development of a Next-Generation European Inland Waterway Ship and Logistics System* (http://www.transport-research.info/project/development-next-generation-european-inland-waterway-ship-and-logistics-system-0 DOA: 8.02.2016)

[78] EC, *Infrastructure – TEN-T – Connecting Europe, Rhine-Danube Corridor*
http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/corridors/rhine-dan_en.htm

(DOA: 8.02.2016).

Box 17. Case study - The Old Bridge in Bratislava

Projects	***Urban transport system, Janikov dvor –Šafárikovo nám section, part 1 –Šafárikovo nám – u. Bosákova***
Beneficiaries	**The Capital City of Bratislava**
Programme	**OP Transport 2007-2013**
Project value	**EUR 76,829,856**
EU funding	**EUR 65,305,377**
The Old Bridge in Bratislava is the city's oldest Danube overpass. It was constructed in 1890 as the first permanent passage over the river. It connects the city centre with the Petržalka district, currently home to 25% of Bratislava's population (approx. 115,000 residents). In 2008, the bridge's deteriorating condition, which also caused the structure to subside, forced its closing for private car traffic, and in 2010 the ban covered public transport, pedestrians and cyclists, too. Although Bratislava has had four more bridges built since the 1970s, the Old Bridge still needed renovation. This was all the more urgent as the Old Bridge linked the city with its largest residential area.	**Problem addressed by the project**
Project scope	Comprehensive renovation of the old bridge, including laying tramway tracks to connect the bridge with the city centre's tram network.
Improved urban transport in Bratislava thanks to a much-needed tram link (after a 55-year wait) between right-bank Bratislava, home to a quarter of the capital's residents, with the city's existing tram network. Improved bridge access for pedestrians and cyclists.	**Outcomes of the V4 project**
Externalities	Next to the Rhine, the Danube is one of the most important European inland waterways and a key route in the Rhine-Danube Trans-European Transport corridor (TEN-T network). Developed within the TEN-T network, the corridor is to become a focal East-West route connecting mainland European states such as France, Germany, Austria, Czech Republic, Slovakia, Hungary, Romania and Bulgaria with Black Sea ports. However, inland waterway use varies significantly across the corridor. Danube freight transport stood at a mere 10-20% of the figure for the Rhine.[79] Because of its engineering structure, and mainly its low clearance, the Bratislava bridge hampered inland waterway transport and was a bottleneck in inland shipping on the Danube and the entire Rhine-Danube corridor.[80] Thanks to the project, the problems were resolved in particular by raising bridge clearance and modifying the spacing of the pillars. Currently, the bridge meets the requirements for class VI international waterways. Apart from upgrading the transport network in Slovakia's capital, the Old Bridge renovation in Bratislava cleared a major bottleneck restricting the growth of the key water corridor connecting Western and Northern Europe with the Black Sea. With these problems solved, the share of inland shipping in overall carriage of goods may

[79] *Development of a Next-Generation European Inland Waterway Ship and Logistics System* <http://www.transport-research.info/project/development-next-generation-european-inland-waterway-ship-and-logistics-system-0 > (DOA: 11.02.2016).

[80] EC, *Infrastructure – TEN-T – Connecting Europe, Rhine-Danube Core Network Corridor*. <http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/corridors/rhine-dan_en.htm> (DOA: 11.02.2016).

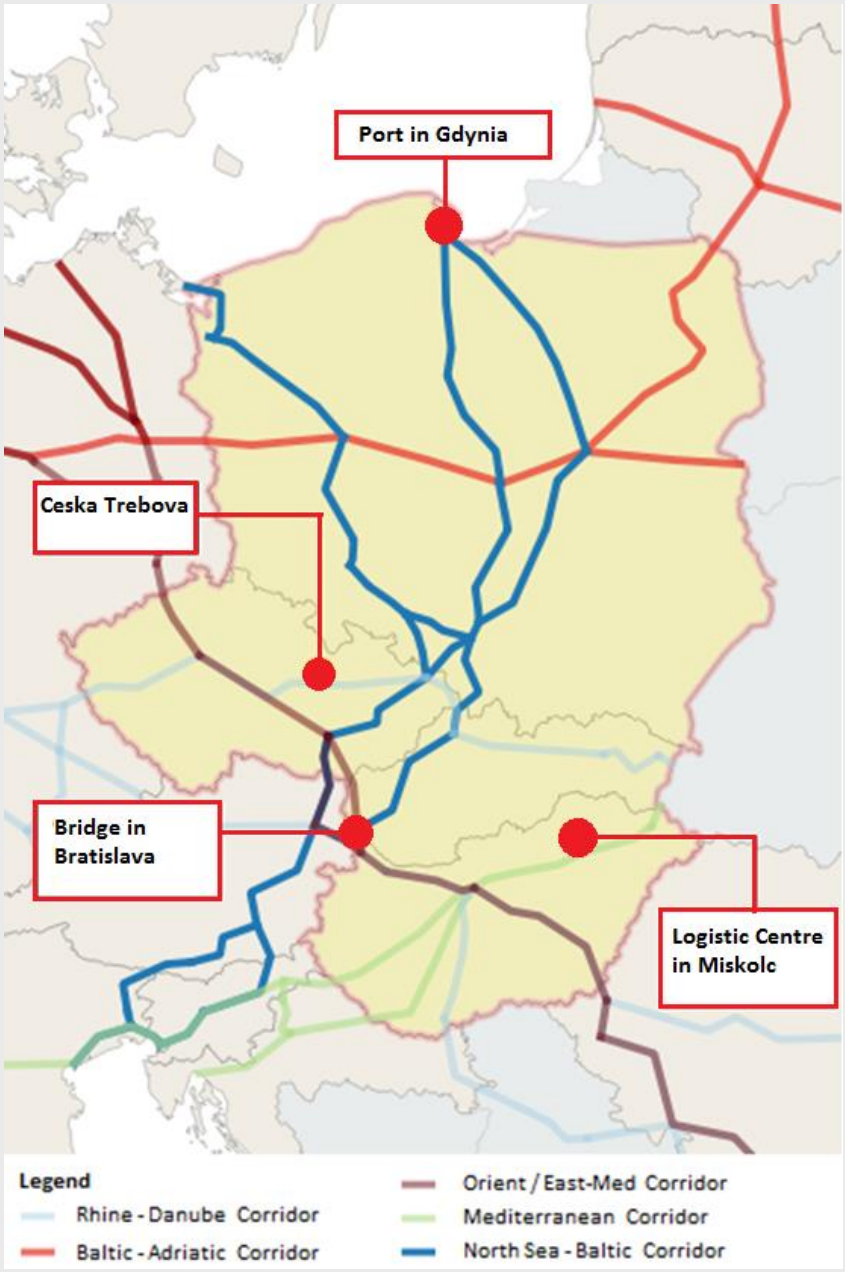
expand, thus making this mode of transport more attractive to potential carriers, since bridge clearance determines the volume of cargo transported by a ship.[81] As per the international classification of waterways, class VI waterways (where the Bratislava bridge with a clearance of 9.10 m now allows such vessels to pass) make it possible for ships to carry four layers of containers.[82]

Foreign logistics companies wishing to expand their business are keen on locating their investment projects in the vicinity of transport routes whose development or upgrade is financed by EU funds. This, however, was just one among many positive outcomes of Cohesion Policy interventions for such companies. Many logistics companies operating in the Czech Republic, Hungary, Poland and Slovakia are either subsidiaries of or entities associated with EU-15 based groups. They not only draw benefits from the development of open-access nodal and linear infrastructure, but have also effectively applied for support for investment projects they themselves sponsor. Consequently, they have boosted their infrastructure capacity, and with it boosted their competitiveness. ÁTI Depo Közraktározási Zrt from Hungary, member of Interag, a holding company with mainly British capital, and METRANS, A.S. from the Czech Republic, part of the Hamburger Hafen und Logistik AG group (HHLA) from Germany are good examples of logistics branches of EU-15-based companies which have both benefited from open-access transport infrastructure development and received direct Cohesion Policy support for projects they sponsor.

[81] Cf. OECD, Report on the Current State of Combined Transport in Europe, by European Conference of Ministers of Transport, 1998.

[82] Wojewódzka-Król, K., Rolbiecki, R., *Kierunki rozwoju śródlądowych dróg wodnych w Polsce (The way forward for inland waterway development in Poland),* Infrastruktura Transportu (Transport Infrastructure) 3/2008 <http://docplayer.pl/9476240-Kierunki-rozwoju-srodladowych-drog-wodnych-w-polsce.html > (DOA: 11.02.2016).

Map 3. Case studies – transport



Externality type	Project
Improvement of logistics infrastructure and competitiveness of EU-15 subsidiaries	***Rehabilitation of side track and crane tracks in the METRANS Ceska Trebova area (Revitalizace železniční vlečky a jeřábové dráhy v areálu METRANS Česká Třebová)*** **– METRANS, a.s.**
	METRANS a.s. is a subsidiary of Hamburger Hafen und Logistik AG (HHLA), Europe's premier logistics enterprise in waterway and land transport (rail and road). The

project was used to build a new hub terminal in Ceska Trebova. For the EU-15, the METRANS project brings benefits such as developing infrastructure and enhanced competitiveness of the HHLA Group, especially in view of the perceived importance of the investment to HHLA.

The construction of the Ceska Trebova terminal was instrumental in achieving a key objective of the HHLA Group's intermodal strategy. The objective is to develop a network of intermodal terminals as hubs for final destinations across Europe.

The investment produced a convenient connection between German sea ports and south-eastern regions of the Czech Republic as well as Slovakia, Hungary and Austria. It helped the HHLA Group to develop its transportation network and expand to Central and Eastern Europe, reinforcing its position as one of the biggest logistics companies providing services between the countries of the region and the sea ports in Hamburg and Bremerhaven.

***Development of the regional logistics centre in Miskolc (Regionális logisztikai központ fejlesztése az ÁTI DEPO Zrt. miskolci telephelyén)* – ÁTI DEPO Közraktározási Zrt.**

The project was to build and equip a logistics warehouse (with a height of 9 m and 5,900 m2 of usable space) at the Miskolc branch, with ancillary infrastructure. Building the ÁTI Depo Zrt warehouse infrastructure serves to boost the potential of a location classed by the national parliament as vital for developing logistics in Hungary. As ATI Depo Zrt.'s majority shareholder is based in the UK, apart from serving project objectives (i.e. improved quality of logistics services provided in Hungary), the impact of this undertaking is further amplified by greater infrastructure capacity and competitiveness of an EU-15 based companies.

The growth of ATI Demo Zrt. may also be associated with external impact resulting from the upgrade of Hungarian transport infrastructure and with the support given by Cohesion Policy co-financing. As company representatives underline, a key asset in securing co-financing for the logistics centre is the excellent location of the warehouse just 3 km from the M3 motorway, plus the direct railway link. The M3 motorway links Budapest to Eastern Hungary; after future extension, the motorway will reach Ukraine's border.

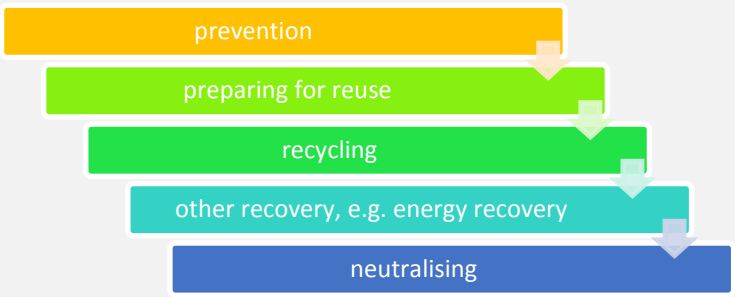
4.5 Externalities and impact of the support for the energy sector and environmental protection

4.5.1 Intervention logic and impact

By signing the Accession Treaties, V4 countries took on a number of commitments to ensure an adequate level of environmental protection. Key challenges facing the Czech Republic, Hungary, Poland and Slovakia included better quality of the air, surface waters, groundwater and soil. It was necessary to reach the goals set by relevant EU directives for each sector.

Waste management

In line with the Waste Framework Directive,[83] EU member states must establish a waste management system consistent with the following hierarchy:



As stipulated, by 2020 the Member States must establish waste management systems ensuring preparation for reuse and recycling of at least 50% of municipal waste containing paper, glass, metal and plastic, plus 70% of construction and demolition waste (excluding hazardous waste)

The Landfill Directive[84], which governs municipal waste disposal, obliges EU member states to process waste before its disposal. The goal set for 2020 requires that municipal bio-waste disposal is reduced to 35% of its mass generated in 1995.

Water and sewage management

The Water Framework Directive governs the requirement of sustainable management of water resources, improving the quality of water and aquatic ecosystems. According to the Urban Waste Water Treatment Directive, Member States must provide all urban centres with a population equivalent (p.e.) above 2,000 with collecting systems for urban waste water. Additionally, in urban centres with p.e. above 10,000, Member States must ensure a higher degree of waste treatment.[85]

Air quality

In order to maintain adequate air quality, the V4 undertook to take measures aimed at curbing pollution generated by the energy sector,[86] industry and municipal services, which are the main sources of low-stack emission.[87]

The general energy efficiency requirements are defined in the climate and energy package. The 2007 plan included the following targets:

[83] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

[84] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

[85] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment

[86] Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants

[87] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

- reduce greenhouse gas emissions by at least 20% in 2020 compared to 1990;
- increase the share of renewable energy in the energy mix by 20%;
- improve energy efficiency by 20%;
- increase the share of biofuel in total fuel consumption in transport by 10%.

In principle, all aspects of the energy sector and environmental protection in the Czech Republic, Hungary, Poland and Slovakia lagged severely behind the EU-15.

Water and sewage management in the V4, measured in particular by the percentage of people using collective waste water treatment systems and connected to waste water treatment plants, deviates significantly from EU standards. In Germany, the Netherlands, Belgium or Sweden almost all residents (from 88 to 100% in 2006-2007) were connected to waste water treatment plants, while in three V4 countries this ratio was below 64% in 2006. Things looked slightly better in urban areas, where the ratio varied from 57 to 67%. With 74% of the residents connected to waste water treatment plants, including 77% to urban sewage systems, the Czech Republic was an exception. However, waste water treatment was insufficient, especially in urban centres with p.e. above 10,000.[88] Relatively few residents were connected to waste water treatment plants in Slovakia as stand-alone treatment systems were popular in the country: 43% of Slovaks used in it in 2006.

Also, the approach towards waste management was not in line with the guidelines adopted in the Waste Framework Directive and Landfill Directive. Vast majority of municipal waste was landfilled. Depending on the country, 77-91% of waste ended in landfills, with the corresponding figure for the EU-15 at just 37%. Incineration (including energy recovery), which in the EU-15 covered 25% of waste, was popular in the Czech Republic and Slovakia, slightly less so in Hungary, and very little indeed in Poland. Recycling, also popular in the EU-15 (24%), ranged from 1% of waste in Slovakia to 9% in Hungary.

The air quality in the V4 suffered largely from low-stack emissions generated by transport, households and public buildings and from industrial and power plant pollution. In each country, concentrations of hazardous substances was exceeded, including in particulates PM10, PM2.5 and benzo(a)pyrene, with negative impact on human health and life.

Figure 93. Changes in greenhouse gas emissions (1990 = 100)

Yet, some progress was noted in greenhouse gas emissions, which to 2007 decreased much faster than the EU-15 average against the reference year 1990. This was largely driven by structural changes in manufacturing industries following the systemic transition at the turn of the 1980s, when large plants closed down and business companies modernised their operations.

[88] NSRF Czech Republic 2007-2013, Prague 2007.

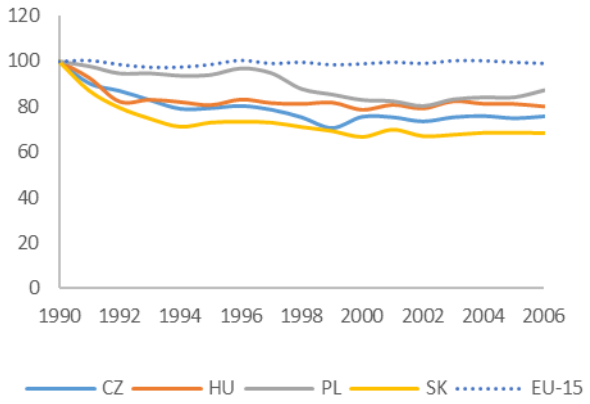


Figure 94. Energy efficiency of the economy (kgoe/1000 EUR of GDP) – 2006

Despite the transition, V4 economies were much more energy-intensive than the more advanced Western European ones in the period preceding the 2007-2013 financial perspective. Energy efficiency measured as GDP to energy consumption used to generate the GDP was almost 2.5 times the EU-15 average in Slovakia, Poland and the Czech Republic. Hungary reported only a moderately better ratio.

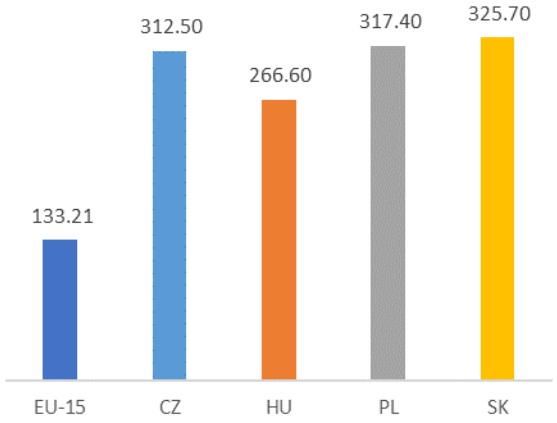
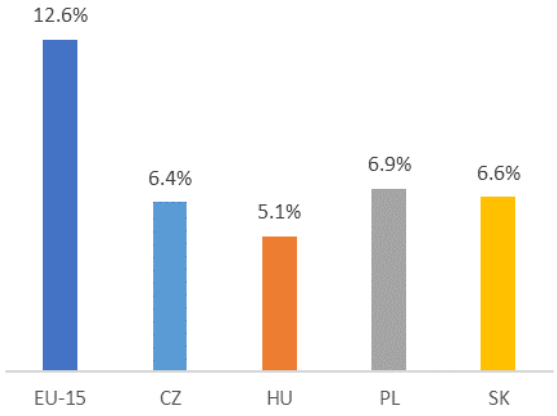


Figure 95. Share of RES in total energy consumption – 2006

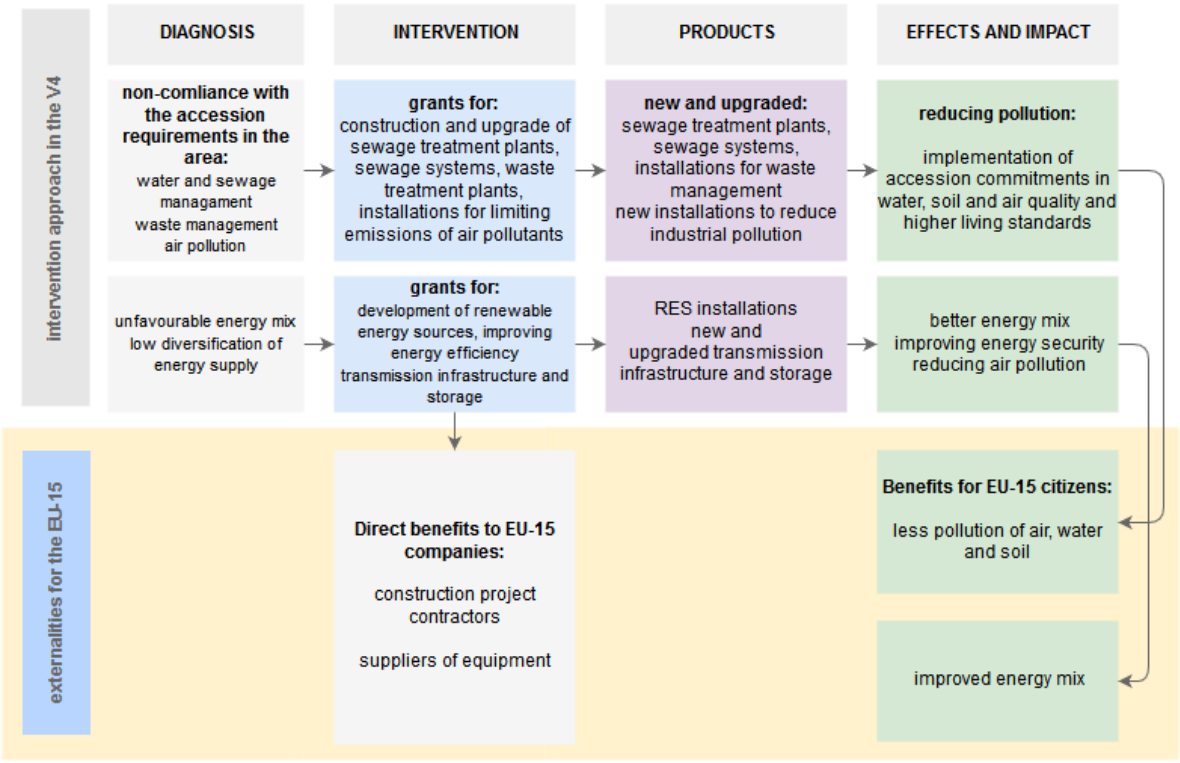
Demand for energy was mainly met by conventional generation. Renewable energy accounted for less than 7% of energy consumption in the V4. By comparison, the EU-15 average was 12.6% in that period. RES accounted for 42.7% in Sweden alone, and 25.3% in Austria.



Source: Own elaboration based on Eurostat data.

This illustrates the gap between the V4 and the more developed EU-15 that existed at the outset of the financial perspective 2007-2013. To bridge it, each country anticipated an array of support instruments to improve the environment and raise energy efficiency. Their common goal was to diminish key sources of air, water and soil pollution, and thereby bring the V4 closer to meeting the accession commitments and to improve living conditions and the quality of life.

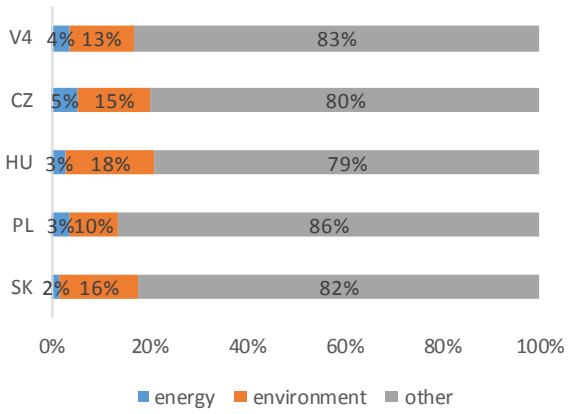
Scheme 7. Intervention approach in the V4 – energy and environment



Source: Own elaboration.

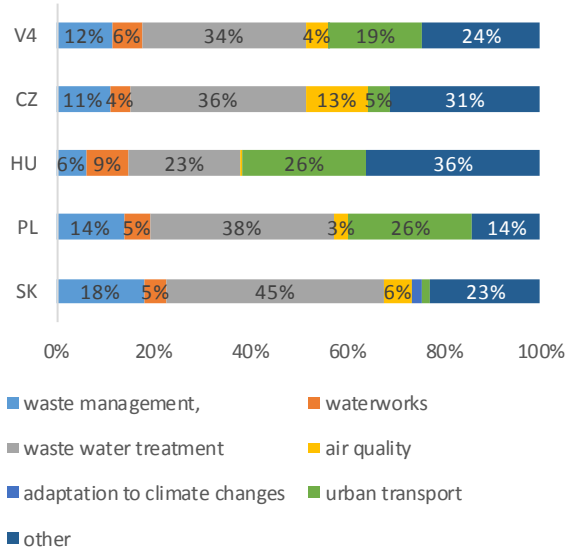
The measures implemented under national programmes ('Environment and Energy' OP in Hungary, 'Infrastructure and Environment' OP in Poland, 'Environment' OP in the Czech Republic and Slovakia) were bolstered by regional programme support. At the central level, support was granted to the largest infrastructure projects, from sewage systems and waste management facilities in large urban centres to key energy investments (e.g. transmission networks in TEN-T infrastructure), to measures aimed at reducing emissivity of key industries. At the regional level, more support was provided to infrastructure development in smaller urban centres.

Figure 96. Share of funding allocated to environmental protection and energy in total EU funding in the V4



Interventions in environmental protection and energy absorbed over EUR 21.5 bn in total, or 17% of global expenditure in the V4. These sectors benefited the most in Hungary (in total 21%) and the Czech Republic (20%), and the lowest share was spent in Poland (13%). Regardless of the differences, the intervention structure in each country is marked by a stronger emphasis on supporting environmental protection, whereas a much smaller share of funds is allocated to energy projects.

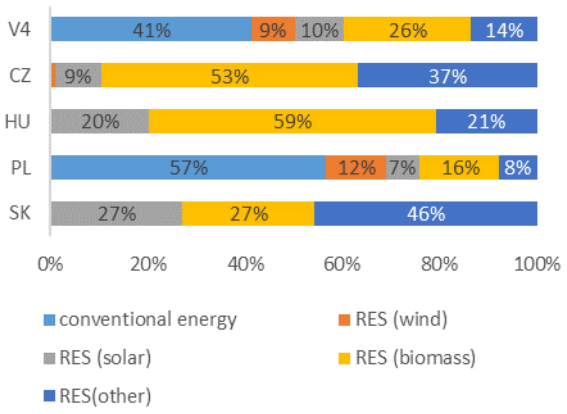
Figure 97. Environment funding by intervention area



In environment, the expenditure mix varies significantly; however, it is overshadowed by funds allocated to developing waste water treatment and water supply systems, which account for 40% of the expenditure. Furthermore, Hungary and Poland allocated 26% of available funds each to support urban transport in order to reduce traffic pollution in cities. The other measures focused on improving air quality (mainly reducing industrial pollution and low-stack emissions) and took up 4% of the funds across the V4 in total, including 13% in the Czech Republic. 12% of the funding was allocated to waste management, with the relatively highest share in Slovakia (18%), and the lowest in Hungary. The remaining environmental protection expenditure included *inter alia* measures to adapt to climate change and protect biodiversity.

In absolute terms, in energy support the general thrust of funding went to improve infrastructure for the transmission and storage of conventional energy, and all such projects were put into operation in Poland. In the other countries, all available allocations were spent on developing renewable energy sources (RES). Funding of biomass energy projects prevailed in the Czech Republic and Hungary, while solar energy was equally popular in Slovakia. In Poland, the development of renewables is based on wind, solar and biomass.

Figure 98. Funding by intervention topics in the area of energy



Source: Own elaboration based on EC data.[89]

Thanks to environmental interventions, the V4 could develop their core municipal infrastructure for managing water, sewage and waste. The executed investment projects that brought the Czech Republic, Hungary, Poland and Slovakia closer to meeting the accession commitments also contributed to a better quality of life in those countries. In addition, the projects brought waste water management benefits to over 1.5 mn people. In Poland alone, over 27,000 kilometres of sewage networks and 521 waste water treatment plants were built or upgraded.[90] In the Czech Republic, over 3,070 kilometres of sewage networks were built or modernised under the Environment OP.[91] Over seven years, Cohesion Policy-financed projects coupled with national co-financing contributed to increasing substantially the number of people connected to waste water treatment plants and urban sewage systems, especially in Slovakia.

As per the statistics collected for the ex-post Cohesion Policy evaluation in 2007-2013, 825[92] waste management projects were put in place in the V4. Just in Slovakia, 207[93] waste collection or recovery facilities were built or upgraded in EU-funded projects. Like in water and sewage management projects, interventions financed by Cohesion Policy funds coupled with national co-financing brought about considerable changes in waste management. Firstly, all waste in the Czech Republic and Hungary is now

[89] Data available at: <http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/priority_theme_overview_2007_2013.xls> (DOA 11.02.2016).

[90] Ministry of Economic Development, Implementation of EU funds under the 2007-2013 National Strategic Reference Framework. Monthly Report, December 2015.

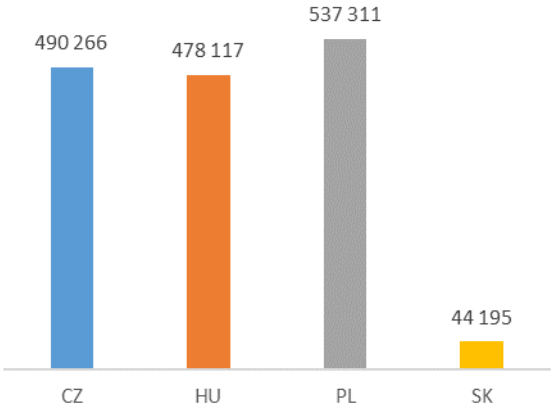
[91] *Environment Operational Programme, Annual Report 2014*, Ministry of the Environment of the Czech Republic, June 2015

[92] The value of the indicator *Number of waste projects* is available at: http://ec.europa.eu/regional_policy/en/policy/evaluations/ec/2007-2013/#1; (DOA: 3.02.2016)

[93] The global value of the following indicators: *Number of built or upgraded waste collection facilities*, *Number of built or upgraded waste recovery facilities* and *Number of facilities built to treat hazardous waste*. Available at: http://ec.europa.eu/regional_policy/en/policy/evaluations/ec/2007-2013/#1; (DOA: 3.02.2016)

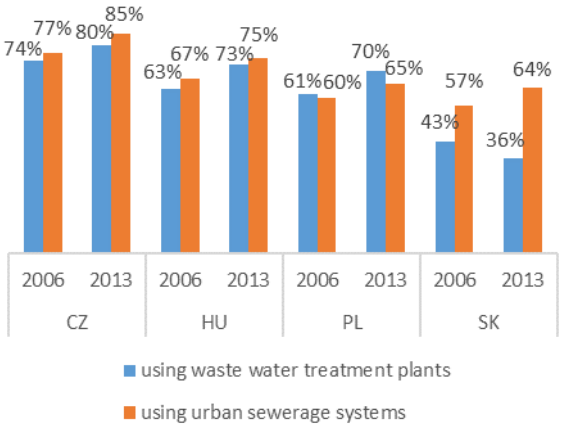
channelled into management, and waste management indicators for Slovakia and Poland are 91% and 84%, respectively (in 2013). Secondly, management methods evolved in the desired fashion. Significantly less waste ends up in landfills and much more is recycled with energy recovery from incineration, a highly important change for Poland. As a result, all the V4 are getting closer to meeting their accession commitments.

Figure 99. Additional beneficiaries of upgraded waste water treatment facilities



Source: Own elaboration based on ex-post evaluation of ERDF and CF[94]

Figure 100. Percentage of individuals connected to waste water treatment plants and using urban sewage systems in 2006 and 2013.



Source: Own elaboration based on Eurostat data.

Figure 101. Percentage of managed municipal waste in 2006 and 2013.

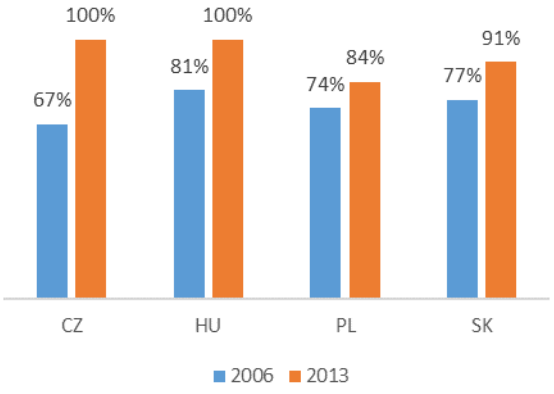
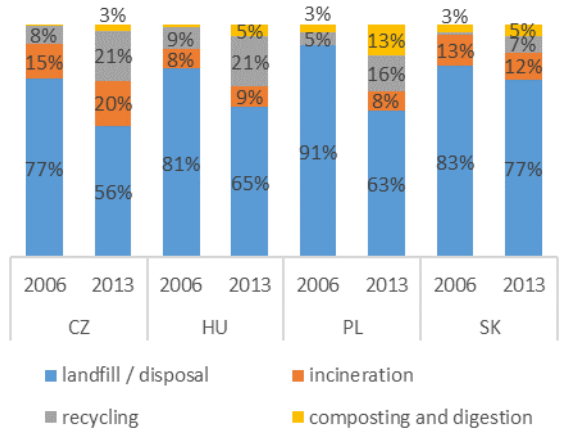


Figure 102. Municipal waste management by method in 2006 and 2013.



Source: Own elaboration based on Eurostat data.

[94] Ex-post evaluation of the Cohesion Policy. Work package 0 - Data collection and quality assessment. WP0 Database 2 - full database including all core indicators and programme specific indicators. Available at: http://ec.europa.eu/regional_policy/en/policy/evaluations/ec/2007-2013/#1 (DOA: 3.02.2016)

Providing urban centres with waste water collection and treatment systems limited the pollution of groundwater and surface waters in the V4. The development of waste collection and treatment systems, in particular those promoting transition from landfilling to other waste management methods, also had an impact on improving the quality of groundwater and surface waters and on reducing air pollution.[95] The support for upgrades of heating systems in private and public buildings together with promoting energy-efficient public transport all contributed to cutting low stack emissions. Better air quality is also a result of support for facilities reducing hazardous substances in industrial and energy emissions**.** In 2007-2013, nitrogen oxide and sulphates emissions were reduced considerably against 2006 levels. Moreover, in Poland and Slovakia the PM10 and PM2.5 particulate content was diminished.

Figure 103. SOx Emissions: 2006 = 100

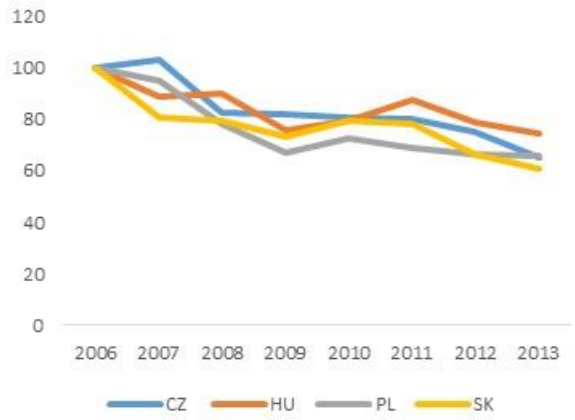


Figure 104. NOx Emissions: 2006 = 100

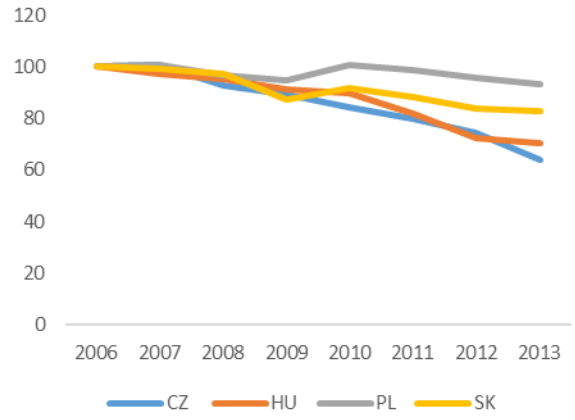


Figure 105. PM10 Emissions: 2006 = 100

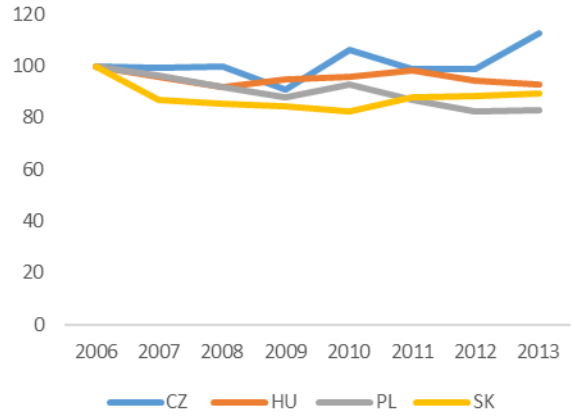
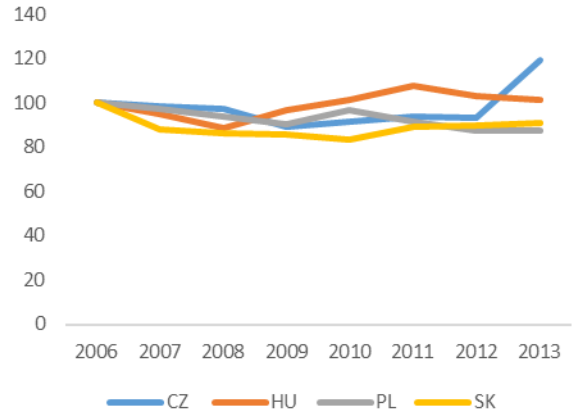


Figure 106. PM2.5 Emissions: 2006 = 100



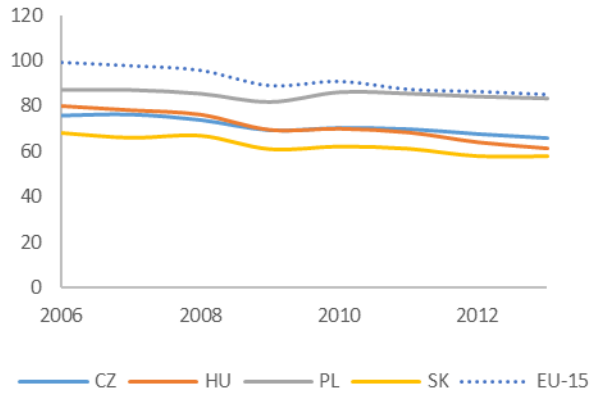
Source: Own elaboration based on EEA data.

[95] Some gases are emitted to the atmosphere through waste fermentation in landfills. Apart from emitting the odour, they contain substances that are harmful to human health, e.g. methane, the second most emitted greenhouse gas after carbon dioxide.

The aforementioned measures taken to eliminate small emission sources, improve energy generation and air quality have contributed to further cuts in greenhouse gas emissions. The biggest progress was made by Hungary and Slovakia, whole Poland lagged behind the most, where emissions dropped mostly in the late 1990s.

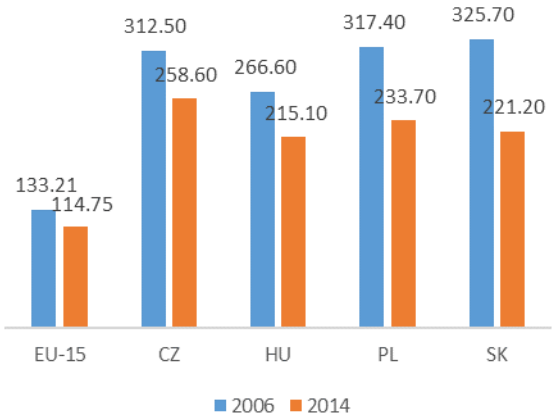
Reductions of greenhouse gas emissions were coupled with a general decrease in energy intensity in the economy.

Figure 107. Changes in greenhouse gas emissions: 1990 = 100



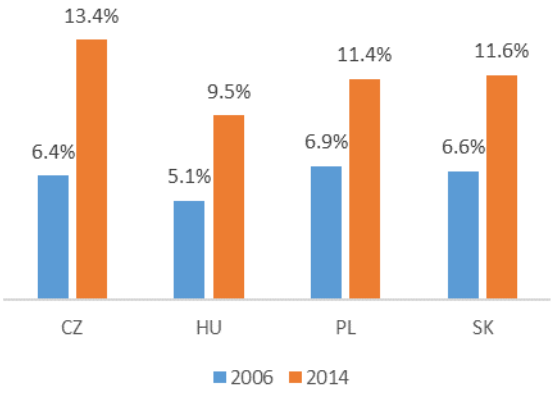
The change noted in the V4 was much more pronounced than in the EU-15. Cohesion Policy interventions and other initiatives helped to reduce emissions by more than 30% in Slovakia, over 25% in Poland and nearly 20% in Hungary. Thus, development and growth in those countries gradually decoupled from growing energy demand.

Figure 108. Energy intensity of the economy (kgoe/1000 EUR of GDP) in 2006 and 2014



Cohesion Policy co-financing and investments funded from other sources largely helped to increase the share of renewables in total energy use in the V4. The Czech Republic made the biggest advances while Hungary improved the least. Although the V4 are still far from reaching the goals of the climate and energy package, they made great strides in 2007-2014.

Figure 109. Share of RES in total energy consumptions in 2006 and 2014



Source: Own elaboration based on Eurostat data.

4.5.2 Externalities

Environmental protection

Lower harmful emissions into air, water and soil are beneficial not only to people who live where protection measures are put into action, but also to all EU citizens. Air pollution and hazardous substances in water can travel far from their source and worsen the environment in neighbouring countries. This challenge requires public intervention, particularly at the sources of emission. Consequently, a better environment in the EU-15 depends also on measures taken by the neighbouring countries including the V4, where the quality of municipal services and environmental protection before the 2007-2013 perspective lagged substantially behind other member states.

Nowadays, hazardous substances discharged into the air are a major environmental risk to human health. Poor air quality increases i.a. the risk of respiratory diseases, tumours and cardiovascular diseases.[96] In Europe, the foremost pollution sources are transport, energy generation, industry, households and public buildings, agriculture and waste management. The emissions can travel far and thus affect large areas far beyond the borders of one country.[97]

Paradoxically, high industrial and power plant stacks help to reduce pollution in their immediate vicinity, but due to the stack height and emission speed, pollutants the can travel far from their source.[98] Hence, all projects aimed at building emission-reducing facilities in industrial and energy sectors in the V4 were also beneficial to people in other EU member states. Such projects were supported i.a. in Poland in the 'Infrastructure and Environment' Operational Programme as part of Measure 4.5 *Support for enterprises in air protection*. Under this measure, companies could apply for subsidies to upgrade or develop existing fuel combustion installations and heating systems, build new installations reducing emission of gaseous and particulate pollutants, or convert fuel combustion installations into environmentally friendly solutions.[99] One enterprise to benefited such support was PGE Górnictwo i Energetyka Konwencjonalna S.A. (PGE GiEK S.A.). The company put into effect many projects to reduce the emissions generated by its power and CHP plants. One of the PGE branches to receive subsidies was Zespół Elektrowni Dolna Odra (Dolna Odra Power Plant Group) located near the Polish-German border.

Restoration and maintenance of good status of groundwater and surface water is another key environmental objective for the EU. Water quality affects not just human health; it impacts natural ecosystems. As watercourses cross state borders, so do pollutants, thus adding to an international challenge.[100] Some of the biggest river basins in Europe cover territories of several countries; for instance, the Danube basin covers i.a. Germany, Austria, Czech Republic, Slovakia, Hungary, Romania,

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[96] World Health Organization, *Ambient (outdoor) air quality and health,* Fact sheet N°313, 2014. Available at: http://www.who.int/mediacentre/factsheets/fs313/en/ (DOA: 05.02.2016)

[97] European Environment Agency, *Air quality in Europe — 2015 report*, 2015

[98] Michalczyk, J., K, Transport gazowych zanieczyszczeń w powietrzu – symulacje numeryczne w skali lokalnej [Transport of gaseous pollutants in the air – numeric simulations on a local scale], Doctoral dissertation under the supervision of Krzysztof Murawski, PhD hab., prof. at UMCS University, Lublin University of Technology, Institute of Environmental Protection Engineering, Lublin 2003.

99 'Infrastructure and Environment' Operational Programme. Detailed description of the priorities, version 5.0, Warsaw, 03.03.2016.

100 Eurostat Statistical books, *Environmental statistics and accounts in Europe*, EU 2010

Ukraine, Bulgaria, and the river basins of the Oder and the Elbe encompass the territories of the Czech Republic, Poland and Germany. Furthermore, many smaller watercourses are natural borders between the EU-15 and V4 countries. For example, the Morava is the border river between Slovakia and Austria, and between Slovakia and Czech Republic, and the Lužnice region is a natural border between Austria and the Czech Republic.

Quite like with air pollution, the EU-15 cannot solve all water pollution problems by 'going it alone.' This is in particular true for watercourses which, before reaching the EU-15, pass through other countries where they are affected by municipal, industrial and agricultural pollution. Germany is a case at hand. After reunification in 1990, the German authorities started a painstaking process of improving water quality of the Elbe, a river heavily polluted for decades by the GDR and Czechoslovakia's industries. Following the 1990 political transformation, the population in eastern Germany shrank by more than 800,000; many industrial plants closed, and agricultural production diminished considerably. Thus, less pollution infiltrated the river. At the same time, water and sewage infrastructure grew strongly between 1990 and 1999. In total, 181 wastewater treatment plants were built, upgraded or expanded, of which 139 in Germany and 42 in the Czech Republic. Those helped significantly in reducing pollution released into the North Sea (e.g. the level of ammonia dropped by 62% and phosphorus decreased by 36%).[101]

Joint Czech and German efforts were instrumental in improving water quality in the Elbe in the 1990s. Under 2007-2013 Cohesion Policy interventions, authorities in the Czech Republic continued to expand sewage systems, thereby connecting more towns to collective wastewater treatment systems. The main source of funding for such projects was Measure 1.1. *Reduction of water pollution* of the 'Environment' Operational Programme. Under this measure, support could be obtained for building and upgrading wastewater treatment plants and sewage systems.[102] Projects were carried out across the country, including in the Elbe basin and the towns located along the river.

Box 18. Case study – wastewater treatment infrastructure in the Czech Republic

Projects	**Support for water and wastewater management**
Beneficiaries	**Local governments and sewage companies**
Programme	**Environment Operational Programme (OP Životní prostředí)**
Measure	**1.1. Reduction of water pollution (Snížení znečištění vod)**
Value of project	**ca. EUR 2.55 bn**
EU funding	**ca. EUR 1.5 bn**[103]

According to the implementing regulations to the Urban Waste Water Treatment Directive, there are 531 urban centres of more than 2,000 population equivalent (p.e.) in the Czech Republic which should have access to collective sewage systems with wastewater treatment	**Problem addressed by the project**

[101] Netzband A., Reincke H., Bergemann M.: *The River Elbe – a Case Study for the Ecological and Economic Chain of Sediments.* J Soils & Sediments 2 (3), 112-116, 2002.

[102] *Programming Document of the Environment Operational Programme 2007-2013* (Programový dokument OPŽP pro období 2007-2013), Ministry of the Environment of the Czech Republic, Version 5, 18.12.2014.

[103] Value determined on the basis of subsidised projects.

plants. In 2006, 267 such centres fulfilled the requirements of Directive 91/271/EEC. The 264[104] remaining ones experienced problems with i.a. insufficient capacity of sewage systems and wastewater treatment plants.[105] Hence the need to carry out a range of investment projects to extend the existing systems, build or upgrade wastewater treatment plants to ensure adequate treatment, and reduce the content of nitrogen and phosphorus compounds in effluents.	
Project scope	Because of the investment needs in wastewater treatment, Measure 1.1 of the 'Environment Operational Programme' provides support in the form of subsidies for expanding and upgrading wastewater management systems in urban centres of more than 2,000 p.e. and, where justified, in areas below 2,000 p.e.
Extending wastewater treatment systems in the Czech Republic helped fulfil the requirements of the Urban Waste Water Treatment Directive concerning more Czech towns and cities. The projects improved living standards, particularly in areas previously not connected to collective sewage systems and wastewater treatment plants. In addition, expanded wastewater collection and treatment infrastructure reduced impact on the environment by limiting the quantity of pollution discharged into groundwater and surface water. Under this measure, funds were disbursed for 784 projects. As of 2015, a total of 3070.98 km of sewage network and 106 wastewater treatment plants were built and upgraded in urban centres of more than 2,000 p.e. In total, 490,266 residents were connected to sewage systems.[106]	**Outcomes of the V4 project**
Externalities	The Elbe basin covers almost all the Czech territory; it is one of the most polluted bodies of water in this country.[107] The Elbe flows from the Czech Republic to Germany, where its basin extends into east German Länder to include economic hubs like Dresden, Magdeburg, Wittenberg and Hamburg. Near Cuxhaven, the river flows into the North Sea. The upper Elbe is in the Czech Republic; thus, the Czech section of the river has a big impact on water quality and its usability in Germany. This section is also crucial in terms of hazardous substances being discharged into the North Sea.[108] Once discharged into groundwater and surface water in the Elbe basin, pollution generated by Czech Republic's municipalities was transported together with the river's waters to Germany and onto the North Sea. Industrial and municipal pollution has a negative impact on the quality of groundwater and surface water. The pollutants include oxygen-absorbing substances, detergents and other

[104] Including 99 urban centres for which no up-to-date data was available.

[105] Vláda České Republiky, *Usnesení Vlády České Republiky ze dne 6. prosince 2006 č. 1391 o Aktualizaci strategie financování implementace směrnice Rady č. 91/271/EHS, o čištění městských odpadních vod.*

[106] Ministry of the Environment (Ministerstvo Životního Prostředí), Report on the implementation of the OP Environment in 2014 (*Výroční Zpráva Za Rok 2014 Op Životní Prostředí 2007 – 2013*), June 2015.

[107] Randak T, Zlabek V, Pulkrabova J, Kolarova J, Kroupova H, Siroka Z, Velisek J, Svobodova Z, Hajslova J., Effects of Pollution on Chub in the River Elbe, Czech Republic, Ecotoxicology and Environmental Safety Volume 72, Issue 3, March 2009, Pages 737–746

[108] Langhammer, J., *Water Quality Changes in the Elbe River Basin, Czech Republic, in the Context of Post-Socialist Economic Transition,* GeoJournal 04/2010; 75(2):185-198. DOI: 10.1007/s10708-009-9292-7 https://www.researchgate.net/publication/225728689_Water_quality_changes_in_the_Elbe_River_Basin_Czech_Republic_in_the_context_of_the_post-socialist_economic_transition (DOA 13.02.2016).

chemicals which pose a threat to aquatic ecosystems, i.e. those which might lead to reducing the population or even extinction of certain fish and plant species in a given body of water.[109] They also contribute to soil acidification. This is why building and upgrading wastewater treatment infrastructure in the V4 was essential also for the EU-15, since it made it possible to reduce the impact on the environment not only in the V4, but also of in EU-15 countries.

Similar benefits were brought about by projects to reduce the risk of polluting groundwater and surface water by eliminating sources of harmful substance emissions. Apart from wastewater, also pollution generated by solid waste poses a threat to groundwater. Its sources are in particular inadequately secured landfill sites. Lack of appropriate protection can cause rainwater and fluids from waste together with other pollutants contained in litter to seep into the soil and groundwater.[110] Due to groundwater pollution hazardous substances may spread, ecosystems may be disrupted and soils may acidify.[111] If this happens near other watercourses, pollutants may penetrate to distant locations. When such problems appear in border areas, they pose a threat to population both in the country or origin and in the neighbouring country. Therefore, eradicating such problems is beneficial to both. This is exemplified by the landfill site in the municipality of Kúty, which benefited from support under Measure 4.5 of the 'Environment' Operational Programme 2007-2013 put into practice in Slovakia. This measure provided funds to investment projects aimed at closing and rehabilitating waste disposal sites.[112]

[109] Randak T, Zlabek V, Pulkrabova J, Kolarova J, Kroupova H, Siroka Z, Velisek J, Svobodova Z, Hajslova J., *Effects of Pollution on Chub in the River Elbe, Czech Republic,* Ecotoxicology and Environmental Safety Volume 72, Issue 3, March 2009, Pages 737–746

[110] Wychowaniak, D., *Migracja zanieczyszczeń w rejonie starego składowiska odpadów z pionową przesłoną przeciwfiltracyjną (Pollutant Migration in the Vicinity of a Disused Landfill with a Vertical Anti-Filtration Barrier),* Przegląd Naukowy – Inżynieria i Kształtowanie Środowiska, Issue 59, 2013: 45–55, p. 45.

[111] Eurostat Statistical books, *Environmental statistics and accounts in Europe*, EU 2010

[112] *Environment Operational Programme 2007-2013, Version 5.0*, 28.10.2015, Slovak Ministry of the Environment, Bratislava.

Map 4. Case studies – environment

Externality type	Project
Reduced emissions and improved air quality in the EU-15	***Upgrade of a combustion installation (boilers 6 and 7) in the Dolna Odra power plant to cut NOx emissions (2), Upgrade of a combustion installation (boiler 5) in Dolna Odra power plant to cut NOx emissions (3) Upgrade of a combustion installation (boiler 8) in Dolna Odra power plant to cut NOx emissions (4)*** **– PGE Górnictwo i Energetyka Konwencjonalna S.A.**
	The Dolna Odra power plant in Nowe Czarnowo (near Gryfino) is part of the Dolna Odra Power Plant Group held by the PGE Group. It is a conventional power plant with 6 generation units and total power generation capacity of 1,362 MWe plus total heat

	generation capacity of 100.81 MWt. The aim of the subsidised projects was to: • upgrade the flue gas desulphurisation facilities for units 5 and 6; • build a combustion installation (boilers 5-8) to cut NOx emissions, based on the technology of non-catalytic reduction of flue gas de-nitrogenation (SNCR) . New and upgraded pollution-reducing facilities at the Dolna Odra power plant helped radically to cut the level of hazardous substances generated in combustion processes. Harmful emissions are a nuisance in the immediate vicinity of the emission sources, but also further away. In fact, air pollution can be transported by wind over long distances. This is even more so in large power plants (due to high stacks) than in low emission pollution. Hence the project's undisputed benefits to people living in cross-border areas, in particular in the north-east German Länder, as the Dolna Odra power plant is located in the Zachodniopomorskie (Western Pomerania) region near the Oder, the border river between Poland and Germany.
Elimination of a source of potential surface and groundwater pollution in EU border regions	***Decommissioning and rehabilitation of the Kúty landfill site (Uzavretie a rekultivácia skládky odpadov – Kúty) – Municipality of Kúty*** In 1975-2000, the municipality of Kúty had an active landfill located in the extraction site of a former gravel pit. Because of the risk of polluting groundwater with leachates from the waste landfilled there for many years, the local authorities decided to close the landfill and rehabilitate the soil in the area. The elimination of the polluting landfill in the municipality of Kúty is beneficial both to local residents and those in EU-15 countries. The cross-border advantages depend mostly on the project's location. The municipality of Kúty is located near the Morava river, part of the border between Slovakia and the Czech Republic. It is located ca. 10 km from the intersection of three borders between Austria, Czech Republic and Slovakia. Further downstream, the Morava runs along the 114 km-long border between Slovakia and Austria and flows into the Danube near Bratislava. Studies pf pollution migrations in and around former landfill sites indicate that failure to rehabilitate such land can cause increased pollution in water and soil, which in turn affects ecosystems and poses a threat to human health. Leachates from landfill waste seep into groundwater together with rainwater, runoff water and fluids from solid waste, thus carrying many hazardous substances deep into the ground, including sulphates, chlorides, hydrocarbons, pesticides and heavy metals.

Energy efficiency

Just as environmental infrastructure development in the V4 has improved the quality of the environment in the EU-15, so do energy interventions in the Czech Republic, Hungary, Poland and Slovakia benefit other EU member states. From the economic perspective, reduced energy intensity of V4 economies is key as it demonstrates that economic growth is increasingly decoupled from growing energy demand. These developments also help to reduce greenhouse gas emissions, one of the main drivers of climate

change with their adverse impact on human health and the environment.113 This, in turn, brings benefits both to V4 and the EU as it helps to pursue EU energy policy objectives.

Box 19. EU's energy policy

The EU climate and energy package referred to above came in response to the risk of climate change and to the growing demand for energy in view of shrinking energy resources and instabilities of external energy supplies. As these issues are of paramount importance to the entire EU, the objectives of ensuring energy security and preventing climate change were written into the EU 'Europe 2020' strategy as part of the flagship initiative known as *Energy Efficient Europe*. The goals of the EU energy policy are also reflected in provisions on energy added to the Treaty on the Functioning of the European Union. Article 194 explicitly provides that the energy policy should aim to:

a) *ensure the functioning of the energy market;*

b) *ensure security of energy supply in the Union;*

c) *promote energy efficiency and energy saving and the development of new and renewable forms of energy; and*

d) *promote the interconnection of energy networks.114*

With improved energy efficiency in mind, construction is a key area of public interventions as available building technologies help to cut energy intensity even by half.115 Residential, public and commercial property accounts for close to 40% of total energy consumption.116 Heating is a large chunk of total use, ranging from under twenty percent in countries like Malta and Portugal to 70-80% in Denmark, Finland or Germany. Energy use for heating in the V4 represents between 65% (Slovakia) and 70% (Czech Republic) of the total consumption.117 However, available research indicates that the ratio is similar to the EU-15 average not so much thanks to energy efficiency of buildings but rather due to a less affluent V4 population, in other words more energy poverty.118

As indicated in statistics, the populations of the Czech Republic, Hungary, Poland and Slovakia top the European index listing the share of energy costs in total household spending, and they are placed well above the EU-15 average. Higher energy prices in the past few years have only exacerbated this. Slovakia is an exception: its energy spending has dropped but continues to be among the EU's highest. Apart from less general wealth, such a high rating of the V4 follows from poor energy efficiency of the municipal and

[113] WHO, *Climate change and health*, http://www.who.int/mediacentre/factsheets/fs266/en/ (DOA: 15.02.2016)

[114] Title XXI ENERGY (Article 194) of the Treaty on the Functioning of the European Union.

[115] European Council for an Energy Efficient Economy, *Energy Efficiency in Buildings, http://www.eceee.org/policy-areas/Buildings* (DOA: 15.02.2016)

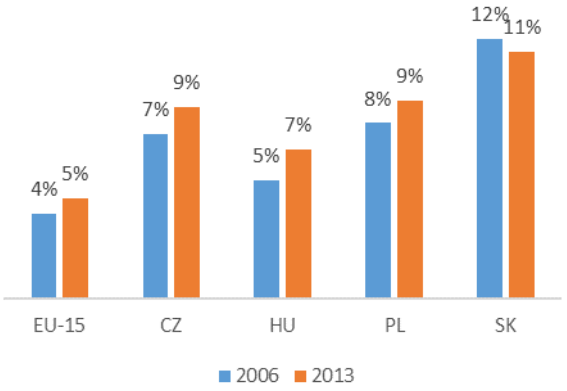
[116] European Council for an Energy Efficient Economy, *Energy Efficiency in Buildings, http://www.eceee.org/policy-areas/Buildings* (DOA: 15.02.2016)

[117] EEA, *Household energy consumption per dwelling by end-use,* http://www.eea.europa.eu/data-and-maps/daviz/energy-consumption-by-end-uses-1#tab-chart_1 (DOA: 15.02.2016)

[118] Stępniak A., Tomaszewska A., *Ubóstwo energetyczne a efektywność energetyczna. Analiza problemu i rekomendacje [Energy Poverty and Energy Efficiency. A Look at the Issue and Recomendations*] Fundacja Instytut na rzecz Ekorozwoju, Warsaw 2013

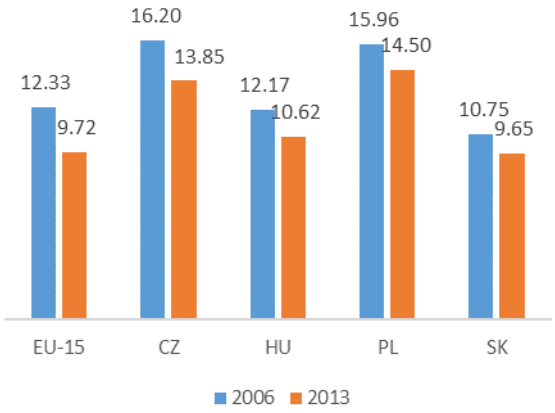
residential sectors in their economies.119 This is corroborated by figures describing demand for energy used to heat 1 m^2 of space. The ratio in Poland and the Czech Republic is well above the EU-15 average; only Slovakia ranks well below it.

Figure 110. Share of electricity, gas and fuel in total household spending



Source: Own elaboration based on Eurostat data.

Figure 111. Energy used to heat 1m^2 of space – (koe/m^2)120



Source: Own elaboration based on ODYSSEE data.

In comparison, figures for the period preceding the 2007-2013 financial perspective and end-of-period statistics both suggest that the V4 has reported a marked energy efficiency improvement in the municipal sector. This was possible among others thanks to interventions financed with Cohesion funds. Each of the V4 put in place measures in 2007-2013 which offered funding for such improvements. Aid was available in the Czech Republic including measure 2.2 *Reducing air emissions* of the Environment Operational Programme. In Hungary, it was under axis 5: *Energy efficiency* of the 'Environment' Operational Programme and 'Energy co-financed projects improving the energy efficiency of public buildings.' Such investments were also supported in Poland via measure 9.3 *Thermal upgrade of public buildings* in the 'Infrastructure and Environment' Operational Programme. In Slovakia, axis 3 *Air protection and minimising adverse impact of climate change* of the 'Environment' Operational Programme offered comprehensive support for reducing greenhouse gas emissions including upgrades and/or replacement of sources of heat, upgrades to eliminate heat losses, plus support for renewables. The measures put into operation at the central level were complemented by regional programmes which largely focused on the residential sector.

Energy upgrades in buildings enabled by the co-financed projects served to reduce energy intensity of the municipal and residential sectors, which cut the maintenance cost of buildings and their emission levels. On the macro scale, this helped to cut the share of fossil fuels in heat generation, thereby adding to the environmental benefits of the interventions. Overall, such initiatives helped to reduce emissions both in each Visegrad country and across the EU.

When looking at these developments, it is important to note that energy use in residential buildings in the Czech Republic, Hungary, Poland and Slovakia was partly curbed by lesser affluence and economic under-development of those countries when set against the EU average. Global experience shows that

[119] *Energy poverty …,* op. cit.

[120] In the absence of current statistics, data for Hungary are shown for 2010 rather than for 2012, as is the case in other countries.

demand for energy grows with economic growth and affluence.[121] This would suggest that income growth in the V4 expected in the coming years will drive more energy consumption. More energy intensity in the economy generates the risk of more greenhouse gas emissions with their impact on climate change, the environment and human health in the V4 and across the EU. Thus, support for initiatives to reduce energy intensity in the building industry is a key precondition of mitigating future adverse impact on climate.

The pursuit of EU energy objectives in the V4 went beyond energy efficiency improvements in each country under consideration. Cohesion Policy-financed investments also helped to grow the transmission and storage infrastructure of trans-European energy networks. Such projects improved the energy security of relevant countries and contributed to the development of EU's open and competitive internal energy market. A single energy market sustains energy security of the entire EU through diversification of supply sources and the expansion and upgrade of transmission infrastructure, which underpins a successful market operation.

Box 20. Trans-European energy networks

The guidelines for the development of trans-European energy networks were initially defined in *Decision 1229/2003/EC of the European Parliament and of the Council of 26 June 2003 laying down a series of guidelines for trans-European energy networks*. Following the 2004 enlargement of the EU, the guidelines were updated to integrate the new member states into TEN-E. *Decision 1364/2006/EC of the European Parliament and of the Council of 6 September 2006 laying down guidelines for trans-European energy networks and repealing Decision 96/391/EC and Decision No 1229/2003/EC* defined a number of projects that are necessary to develop energy grids. The investments included priority projects, known as projects of European interest. Some of the projects are located in V4 countries.

Type	Corridor	Projects of European interest
Power grids	**EL.7.** Denmark — Germany — Baltic Ring (including Norway — Sweden — Finland — Denmark — Germany — Poland — Baltic States — Russia)	• Poland — Lithuania link, including the essential reinforcement of the Polish power grid and the Poland-Germany profile to enable internal energy market participation.
	EL.8. Germany — Poland — Czech Republic — Slovakia — Austria — Hungary — Slovenia	• Neuenhagen (DE) — Vierraden (DE) — Krajnik (PL) line • Dürnrohr (AT) — Slavětice (CZ) line • New interconnection between Germany and Poland • Veľké Kapušany (SK) — Lemešany (SK) — Moldava (SK) — Sajóivánka (HU) line • Gabčíkovo (SK) — Veľký Ďur (SK) line • Stupava (SK) — south-east Vienna (AT) line. • Neuenhagen (DE) — Vierraden (DE) — Krajnik (PL) line
Gas networks	**NG.4.** Liquefied natural gas (LNG) terminals in Belgium, France, Spain, Portugal, Italy, Greece, Cyprus and Poland	• Diversification of supply sources and entry points, including the LNG terminals connections with the transmission grid.

Source: Own elaboration based on Decision 1364/2006/EC of the European Parliament and of the Council of 6 September 2006 laying down guidelines for trans-European energy networks and repealing Decision 96/391/EC and

[121] *2050.pl Podróż do niskoemisyjnej przyszłości* [*2050.pl Journey to a low-carbon future*] Warszawski Instytut Studiów Ekonomicznych, Instytut na rzecz Ekorozwoju, Warsaw 2013. http://np2050.pl/files/pliki/NP_2050__CALOSC_internet_2.pdf.

The development of trans-European energy networks was co-financed in Poland under measure 10.1 *Development of electricity, gas and oil transmission systems, construction and reconstruction of natural gas storage* of the 'Infrastructure and Environment' Operational Programme. In total, nine TEN-E investment projects were implemented both in power grids (six) and gas networks (three). The construction of an LNG terminal in Świnoujście (see the box for details) is key in diversifying energy supply sources both for Poland and the EU-15.

The Świnoujście terminal fits well with the Commission's strategic documents on energy security and a competitive gas market in the EU. The terminal was listed as a project of common interest and presented as such upon the publication of the 'State of the Energy Union' report in November 2015. With its gas connection to the Czech Republic and prospective investments in transmission networks, the Świnoujście terminal is an important part of the North – South corridor which connects the EU's gas system from Poland to the Croatian terminal at Krk. In the event of a surplus occurring in Poland or in the south of the EU, gas can be freely moved within the system.

In line with EU objectives, the terminal may be an interesting provider to the neighbouring countries: Germany and Scandinavia. It can supply gas to businesses and houses in northern lands of Germany and provide energy for LNG-fuelled ships (specific opportunities for Danish and Swedish companies).

5 Conclusions

Throughout the implementation of operational programmes in three financial perspectives, all four V4 countries have reported a dynamic social and economic transition, which largely helped to bridge the development gap between them and the EU average.

Available research suggests that the social and economic change in the Czech Republic, Hungary, Poland and Slovakia is also substantially due to the operational programmes funded under the Cohesion Policy. According to macroeconomic model simulations, the impulse from spending structural funds and the Cohesion Fund accounts for ca. 25-30% of the real convergence of the V4 GDP with the EU average.

The Cohesion Policy financial resources consist largely of EU-15 member states' contributions to the EU budget, especially from net contributors. As researched in detail and described in this report, the spending is offset by a range of benefits available to the EU-15 via three economic channels:

- indirect export benefits (EUR 76.9 bn), i.e. exports induced by the growth of aggregate demand in V4 countries resulting from Cohesion Policy interventions, excluding direct involvement of EU-15-based or EU-15-owned companies in project implementation;
- direct export benefits (EUR 11.7 bn), i.e. benefits drawn from direct involvement of EU-15-based companies as contractors or suppliers in EU-funded projects in V4 countries;
- direct capital benefits (EUR 8.0 bn), i.e. benefits resulting from contracts awarded to local companies owned by EU-15 based majority capital.

A combination of indirect and direct export benefits and direct capital benefits produces total estimated economic benefits to the EU-15 from Cohesion Policy implementation in the V4 in 2007-2015 at approx. EUR 96.6 bn, or ca. 80% of the spending.

The benefits to the EU-15 are not limited to additional exports and direct participation in goods and services supplies in co-financed projects. A qualitative analysis of the externalities has shown that the EU-15 benefit indirectly from Cohesion Policy investments carried out in the V4. It applies especially to innovation and entrepreneurship support, enhancement of transport access, development of energy and environmental infrastructure and enhancing R&D and teaching capacity.

When investigating the benefits to the EU-15, one should be aware that they do not take away from the positive effects of Cohesion Policy in the V4. On the contrary, these mechanisms are an example of mutual benefits gained both by support beneficiaries and by the co-financing intervention.

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_2007_2013.xls

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