

STUDY

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Research for REGI Committee - Externalities of Cohesion Policy



Regional Development



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Research for REGI Committee - Externalities of Cohesion Policy

Abstract

The study investigates the effects of Cohesion Policy (CP) which occur in a country other than the one in which CP resources were actually spent. The study estimates that macroeconomic spillovers significantly contribute to the impact of CP. Spillovers directed to EU countries represent around 9% of the total annual CP expenditure. Other spillovers to Non-EU countries are around 8% of the CP expenditure. Macro and micro spillovers together arrive at the 21% of the annual CP expenditure 67% of which is distributed among EU countries. Around 20% of the CP expenditure can trigger sectoral spillover effects in the environment, transport and higher education sectors. The analysis demonstrates that externalities reinforce EU growth and competitiveness without CP deserting its convergence objective.

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LIST OF ABBREVIATIONS

CF	Cohesion Fund
CP	Cohesion Policy
CEE	Central and Eastern Europe
DG	Directorate-General for Regional and Urban Policy of the European Commission
REGIO	
EC	European Commission
EP	European Parliament
ERDF	European Regional Development Fund
ESF	European Social Fund
GDP	Gross Domestic Product
EU	European Union
HE	Higher Education
HEI	Higher Education Institution
MA	Managing Authority
MNE	Multi-National Enterprise
MS	Member State of the European Union
NACE	Nomenclature statistique des Activités Economiques dans la Communauté européenne (Statistical Classification of Economic Activities in the European Community)
OP	Operational Programme
REGON	Rejestr Gospodarki Narodowej (Polish Register of National Economy)
TEN-T	Trans-European Transport Network
V4	“Visegrád” countries (Czech Republic, Hungary, Poland, Slovakia)
WIOD	World Input-Output Database

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EXECUTIVE SUMMARY

This study investigates the effects of Cohesion Policy (CP) which occur in a country other than the one in which CP resources were actually spent. **These effects are called “externalities” or “spillovers” in the study;** and these terms are used here as synonymous even if technically they can differ. Externalities, or spillover effects, are well known in economic literature but have only occasionally been associated to CP. A recent study (Bartkiewicz P., 2016) which includes new estimations of externalities has revived this debate which might also be relevant for the preparation of the CP for the 2021-2027 period.

Spillover effects are interlinked with Cohesion Policy

To analyse spillover effects a specific theoretical framework has been developed in the paper through a review of the main development theories on which CP is based. This theoretical framework shows **that spillover effects are an inseparable component of CP policies and produce positive results both in the country where CP resources are actually spent and the country where the spillovers effects occur.** The framework also highlights a number of transmission channels of the spillover effects: trade, mobility of workers and researchers, physical and cooperation networks, spatial contiguity. As a consequence, the sensitivity of a country to these effects, both as origin and as destination of spillovers, mainly depends on:

- **the degree of openness and competitiveness** of its economy and, in particular, of the sectors funded by CP;
- **participation in physical networks**, such as transport or energy networks, or **in collaboration networks** such as research networks;
- **the propensity of its citizens to move** to a different country;
- **its geo-political position** and the extension of its borders.

These mechanisms are deeply rooted in the CP and in the economic relationships between integrated and open economies. Hence, to a different extent spillovers affect all the EU Member States, as both producers and users of spillovers, and also non-EU countries, as users only.

Spillover effects are more than 15% of Cohesion Policy expenditure

The analysis of CP spillover effects has been carried out at three levels: macroeconomic, microeconomic and sectoral.

At a macro-economic level direct effects and spillover effects of CP have been examined with the support of international econometric models; in particular, the study used the QUEST III model with simulations provided by the Commission and the WIOD model with simulations directly designed by the study team. Simulations demonstrated that **international trade is one of the principal transmission channels of spillovers and that spillovers mainly flow from cohesion countries¹**, which spend the principal share of the CP resources and consequently increase their imports, **to non-cohesion countries** which have a higher export capacity.

¹ Bulgaria, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Spain, Romania, Slovenia, Slovakia.

In general, it is possible to affirm that of **every CP Euro spent in the cohesion countries in the period 2007-2013, 9 Euro cents flowed to non-cohesion countries and 8 Euro cents to non-EU countries in the form of import demand.**

According to QUEST III simulations, in the long run (2023) **the total effects of CP for non-cohesion countries are limited but positive** (an approximate 0.1% increase in GDP) **and on average 40% of this additional growth is due to spillover effects.** Conversely, **in cohesion countries the total effects of CP spending are significantly higher** (between 0.5% and 4% of GDP) **but gains from spillovers are negligible.**

According to the WIOD simulations, **spillovers generated around EUR 800 million of additional annual demand in Germany, with EUR 700 million coming from CP in cohesion countries. In France, Italy, the Netherlands and the UK additional annual demand from CP spillovers exceeded EUR 200 million,** and for Belgium, Austria, the Czech Republic, Poland and Spain it was still over EUR 100 million per year, again with a significant proportion coming from cohesion countries.

Aggregating the spillovers over all countries results in **total annual spillovers worth EUR 5.4 billion, of which EUR 5.2 billion stems from cohesion countries.** Considering only the EU countries as destination of spillover effects, total spillovers amount to EUR 2.9 billion of which EUR 2.4 billion stem from cohesion countries. These estimations of the spillover effects are lower than those proposed by Bartkiewicz et al. (2016) but are higher than the ones presented in a previous study (Bradley et al., 2009). While in this present study all non-cohesion countries in the long run have an economic advantage, however small. In (Bradley et al., 2009) the largest part of spillovers went to non cohesion countries, as in our simulations, but were not sufficient to counterbalance the financial contribution of some of the net payer countries towards CP budget.

The findings confirm that spillovers are an important component of the final impact of CP. They have a relatively higher impact in non-cohesion countries and are usually, but not exclusively, generated by cohesion countries. Spillovers in no way hinder the objective of economic convergence pursued by CP as the overall effects of CP continue to benefit mainly cohesion countries.

Foreign owned companies play a significant role in Cohesion Policy and involve non-EU countries to an important extent

The microeconomic analysis investigated the foreign owned companies that benefit from CP expenditure in Poland and the Czech Republic. Estimations in the analysis are based on the available information on the typology of investments carried out by foreign beneficiaries in the 2007-2013 period. The estimations indicate that:

- **the funds allocated to foreign enterprises comprise around 10% of the ERDF and CF resources in Poland and 5% in the Czech Republic;**
- **the financial benefit for the countries of these enterprises varies between 6% of the total ERDF and CF resources in Poland and 3% in the Czech Republic, because the remaining part of the CP financing remains in the countries of origin;**
- **non-EU countries received around 50% of the spill-over effects** stemming from the funding of foreign owned enterprises.

Multiple mechanisms trigger spillover effects

The sectoral analysis confirmed the importance of spillover effects in some particularly sensitive policy areas: research and higher education, environment and transport. To illustrate the concrete functioning of transnational spillover mechanisms in these three areas, a number of demonstrative cases have been identified and described in individual project fiches (see annex C).

Multiple mechanisms potentially triggering transnational spillovers operate in the above sectors. In *higher education and research*, **the internationalisation of the activities and the participation in transnational networks** as well as the **mobility of students and researchers** are important mechanisms promoting spillovers abroad. In *transport*, **network connections** are of the greatest importance and their spillover potential is related to the rank occupied in the European hierarchy of infrastructures. In *the environment policy*, **physical and geographical linkages** are crucial, as are **biological connections and ecological networks**.

Using these mechanisms as proxies of the intensity of the potential spillovers it was found that in the 2007-2013 period at the European level the share of total CP expenditure **potentially contributing to transnational spillovers in the three sectors amounts to around 18% of total ERDF and CF expenditure.** Considering the **effect of proximity in border regions**, where spillovers are stronger, the share rises to over 20%. Even if information on expenditure by regions is still not available, similar percentage of potential spillovers may be assumed in the current programming period.

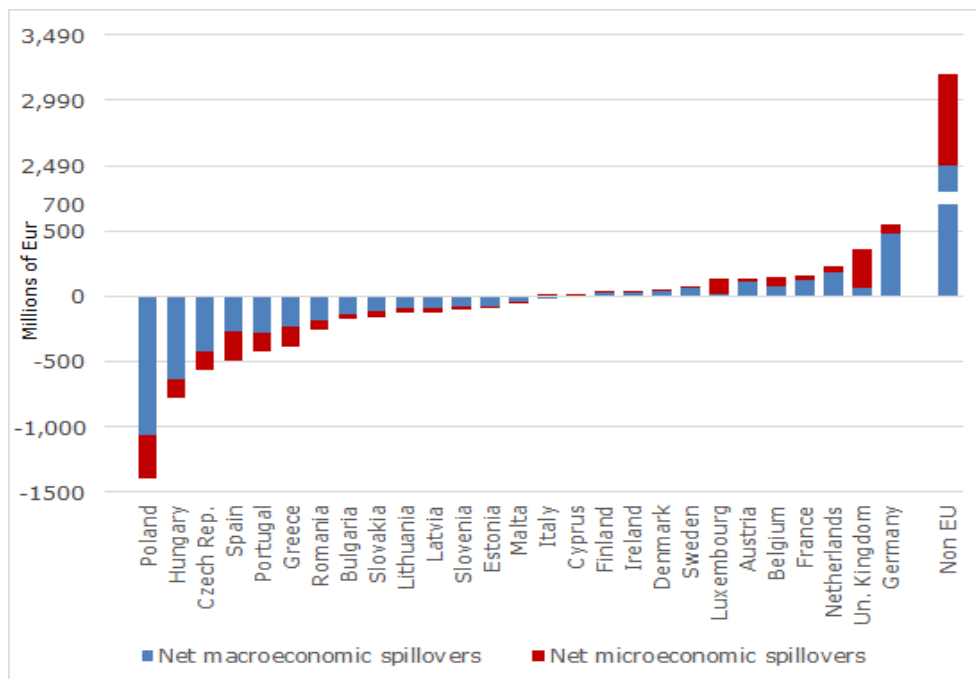
Economic benefits of spillovers are concentrated in few countries

The study provides different analyses and estimations of externalities. Their findings can help to account for how, and to what extent, spillovers benefit Member States.

Making several assumptions on the sectoral distribution and the size of the benefits for foreign countries, the micro-economic spillovers have been added to the demand spillovers calculated by the WIOD model. The resulting overall estimations of the spillover effects do not differ substantially from the estimations calculated using the QUEST III model, which includes micro and macro dimensions, reinforcing the validity of both results.

The sum of the macro and micro net effects (spillover in entrance minus spillover in exit) is shown in **Error! Reference source not found.** below and indicates **Poland, Hungary and the Czech Republic as the main producers of net spillovers and Germany and the United Kingdom as the major receivers after the block of non-EU countries.**

Figure 1: Total net spillovers by country (million Eur, calculations on annual average expenditure data in the 2007-2014 period)



Note: for methodological details see Table 16

Source: Ismeri Europa and wiiw estimations

Spillover effects and the cost of Cohesion Policy

An in-depth comparison of the spillover benefits with the net contribution to the EU budget in the different countries is beyond the scope of the study, however our findings indicate some important facts.

It is clear that **non-cohesion countries, which are the net contributors to the EU budget and thus to CP, benefit from macroeconomic and microeconomic spillover effects.** This element has to be taken into consideration in the negotiation concerning the MFF and the CP budget. However, the analyses of the spillover effects shows that their importance cannot be measured only on their financial value.

On the one hand, **CP is based on solidarity principles which are not overshadowed by spillovers.** In fact, most significant positive impacts of CP remain concentrated in cohesion countries and this confirms the key role of CP in promoting economic convergence.

On the other hand, **both macro and micro spillovers indicate that CP plays an important role in increasing the size of and fostering integration within the common market.** These effects positively influence the overall productivity of the EU and counterbalance the possible competitive disadvantages produced in some non-cohesion countries by the higher growth of some cohesion countries where CP investments are more substantial.

The exploitation of these positive outcomes triggered by spillover effects depends on the ability of each MS to adapt its economy to innovation and international trade. The non-cohesion countries are generally better equipped for this goal, while less developed cohesion countries need the support of CP. **If well governed and supported by an effective CP, the recursive process between CP and spillover effects can lead to increasing convergence between MSs and regions.**

Spillovers towards non-EU countries are important

Normal trade interactions and foreign investments give rise to an extensive flow of spillovers towards non-EU countries, and lead to some further considerations. Firstly, it should lead to a **more effective policy of import substitution in sectors where dependence on non-EU countries is stronger**, such as the energy sector. Secondly, **a selective promotion of foreign investments** to favour new productive plants and technologically advanced productions would be desirable. Thirdly, **public funding of enterprises from 'tax haven' countries should be controlled and limited**, especially if countries are on the blacklist of the EU².

Conclusions

The findings of the study corroborate the conclusion that **the effects of CP are not limited to the destination where funding is spent** and spillovers are a powerful tool to support EU economic growth and integration.

Individual Member States tend to calculate their own gains and spending without taking into consideration the all European context. The findings have demonstrated that such an **"accounting" vision is an undeniable dimension, but it is too restricted and hampers a full understanding of the CP effect on growth and competitiveness** of Member States.

In the debate on the future 2021-2027 CP, **the policy implications of spillovers should be considered and a positive use of these transnational effects should be promoted**. Spillovers should be interpreted as a means for reinforcing CP and the possibility of extending CP effects beyond the administrative borders of a country should be explicitly addressed by activating adequate networking and planning tools.

In this context, microeconomic and sectoral spillovers are not unintended or unexpected effects, but should rather be promoted and governed. They are also a fundamental opportunity to stimulate less developed regions to participate in international networks and increase exports. The strategy of sectoral investments - such as transport, environment, research, higher education - and the attraction of investments need to adopt a broader view and cross the administrative borders. **Macro-regional strategies already address the issue of a more open and integrated CP, but further improvements are possible**.

The proposed new regulations for the 2021-2027 period in part address this issue. They introduce "component 5" (*interregional innovation investments through the commercialisation and scaling up of interregional innovation projects*³) into territorial cooperation. In the proposal of the Common Provisions Regulation⁴, article 17 (*Content of programmes*) paragraph 3 facilitates, and implicitly promotes, transnational projects.

However, more focused incentives and requirements in this direction could be included in the regulation. For example, **the definition of transnational implementation "models" in**

² See Council of the European Union, *The EU list of non-cooperative jurisdictions for tax purposes*, 8 march 2018. <http://data.consilium.europa.eu/doc/document/ST-6945-2018-INIT/en/pdf>

³ European Commission, COM(2018) 374 final, Proposal of a regulation of the European Parliament and of the Council on specific provisions for the European territorial cooperation goal (Interreg) supported by the European Regional Development Fund and external financing instruments.

⁴ European Commission COM(2018) 375 final, Proposal for a regulation of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, and the European Maritime and Fisheries Fund and financial rules for those and for the Asylum and Migration Fund, the Internal Security Fund and the Border Management and Visa Instrument.

some critical sectors (education, research, environment and SME collaboration) can facilitate transnational projects and orient high added value foreign investments, as happened in the models used in integrated territorial investments ('ITI') or community-led local development ('CLLD')⁵. These **transnational operations may be optional but when implemented should receive an "award" in terms of EU co-financing**; the greater technical and administrative complexity of these interventions justifies the award.

Finally, minor and not too burdensome **improvements are possible in the CP monitoring system** that may result in a substantial advancement in the capacity of tracking spillover effects. **Two pieces of key information should be made available in the list of selected operations** expressly requested by the Commission proposal of the Common Provisions Regulation (COM(2018) 375, article 44 paragraph 3): the names of the companies called to implement projects and the nationality of the ownership of the company receiving CP resources.

⁵ See article 23, 24 and 25 of the European Commission COM(2018) 375 final, Proposal for a regulation of the European Parliament and of the Council laying down common provisions.

INTRODUCTION

This study has been commissioned by the European Parliament, upon request of the Committee on Regional Development, and aims at investigating the effects of Cohesion Policy (CP) which occur in a country other than the one in which CP resources were actually spent.

Externalities are well known in the economic literature but they have been only occasionally associated to CP. A recent study (Bartkiewicz P., 2016) which includes new estimations of externalities and the current debate on the future of CP after 2020 have revived this debate.

The study reconstructs the analytical and theoretical framework at the basis of the spillover effects of CP investments. These investments include the expenditures financed by ESI funds (ERDF, CF, ESF) in the 28 EU countries in the 2007-2013 period and, in some cases, also in the 2014-2020 period. The study identifies the main mechanisms by which the spillover effects are triggered. It is evident that these effects are an inseparable component of the development policies and produce positive results both for the origin and the destination country of the spillovers. The analysis has been carried out at various levels: macroeconomic, microeconomic and sectoral. The macroeconomic analysis focuses on the effects deriving from trade and competitiveness interactions associated to CP investments. Microeconomic analysis investigates the spillover effects on foreign companies and in particular the possibility for these companies to access to national market with direct investments or the implementation of projects funded by CP. The sectoral analysis observes the causes of spillover effects in transport, environment and higher education and research as well as their potential extension.

All these analyses propose measures of the size of the spillovers; macroeconomic and microeconomic effects are measured in terms of CP expenditure collected by foreign countries. In the case of the sectoral analysis, an earmarking of CP expenditures that can potentially trigger spillover effects are estimated. To a different extent, the estimation depends on the adopted analytical tools and data availability, other than on specific assumptions. In particular, the macroeconomic analysis used the QUEST III econometric model of the European economy in use by the European Commission (EC) and the WIOD model, specifically adapted to this study. The microeconomic and the sectoral analyses used available monitoring data, surveys and case studies.

The study is structured as follows:

- (i) The first chapter presents the analytical framework of CP externalities. the theoretical basis of CP and the related spillover mechanisms are examined and a logical framework connecting macro, micro and sectoral spillovers is proposed;
- (ii) The second chapter illustrates the findings of the macroeconomic analysis, whereas the results of the QUEST III and WIOD quantitative simulations are separately presented because these cannot be directly linked (the two models are independently defined and their integration would require a complex econometric effort which is not possible in this study). However, the two models provide different levels of details and their results can be logically associated.
- (iii) The third chapter presents the results of the microeconomic analysis; this focuses on Poland and Czech Republic as cases of microeconomic externalities. These two countries have been selected because they are beneficiary of an important amount of ESI Funds, are particularly open to foreign investments and trade, and have made a relatively good set of information accessible. On the basis of the available data, quantitative estimations of externalities are attempted.
- (iv) The fourth chapter analyses the sectoral spillover effects; the economic mechanisms at the basis of these sectoral effects are first identified according to

the existing literature; subsequently, on the base of these mechanisms, an earmarking of the CP expenditure where spillovers effects can be triggered is proposed. Some short case studies complete the section aiming at showing concrete examples of spillover effects.

- (v) The final chapter wraps up the findings of the previous sections and propose some main conclusions. Here, an integration of macroeconomic and microeconomic analyses is proposed to estimate benefits of spillover effects among the EU countries. Some suggestions on how the analysis of externalities may be continued and updated in the future are included.
- (vi) The annexes contain some additional statistical tables and figures of the macroeconomic and microeconomic analyses as well as the bibliography of the study.

1. LITERATURE REVIEW

KEY FINDINGS

- The definition of externalities used in the study is limited to **the economic effects of the CP investments outside the country where investments are carried out**. According to this meaning “externalities” and “spillover” (effects) are used as synonymous in the text.
- **All the main theories of economic development** on which CP investments are based identify causality processes that can trigger externalities.
- According to development theories the main transmission mechanisms of spillovers are: **trade, mobility of people (workers, students, researchers), international networking of enterprises or research bodies, geographic contiguity**.
- A **transmission mechanism of spillovers is not exclusive** but can affect more than one type of investments.
- Some **geographic, social and economic characteristics of a country** (openness to trade, competitiveness, people capable/willing to move, length of borders, strategic position in networks) **determine its capacity of generating and/or capturing spillover effects**.
- Spillover effects can be identified at **different economic levels**: macroeconomic, microeconomic and sectoral.
- **Measuring spillovers is complex**, requires detailed information and advanced techniques. Estimates can be attempted at different levels paying attention to the fact that **microeconomic and sectoral spillovers are components of macroeconomic spillovers** and cannot be added to these.

1.1. The definition of externalities and spillovers

The first task aims to provide a review of the literature on the concept of externality that takes place when the CP impact crosses borders to benefit countries other than those of the original beneficiary. The concept of ‘externality’^{6,7} utilized by the tender specification refers to impacts of CP spending which go beyond the area for which a particular support was originally designed. In this case, however, the most appropriate concept to utilize is “spillover” effect since the concept of externality carries with it the notion of market failure which is not appropriate in relation to the phenomena the study intends to analyse, as it is influenced by other factors governing the functioning of the market. For this reason the study often uses the expression “spillovers” and “externalities” as synonymous.

⁶ The definition of ‘externalities’ in economic theory – as stated in the definition from the OECD glossary – ‘... externalities are “situations when the effect of production or consumption of goods and services imposes costs or benefits on others which are not reflected in the prices charged for the goods and services being provided”.’ - thus refers to a mis-pricing problem in a market economy whereby the prices charged in markets for certain goods and services do not reflect (fully) the benefits and costs reaped by or incurred by producers or consumers who either use or consume these products or services. The policy analysis based on this definition of externalities then examines how to deal with such a mis-pricing problem which can cause serious distortions in resource allocations and consumption behaviour.

⁷ Since the recent Imapp/IBS study guided the ToR we might add the specific definition of externalities in the context of CP used in that study (see Bartkiewicz et al., 2016, p.8): “Positive externalities are defined as benefits that an entity (i.e. ...individuals or institutions) may draw from a public intervention co-financed within the Cohesion Policy (...), even though the intervention was not initially addressed to the entity in question.”

Whether such 'spillover effects' were intended or not is of secondary importance, but capturing such effects is an important element for a comprehensive assessment of CP. Furthermore, an anticipation of such 'spillover' effects may add further information that might be useful when planning cohesion interventions. Finally, an acknowledgment and (possible) quantification of such effects will also shape the public stance and interests of EU Member States which are not the direct beneficiaries of particular CP actions.

Therefore, the study focuses on specific cross-country spillover effects of CP benefiting non-beneficiary countries. The study aims to shed light on a highly debatable subject, that is, the dimension and the negative or positive sign of cross-country spillovers and, in particular, the overall financial balance between the EU budgetary transfers of CP and the financial resources going back to the different countries as direct or spillover effects. The study needs to trace the mechanisms analysed in scientific literature which generate these spillovers, how they operate and their size compared with the original transfer. This is not an easy task since a development policy and the type of expenditure linked to it can be based on different drivers (employment, investment in different areas and for different purposes, research, innovation of different kinds, human resources etc.) which can be triggered by different policy instruments⁸ and types of expenditure.

Each policy instrument is characterized by spillovers of a different nature and intensity. Furthermore, the way the policy instrument is implemented - the location where the expenditure takes place and the kind of expenditure it incurs- influences the size of cross-country spillovers. The "supply side" features of the beneficiary country or region is another relevant factor that influences the kind and size of spillovers; namely, to what extent the CP expenditure can stimulate untapped local or national resources or to what extent they need to be imported from abroad. For example, if an administration of a less developed region implements a policy of industrial support, it is relevant if the beneficiary companies buy new machinery imported from a different EU member country or from a more developed region in the same country, or if it supports schemes of research and development carried out by a regional University, or if it finances business services from local providers or, finally, if it supports import substitution effects attracting investments from abroad that enlarge the local productive base. It therefore appears evident that the size of cross-country spillovers from CP strictly depends on the policy carried out to trigger a specific development driver at a given time, and may change over time due to a change in the policy driver or in the economic context or in both.

In short, there is a demand and supply element related to the kind of policy implemented and the expenditure it entails on the one hand, and the possibility of local supply of goods, services and human resources to satisfy the increase in demand, which determine the "leakages" that generate imports from abroad on the other.

The literature review firstly focuses on the main development theories and related drivers of growth. Each of these theories is based on one or more drivers which are considered the "agents" of development and which can give rise to different types and intensity of cross-country spillovers.

⁸ Policy instruments are public interventions in local, national or international economies intended to achieve outcomes which are coherent with the objectives of public policy. They are techniques, procedures or means through which states or regions attempt to achieve their goals.

1.2. A review of development theories and their relation with spillover effects

In this section the main development theories on which CP is based are reported and their capacity of triggering spillover effects is highlighted. Table 1 shows the relation between the main drivers of development highlighted by the scientific literature on development and the specific policies which are implemented in the CP. Each of these policies gives rise to spillovers of a different nature and intensity. Spillover sources often cumulate.

1.2.1. Integration and liberalization

A first theoretical strand focuses on the relevance of integration, liberalization and stabilization as a necessary premise of any cohesion and development policy. The inseparable companion of integration is market liberalization; though the two concepts are distinct, there is a conviction that the economic gains of integration can fully manifest themselves only in the context of competitive markets; that is why these two drivers are the cornerstones of the European Union.

However, theorists concerned with economic development do not all agree that the gains from liberalization occur always and everywhere; less developed regions and countries in EU, in fact, may possess different kinds of structural factors, depending on their markets, their location, their territorial specificities, their endowments of resources both human and physical which prevent them from adapting to competitive market conditions and developing their competitive advantages. These features of the process of integration and liberalization are the rationale for implementing a CP which derogates from a number of principles of integration and market liberalization to establish favourable conditions of a different kind in the less developed regions, to allow them to adapt to a competitive arena.

This development driver is clearly relevant in the context of our analysis since it is a source of cross-country spillovers of CP as these policies are implemented in a context of an open and integrated EU economy and there are no barriers which may hamper the fact that resources invested in one country are spent on imports from another country. As a matter of fact, the very reason for the financial transfer to the weak regions is to compensate them for the competitive weakness of these economies.

Table 1: Development theories, their relations with Cohesion policy and potential spillover effects

DEVELOPMENT THEORIES	DRIVERS	COMMON INTERVENTIONS IN COHESION POLICY	POTENTIAL SPILLOVER
PHYSICAL CAPITAL [(Harrod, 1939), (Lewis, 1951) (Solow, 1956), (Swan, 1956) (Rostow, 1960), (Barro 1990)]	1 Private capital accumulation	1.1 Direct grants and other financial or fiscal subsidies	– Imports of machinery and/or intermediate goods – foreign companies or foreign owned resident comp. benefit from subsidies
	2 Public investment	2.1 in Infrastructures	– Foreign contractor for building /maintenance/management of the infrastructure. – All EU can benefit from a better endowment: environment, transport etc.
2.2 in Utilities (Water, energy,)		– Foreign contractors benefiting from non-rival and non-excludible good or services financed by CP.	
HUMAN RESOURCES AND HUMAN CAPITAL [(Ramsey, 1928), (Harrod, 1939), (Lewis, 1951), (Solow, 1956) (Swan, 1956) (Lucas, 1988)(Nelson, Phelps 1966) (Aghion, Cohen 2004)]	1 Education	1.1 Schooling	– Foreign student or teacher can benefit from improved opportunities for jobs and better services – Foreign schools and tertiary education establishments can benefit from increased resources and public investments in this fields – National students are supported to go to study abroad
		1.2 Training	
		1.3 Tertiary education	
	2 Employment in R&D	2.1 Researchers' mobility	– Opportunities for foreign students and researchers – higher skills available on the EU job market – diminishing costs for research for foreign companies
		2.2 People attracted into scientific and technical studies 2.3 Attraction of foreign researchers	– More and better research results available abroad – Direct impact on employment of foreign researchers
	3 Infrastructures	3.1 Health	– Better health services for all EU citizens, job opportunities – imports of specialized machinery and equipment.
3.2 Schools and Universities		– Foreign contractors can use university infrastructures – Easier access to international networks of research	
INNOVATION [(Ramsey, 1928), (Schumpeter, 1934) (Lewis, 1954), (Solow, 1956; 1970) (Romer, 1990) (Aghion, Howitt, 1992) (Grossman, Helpman, 1994) (Acemoglu et alia, 2002) (Dosi et alia, 2005)]	1 R&D	1.1 Targeted Direct Grants 1.2 Public expenditure on R&D	– Foreign resident firms or research centres benefiting from grants – EU countries benefit from more and better results in research
	2 R&D networking	2.1 Business networks	– Researchers in EU benefiting from the increased quality and range of research networks.
		2.2 Public private partnership	– Opportunities for foreign firms to associate with local research to develop joint applied research.
		2.3 Technology transfer	– Transfer of technologies from foreign producers, job opportunities for foreign technicians
		2.4 Mobility of researchers	– Job opportunities for foreign researchers
	3 New firm formation	3.1 Targeted Direct Grants	– Foreign firms can be financed to locate in the cohesion region
		3.2 Administrative simplification	– Foreign citizens and firms benefit from easier and less costly access to the P.A. and from a more efficient provision of public services and public goods
	4 Infrastructure	4.1 ICT	– General improvement of the EU context caused by an increased endowment of ICT infrastructures; – opportunities for import of specialized goods and services
	5 Finance	5.1 Venture capital	– Foreign start-ups can be financed

DEVELOPMENT THEORIES	DRIVERS	COMMON INTERVENTIONS IN COHESION POLICY	POTENTIAL SPILLOVER
AGGLOMERATION [(Myrdal, 1957), (Kaldor, 1960; 1970; 1981), (Arrow, 1962), (Beckerman, 1962) (Romer,1986) (Porter, 1990)(Krugman, 1991) (Ottaviano, Thisse, 2004)]	1 Infrastructure	1.1 Transport	– EU benefiting from investments in large Urban areas; foreign contractors for Urban transport and RTD and Education infrastructure. Job opportunities etc.
	2 Private Investment - Investment attraction	2.1 Direct Grants	– Imports of machinery and/or intermediate goods – foreign companies or foreign owned resident comp. benefit from subsidies
SOCIO-ECONOMIC ENVIRONMENT [(Becattini, 1978), (Granovetter, 1985), (Cohen, 1986), (Coleman, 1988) (Pyke et alia, 1990), (Putnam, 1993) (Hall, Jones, 1999) (Camagni, Maillat et alia, 1999), (Sen 1999), (Sabel, Dorf, 2006), (Castiglione, Van Deth, Wolleb, 2008)]	1 Systems of SMEs	1.1 Value chain integration/Industrial districts and clusters	– Firms within the value chain or the international clusters benefit from higher productivity and higher investments and intra-network exchanges.
		1.2 Business services	– Opportunities to new localization of foreign services firms; – opportunities for specialized jobs for foreign technicians.
	2 Territorial endowment	2.1 Natural Environment	– Benefits for spatial contiguity and general benefits for EU for better air, water and environment quality
		2.2 Urban and Rural Areas	– increased opportunities for investing for non-resident and resident foreign firms.
		2.3 Cultural Heritage	– General benefit for the EU in terms of values and identity – specific benefit for foreign hotels and tour operators.
		2.4 Utilities	– Foreign contractors benefiting from non rival and non" excludible" goods or services financed by CP.
GOVERNANCE AND INSTITUTIONS (Habermas, 1991), (Bohman, Reigh 1997)(Ostrom 1990) (Sen 1999), (Rhodes, 1997) (Rodrik, 2000; 2003; 2007), (Crescenzi et al. 2015) Rodriguez-Pose 2018)	1. administrative and institutional capacity, democratic participation	1.1 Capacity Building	– Networking and exchanges between administrations improve capacity – Improved administrations and institutions favoured the diffusion of economic spillovers
		1.2 Social dialogue and partnership	– Participation of stakeholders makes decision policy making more transparent and efficient and promote exchanges of good practices

Source: Ismeri Europa own processing

1.2.2. Physical Capital

A second strand of development theories has emphasized the role of physical investment, private and public, as an engine of growth. This driver contains a wide array of measures to foster business investment, especially small and medium enterprises: fiscal incentives to attract foreign investment, provision of business services, easier financial access to venture capital, a friendly regulatory environment for new firms, support for inter-firm cooperation.

The policies grounded in this theoretical strand are those aimed at increasing private investment and strengthening the endowment of infrastructure in weak regions; they make up a significant share of CP expenditure in the less developed regions and countries.

The main areas of intervention of development theories based on “physical capital” relevant to cross-country spillovers are:

- *measures aimed at promoting entrepreneurship by fostering private investment* through direct grants and subsidies and easing access to finance as well as those aimed at attracting foreign investment;
- *measures to improve infrastructure endowment*, including the construction of transport systems (airports, ports and urban transport as well as road and rail), telecommunication networks, public utilities (energy and water supply) and environmental infrastructure (waste treatment).

The first type of intervention directly enhances private investments either from local/national investors or from foreign investors who find favourable conditions for production in the weak region. Both policies have substantially different impacts on cross-country spillovers. Investments from local producers can imply imports of goods and services and the second type of intervention can diminish spillovers by producing locally those products that would otherwise have been imported; however, the first impact when setting up and running the production lines most probably implies significant imports. The overall net impact over time would most probably reverse and stimulate exports from the less developed region. The second type of intervention consists of investments on infrastructures of different kinds; from transports to energy, environment etc. In this case there may be two kinds of spillovers. One kind is the import content of constructing and running the infrastructures and related services (trains, metro, special components and equipment of infrastructures which are not available in the national market.) Another mechanism triggering spillover is when a foreign firm is successful in the bid for the construction, management and maintenance of a given infrastructure. In this case spillovers can be relevant and imply not only equipment, machinery and intermediate products but also specialized skills and maintenance services. The size of the potential spillovers will depend on the availability of the required know-how in the beneficiary region or country (builders and specialized manpower) and on the amount of subcontracting to local firms for specific components of the final product.

1.2.3. Human Resources

A third strand of growth theory focuses on the role of labour and human capital. Growth can be fostered by a fuller utilization of the working population increasing the rate of activity of various segments of the population and reducing the rate of unemployment. But growth can be fostered as well by raising the quality of human capital and the skills of the labour force investing in education and training. Measures aimed at these ends are at the core of the EU2020 development strategy.

This driver is particularly relevant in Europe today where the natural growth of the population is negligible and where there is substantial scope for an increase in participation rates,

especially in lagging regions. In the most recent literature⁹ human capital tends to be regarded as a prerequisite for development and the achievement of a higher rate of economic growth, which in turn will tend to increase human capital accumulation. The link between human capital and development, therefore, goes both ways. Investment in human capital, moreover, is thought to increase productivity both directly and indirectly; directly because skilled labour is more productive than unskilled and indirectly, because it increases the pace and rate of absorption of technology and innovations and thus increases the capacity to incorporate new technologies in the less developed regions. (Nelson and Phelps 1966, Aghion et Cohen 2004). The main policy implication is that the focus should be on strengthening education and training systems not only by raising the standard of the subjects taught but also by improving accessibility at all levels. From the viewpoint of our analysis investment in human capital tends to favour endogenous development and minimize spillovers. However, the market for private education has risen and the supply of education has become a tradable service; as a consequence, investment in human capital with EU regional funds has often implied the creation of local branches of foreign schools and Universities or the financing of training and educational programs and research for local students abroad. Foreign students can benefit from the supply of better educational services.

1.2.4. Innovation and Technological Progress

A fourth strand of theory has identified the most important determinant of development in innovation and technological progress. Two approaches within this strand of theory are relevant for our analysis of cross-country spillovers. A linear approach that focuses more on the importance of rising private and public investment in R&D and a systemic approach relying more on the relationships between economic agents and on the learning that these generate. Policies enhancing innovation in the EU have risen in relevance and structural funds have implemented a host of instruments to stimulate less developed regions to progress in this direction, following both approaches. Both forms of intervention require different policies and institutions.

The pursuit of innovation can give rise to very different kinds of spillovers; going in both directions, positive and negative. For example, a positive spillover is generated from advanced to less advanced regions when knowledge and know how stemming from a more developed region can be acquired in a catching up region. Another type of spillover can be generated by the need of a region to import machinery, equipment and skills from more developed regions. Innovation policies may give rise to both kinds of spillovers and, therefore, where we draw the line between advantage or disadvantage depends on the medium and long term impact of the policy in the less developed region or country; whether it generates new competitive companies, using more advanced technologies or whether it creates a permanent market dependency of the businesses in the less developed regions. An important aspect to consider from the point of view of spillovers is that technology and the corresponding knowledge and know how are generally, and more than other economic activities, deeply rooted in the region where they are produced, due to the cultural and social context which generates them; for this reason innovation and technological progress are considered to be path-dependent and tend to concentrate and therefore go against the objective of regional cohesion.

⁹ Among the others see: Gennaioli et al. (2011), Lagakos et al. (2012) Rocha et al. (2015) and Pelinescu (2016).

1.2.5. Agglomeration, Clusters and Districts

A fifth strand of theories focuses on the economic benefits of agglomeration. Firms concentrated in a single location may take advantage of technological and other externalities, a pooled market for workers with specific skills, knowledge spillovers, local production of specialised inputs and a growing local market. These externalities generate lower transaction costs and favour scale and network economies when the providers of intermediate goods and services are located in the same geographical area, and explain why specific industrial sectors tend to concentrate in particular places. Once transport costs and economies of scale cross a critical threshold, agglomerations will tend to continue to attract resources at the expense of other areas.

Policy implications from this approach may differ radically. Some advocate policies to ease the agglomeration process with the aim of maximising economic growth. An alternative view on the other hand advocates policies aimed at exploiting the endogenous resources of deprived areas to counteract the unbalancing effects of concentration. Recently the debate on the effect of concentration has put forward evidence that large urban concentrations in the EU and, more in general, in developed countries have shown more resilience in the last decade and are the winners of the globalization process (Frick, Rodriguez-Pose 2018; Iammarino, Rodriguez-Pose, Storper, 2018; Castells-Quintana, Royuela 2014). Concentration of firms in a single location makes it possible to take advantage of technological and other spillovers, like a pooled market of workers with specific skills, knowledge spillover and technology diffusion, easy access to local production of specialized inputs and, on the demand side a large and growing local market.

Historically, various models of cumulative growth have been developed to explain the dynamic, and the advantages, of agglomeration. The essence of these models is the nexus established between the rate of growth of production and that of productivity, a higher rate of growth of production leading to higher productivity growth which, in turn, increases the rate of growth of production (Myrdal 1957, Kaldor 1960, 1970, 1981, Beckerman 1963).

Recognising the importance of the spatial dimension (Krugman, 1991) inspired a wide strand of literature which goes under the name of the "New Economic Geography" and which has featured prominently in the debate on CP. This puts the emphasis on promoting growth through encouraging the agglomeration of economic activity in order to exploit fully the effects of increasing returns to scale. Appropriate policies include investment in infrastructure to reduce communication and long distance transport costs and measures to increase private investment and attract capital and labour.

It is also important to consider the development of the cluster concept as a geographical concentration of interconnected businesses, which are thought to enjoy a range of benefits that firms operating in isolation¹⁰ do not enjoy.

This implies that there is a potential trade-off between growth and cohesion. CP, which endeavours to achieve a more territorially balanced distribution of economic activity and which slows down the natural formation of agglomerations, may even reduce the overall rate of growth. Little can be said from the point of view of cross-country spillovers using this growth driver in a less developed region; the size of the spillovers depends on the trade structure of the country and region where the policy takes place as well as on the kind of investment made. In very general terms, agglomerations tend to develop internal complementarities which in the medium-long term may reduce the need to import intermediate goods and services necessary for their firms or may increase the linkages outside the area.

¹⁰ See Porter (1990).

1.2.6. The Quality of Social and Economic Environment

The sixth strand of theory emphasizes the quality of the environment, interpreted very broadly to include the quality of social relations in terms of trust, solidarity and social inclusion, the characteristics of the productive system, especially as regards SMEs, the capacity of local institution to produce public goods, the level of democracy in decision-making and making the best use of local resources.

The quality of the environment is thought to affect the propensity to work, invest and innovate, not only because it increases the profitability of private investment but also because, more generally, it raises the “capabilities” of people (Sen, 1999).

A first important element of such theories is the literature on industrial districts (Becattini 1978, Pyke, Becattini and Segemberger 1990), while an ancillary strand concerns “milieu innovateur” (Camagni et al. 1999) which focuses in particular on clusters of high technology firms. These strands emphasize the economic relevance of agglomerations and focus on the qualitative aspect of development policies aiming to reinforce the networks of local enterprises. Policy intervention based on this theory, should produce less cross-country spillovers as it focuses on improving the quality of the relationships within the less developed regions and implies investments in human resources, provision of local services to people and firms, networking between different local actors, improving governance and the production of public goods. Theories based on the quality of the social and economic context imply a vast array of interventions which can generate cross-country spillovers in the short term (investments in public goods from transport to health; research infrastructure, capacity building etc.). These policies tend to be local-based in the sense that they encourage local producers and attract external producers who can enjoy the effects of networking and the benefits of tailor made services; therefore, in the medium-long term these areas should become more self-sufficient.

1.2.7. Governance and institutions

Good governance and good quality institutions are considered a driver of growth and development by several scholars. According to those authors low quality governance hampers the process of development especially since it lowers the quality and the effectiveness of development policies which are carried out by national and local institutions. The concept of governance relevant to development policies encompasses two main aspects; one aspect focuses on the functioning of a democratic deliberative and participative society (Habermas 1991; Bohman and Reigh 1997) and a second aspect concerns the functioning of the public administration and the production of public goods (Rhodes 1997, Rodrik 2000, Rodrik 2007 and more recently Crescenzi, De Cataldo and Rodriguez Pose 2016) According to this strand of theory, governance affects the performance of the institutions and especially of the public authorities at national, regional and local level which are responsible for development and for implementing CP. Therefore, an increasing responsibility for inefficient development policies should be given to bad governance, inefficient institutions and, lack of transparency and corruption of the administrations.

Governance and institutions are linked to specific administrative and institutional contexts and do not directly produce economic spillovers. However, they may facilitate the diffusion of economic spillovers triggered by other mechanisms as they ensure an efficient functioning of market rules and public goods. In terms of specific spillovers in governance, networking and exchanges between administrations of different countries they may promote the diffusion of good practices and forms of cooperation or partnership in managing public policies.

1.3. Sources of cross-country spillovers

The previous analysis identifies four main sources of cross-country spillovers:

1. *The first and most relevant mechanism triggering spillovers is trade* which is due to the free market and the free mobility of goods and people and is triggered by public and private investment policies. Public and private investments financed by CP stimulate, directly or indirectly, a demand for the import of goods, machinery, raw materials or intermediate products which are necessary for the production and construction, management and maintenance of infrastructures. The dimension of cross-country spillover generated by trade depends on two main factors:
 - the level of competitiveness of domestic supply for the same imported goods or services;
 - the availability of inputs and know-how for industry, infrastructures or services production.

In any case demand for imports stimulates growth of income/production and jobs which will be reflected in more consumption and investments in the exporter countries (macroeconomic spillovers). Trade also generates micro-economic spillovers as the exporter firm can raise its market share and productivity as a result of higher turnover and profits.

2. *A second source of spilloverspillover is mobility of workers or researchers or students.* Investment of CP in a less developed country or region may create an opportunity for foreign residents, especially from the EU. This is reciprocal for the citizens in less developed countries or regions who may benefit from opportunities available in the more developed countries or regions. Apart from a general benefit that everyone in the EU is entitled to, mobility allows an inflow of experts and technicians for construction, maintenance or production of goods, services and infrastructures (construction of airports, motorways, metro networks etc.). Trade of goods and services are often strictly connected with the mobility of specialized manpower and imports of services.
3. *A third mechanism of cross-country spilloverspillover is networking,* which is generated by a firm of the less developed country or regions establishing functional links with other firms abroad within a cluster, a value chain. Networking allows foreign firms in clusters in the value chain to benefit from the investments and increased competitiveness, increased production levels of the firms located in the less competitive region or country. Networking is a distinct feature of modern development processes, facilitated by the development of ICT and communication technologies, energy transportation, transport facilities and the impact of globalized markets on the spatial organization of production. Networking is also a feature of research and development activities spread over different countries that exchange information and communicate to achieve their results. Networking is a fundamental feature of global value chains (GVC) that has imposed itself as a fundamental driver of growth on the globalised markets. GVC has produced a "trade, investment-services know-how nexus to coordinate the dispersed production and distribution of goods and services"¹¹.
4. *A fourth mechanism of spillover occurs as a result of spatial contiguity.* This kind of spillover is generated by investments which can be utilized or generate beneficial effects for citizens in the surrounding regions. For example, investments in transports or in other major infrastructure in energy, environment, reduction of water and air pollution

¹¹ OECD (2014).

generally spread their effects in the surrounding territories. *Energy diversification and security of energy supply* tend to cut CO² emissions; road and water communication generate shorter and safer travel conditions. Environmental investment generates cleaner water and air for the benefit of areas surrounding the targeted territories. Spatial contiguity has been a powerful and mutually positive driver of development between less and more developed countries and regions.

The intensity of the externalities cannot be defined a priori, but depends on the sector, the size and the type of the investments. However, to this regard some general rules may be considered:

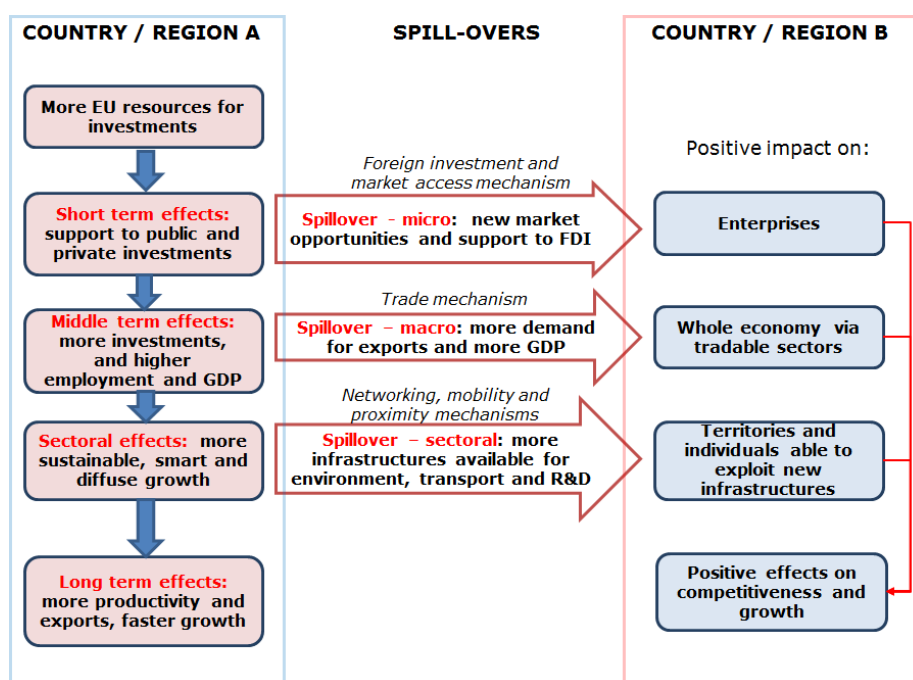
- the more open a country is to international trade, the more it is affected by externalities, either in entrance or in exit;
- smaller countries tend to be more open than larger ones and, consequently, to be affected by externalities;
- the more competitive a country is in exports, the more it can gain from externalities coming from trade partners;
- the willingness and the capacity of people - mainly students and researchers - in a country to move abroad make it possible to exploit spillovers of investments in education or research of other countries;
- the geographic or strategic position of a country in a physical network (transport, energy) or in a cooperation network (research, value chain) determines its capacity of generating and capturing externalities transmitted by the network;
- a country with long borders or surrounded by several countries can receive and generate significant spillovers through the physical contiguity mechanism;
- linguistic and cultural homogeneity can develop a more intense movement of labour between border regions.

1.4. Theoretical framework to analyse spillover effects

As shown, CP can give rise to different policies and different spillovers and these are triggered by four main "mechanisms" which are "transversal" to the policies and which can cumulate with each other.

Another dimension of analysis spillover relevant to identifying and measuring the impact of cross-country spillovers must be dealt with since they take place at different economic levels (microeconomic and macroeconomic) and in some policy areas are more important (environment, higher education and research, transport).

The figure below (Figure 2) describes the circular flow of CP from the original transfers to the investments of the beneficiary countries and how resources through potential "leakages" at micro, macro and sectoral generate spillover effects to other countries.

Figure 2: Theoretical framework including direct effects and externalities of Cohesion Policy

Source: authors own elaboration

Figure 1 shows the economic flows between the country which spends the EU resources (Country A) and the country which benefits from the spillover effects (Country B). The flows between these two countries exemplify the more complex flows involving the 28 EU MSs. In detail the main steps are:

1. **Short-term effects: support to new investments** - The augmented availability of public resources for investments increases the demand for public works and/or the subsidies for private investments in Country A. → **Spillovers at Microeconomic level** - The additional investments and public works in Country A may be partially fulfilled by enterprises of Country B. The new income acquired by these enterprises will flow into Country B. Furthermore, the advantage for enterprises of Country B can occur also in the form of increased market share or a better position in international value chains.
2. **Mid-term effects: More investment and higher employment and GDP** - In the implementation of the EU programmes of Country A the additional public spending impacts positively on its national demand and GDP. → **Spillovers at Macroeconomic level** - The increase in the income of Country A will increase its imports from Country B, which in turn leads to growth in the GDP of Country B. International trade is the transmission mechanism of spillover effects; its intensity depends on the economic integration and trade specialisation of the two countries¹².
3. **Sectoral effects: More sustainable, Smart and diffuse Growth** - The completion of public works and investments in Country A leads to increases in its endowments of material and immaterial infrastructures. This has positive effects on productivity, social and environmental sustainability and leads to new and more sustainable patterns of growth in Country A. → **Spillovers at sectoral level** - Various beneficial

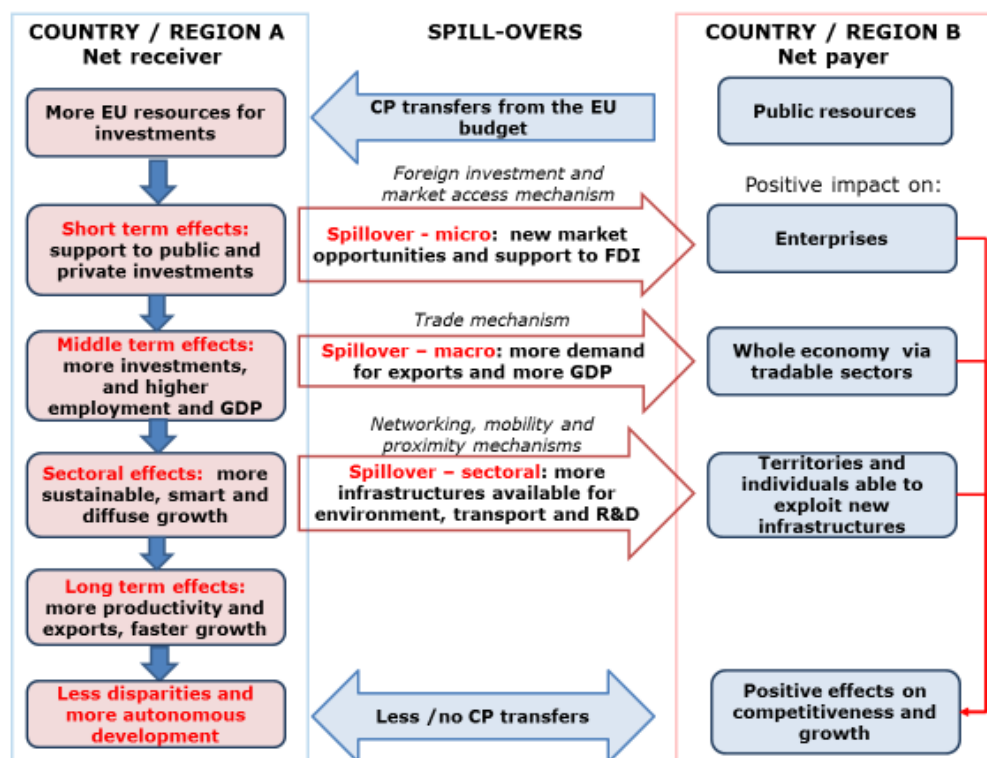
¹² It should be noted that the increase in GDP in Country B - via exports to Country A - is in part matched by foreign imports, leading to a second round of spillover effects from Country B to Country A. These spillovers will, in the same manner, lead to a third round spillover effects from Country A to Country B and so on. The size of the subsequent spillovers is likely to diminish progressively.

effects of these changes in Country A can also affect Country B. The transmission channels of spillovers differ from sector to sector, for instance: networking and easier access to markets or resources are the most significant channels in transport; territorial contiguity plays a primary role in the environment; cooperation opportunities, mobility of students and researchers and immaterial networking are privileged in higher education and R&D. These processes may provoke several spillover benefits for country B, such as for instance: a) *in transport*: lower transport costs, reduced transport time, higher fuel efficiency etc. b) *in the environment*: improved water and air quality, a better mitigation of climate change (extreme weather events) and decreasing natural hazards such as floods, fires; b) *in higher education, R&D*: increased potential of research cooperation, more internationally trained students, wider access to innovation.

It is important to highlight that **spillover effects can also benefit extra-EU countries**. For instance, the energy demand of many EU countries depends on extra-EU imports and, consequently, an increase in the internal demand immediately produces an increase in their energy imports from extra-EU countries. For extra-EU countries the transmission mechanisms of the spillover effects are the same as those illustrated above, but extra-EU enterprises cannot benefit from the single market rules and this makes their presence in the EU market relatively more difficult than that of the EU enterprises.

A final observation concerns **the division between net payer countries to the EU budget and net receiver countries from the EU budget**. This division is important in CP which largely benefits less developed, and at the same time net receiver, countries. The functioning of the spillover effects is independent of the net position of a country in relation to the EU budget, but clearly spillover effects between net receivers and net payers are more important. In fact, CP expenditure is concentrated in net receiver countries while exporting capacity and competitive enterprises are concentrated in the net payer countries. These spillover effects are also politically sensitive, because they influence the effective net position of the different countries; a large amount of spillovers destined to a net payer country reduces in practice its financial burden in contributing to the EU budget.

This study is focused on the functioning and the measurement of the spillover effects and **does not investigate the implications of the spillovers on the EU budget**, however it cannot neglect this dimension. As it is shown in the next chapters, the main spillover effects go from net receiver countries to net payer countries. In this respect, Figure 3 below presents the spillover effects by illustrating the financial transfers from the EU budget from net payer Country B to net receiver Country A. The initial transfer from Country B increases the investments in Country A, but spillover effects diminish the financial burden for Country B and, if CP is successful, disparities in Country A decreases as well as its need for financial transfers from Country B.

Figure 3: Theoretical framework of direct effects and externalities for net payers and net receiver countries

Source: authors own elaboration

1.5. Measuring spillover effects

The analysis and the measuring of the spillover effects is complex; many interactions among countries and economic variables are involved at macro level, while at micro level information is scarce and does not always permit to understand the nationality of the beneficiaries of CP expenditure because this information is not required in the monitoring system of ESI funds.

The measurement of macro-economic spillover effects is normally estimated by econometric models. It is important to point out that in this kind of measurement macroeconomic spillover effects very often include microeconomic spillover effects, because estimations of macro effects make assumptions on the micro-economic and sectoral changes. Consequently, in these cases the measure of microeconomic effects cannot be added to the measure of macroeconomic effects, but it is simply a component of that¹³. Similarly, the measurement of sectoral effects do not differ from macro or micro effects, it only illustrates particular spillover effects in some more sensitive sectors. For this reason the measurement of sectoral effects cannot be added to the measurements of macro effects estimated with the econometric models.

¹³ This, for instance, happens in the simulations of the Quest III model used in the next chapter, but not in the simulations of the WIOD model which estimates only the spill-over effects deriving from the demand side.

With these cautions, the different spillover effects will be analysed and possibly measured using different methodologies in the subsequent tasks:

- Macroeconomic effects using comprehensive cross-country econometric models to capture the national and the cross-country aggregated effects of CP;
- Microeconomic effects focusing on the amount of resources that foreign firms succeeded in collecting from CP expenditure of two exemplary countries (Poland and the Czech Republic);
- Sectoral effects examining the main mechanisms triggering spillovers in transport, environment and higher education and the quota of CP resources that can mainly activate spillovers. In addition, some case studies are presented to show projects that promote spillovers in these sectors.

2. MACROECONOMIC ANALYSIS

KEY FINDINGS

- Of every **CP Euro spent in the cohesion countries** in the period 2007-2013, **9 Cent** (9 percent of the total) flowed back **to non-cohesion** (net-paying) countries in the form of **import demand**.
- CP expenditures in cohesion countries lead to an **increase of important demand** from **Germany** of around EUR **700mn**, and from **Austria, France, Italy**, the **Netherlands** and the **UK** of around EUR **100** to **230mn**.
- **Adding capacity effects to the pure demand effects**, e.g. through the improvement of infrastructure, human capital or R&D, **increases the positive CP spillovers from cohesion to non-cohesion countries**. In the medium run total spillover gains are high for Germany, France and Italy (around EUR 1.7 to 1.0 bn) and smaller for other countries (from EUR 375 mn in the UK to EUR 28 mn in Luxembourg).
- **In the long run positive effects of CP are even higher**, as the improvements in R&D, infrastructure and human capital have a cumulative effect on economic development and lead to comparatively higher GDP in all EU MSs. Long run GDP gains for more developed countries on average amount to 0.02% of GDP per year and to on average of 2% of GDP for less developed countries.

2.1. Introduction to the macroeconomic analysis

This chapter of the study focuses on the macroeconomic spillovers of CP. It analyses the economic effects of CP expenditures in one MS on the economic development in other MSs, due to an increase in the demand for imports but also for example due to changes in the competitive positions of the countries. Thereby, this chapter considers spillovers between individual MSs as well as spillovers between country groups, that is from cohesion to non-cohesion countries. Cohesion countries are defined as: Bulgaria, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and for recent periods also Croatia. Non-cohesion countries are all other EU-28MSs.

The study is less concerned with direct effects of CP, i.e. the effects on the economic development of the country where CP expenditures were made. This topic has been analysed extensively in the literature, through a large number of econometric studies, see e.g. OECD (2012), Dall'èrba and Le Gallo (2007), Esposti and Bussoletti (2008), Becker et al.(2010) as well as Mohl and Hagen (2010), the last also providing a comprehensive overview of related previous literature. Alternative approaches to estimate direct effects of CP are based on econometric model analyses. These, for example, include the CP evaluations made using the macroeconomic Quest III (Monfort et al., 2016) and the regional economic Rhomolo model (European Commission et al., 2016) in the Ex-post evaluation of 2007-2013 CP programmes financed by the ERDF and CF. An extensive meta-review of the effects of CP, including an analysis of the different methods used to identify them, is provided by Davies (2017). This author groups existing studies into four methodological typologies (macroeconomic models, econometric regressions, micro-economic studies and case study evaluation) and discusses their advantages and disadvantages as well as their results.

The econometric studies deliver mixed results regarding the growth impact of CP, with some analysis finding no or partly even negative effects and others finding slight positive effects.

Model based analysis are more optimistic in this respect, because they are more suitable as regards taking long run capacity effects into account (compared to econometric analysis). Thus, the Quest III model suggests that EU cohesion and agricultural policy expenditures increase GDP in the Central and East European countries by 3% to 5% both in the short and medium run. Projected effects in the more developed EU countries are also positive, though much smaller (in terms of GDP). Similar results are shown by the Rhomolo model, which provides estimates of CP effects at the NUTS-2 regional level. In addition to the country level Quest III model result, Rhomolo focuses on regional differentiation of growth effects within the EU countries.

In contrast to the analysis of direct effects, spillover effects or the interrelations between EU CP spending and related changes in trade and capital flows between cohesion and non-cohesion countries were not the focus of discussion, yet, were not completely neglected either.

Already in 1996 Orlowsky scrutinized the possible impact of the expected substantial EU transfers on the trade balance of the then still EU candidate countries in Central and Eastern Europe after their accession. He warned of a possible detrimental effect from the candidate countries' point of view and referred to the post-accession appreciation of the national currencies of Spain, Portugal and Greece. The Third Cohesion Report (European Commission, 2004) found a strong relation between EU transfers and trade flows. The example of the 'old' (pre-2004) cohesion countries showed that around one fourth of structural policy transfers were spent on imports – typical of other, highly developed, EU member states.

Richter (2008) compared the balances in trade between net contributor and net beneficiary MSs with the net financial positions of both groups vis-à-vis the EU budget for the year 2006. In 2006, all but one of the net contributor MSs had a surplus in their trade with the group of net beneficiary member states. Net contributor MSs had a higher surplus, relative to their GNI, in their trade with the group of the net beneficiary member states, their 'deficit' vis-à-vis the EU budget was, again relative to their GNI. The group of net contributor MSs achieved a combined surplus in their trade with the group of net beneficiary MSs that was almost six times the amount of their combined net contributions to the EU budget.

Nevertheless, this picture, characterizing the situation in the early years of EU membership of the Central and Eastern European countries so spectacularly, has significantly changed since then. The net financial position of the net contributor MSs has deteriorated relative to 2006 as since then three new net beneficiary MSs (Bulgaria, Romania and Croatia) have joined the EU. More importantly, the net beneficiary CEE-EU countries have since turned the trade balance to their advantage reaching substantial surpluses with the group of net contributor MSs in the last decade.

In a seminal study, Bradley et al. (2009) attempted to show "*how the donor states are likely to be affected by the cohesion expenditure*". Using the macroeconomic HERMIN model, they estimated the increase in economic activity triggered by 2000-2006 CP in the net-recipient MSs. Bradley et al.'s estimations indicated positive spillovers in terms of higher net-exports from donor to net-recipient MSs. Still, these positive effects were outweighed by negative CP spillovers caused by the assumed need to levy higher taxes in order to finance CP contributions in the donor MSs. As a result Bradley et al. concluded that total CP spillovers for most donor MSs are in fact negative as the negative tax effects are higher than the positive trade effects.

These results can be considered overly pessimistic for two reasons. First, it appears that the used version of the HERMIN model involves explicitly three main aspects of GDP: aggregate output, domestic demand and income, while the foreign trade balance remains a residual item. Hence, the model makes no effort to internalise foreign trade effects, i.e. to consider

the trade effects on GDP. Thus, the estimated effects of changes in the trade balances elicited by this approach may be viewed as approximations to the first-stage consequences of cohesion transfers. By contrast, second round effects, i.e. the fact that increased exports from donors to receivers may require increased secondary imports – e.g. of components from the receivers to the donors – cannot be captured.

But even allowing for such secondary trade effects would not be sufficient. Contemporarily the national economies are closely integrated through trade in intermediate inputs. The secondary imports may themselves have some “foreign” contents. The computation of the total consequences of the CP transfers for both donors and receivers would thus require running models that account for the high degree of trade integrations.

Second, Bradley et al. lump together the trade benefits accruing to the donor countries with the higher taxes they have to charge to fund their CP contributions. From different points of view this is problematic. From a methodological point of view, national accounts do not define and propose to make any use of an aggregate consisting of trade balance and tax revenue. There are good grounds for this negligence: the economic functions of these items are completely different. In particular, the raising of budgetary revenue (i.e. through taxation) does not automatically imply any loss to the national economy (i.e. its GDP). By taxing private sector income that would not be spent on domestic consumption or investment anyway (i.e. by taxing private savings) the government does not reduce GDP at all. In fact if actually spent (on public investment, consumption or as transfers to households with low saving propensities) such taxation tends to increase GDP. Besides, from a practical point of view, the contributions to CP may well be financed by government borrowing which need not generate any negative effects - at least in the short and medium terms.

Bartkiewicz et al. (2016) authored the latest study on macroeconomic CP spillovers, representing the state-of-the-art as far as their identification and quantification is concerned. The aim of the study is to estimate the value of additional EU-15 exports to the Visegrád countries (V4), the Czech Republic, Slovakia, Hungary and Poland, resulting from CP transfers to the V4. Their estimation of spillovers included 4 stages of which the first two are essential, while the 3rd and 4th stages are a more or less mechanical aggregation or disaggregation of the final outcomes of the 2nd stage. In stage 1 *'the value of additional GDP generated due to CP implementation in each V4 country was calculated'*. In stage 2 *'the value of additional consumer and investment expenditure imports was estimated'*. These additional expenditures are identified as 'export benefits' accruing to EU-15.

Stage 1 estimations of additional GDP due to CP are exogenous. These estimates are derived from a version of Quest III model for each individual V4 member. The difficulty with this is that the Quest III model yields internally consistent estimates of GDP gains resulting from the actual spending of the CP funds. Consequently, the GDP gains from stage 1 have already internalised all essential effects of such spending – including the multiplier effects of increased investment on incomes, consumption and foreign trade in each V4 country. However, the Bartkiewicz et al. study implies that the additional transfer-driven consumption and investment, as well as additional import, calculated at stage 2 follow from the additional GDP volumes from the stage 1 calculations. But, as the increased consumption and investment are already parts of the GDP gain through stage 1, the Bartkiewicz et al. study implies some 'double counting', potentially leading to over-optimistic results. Additionally, the study shares the basic limitation of the Bradley et al. study, that only first-round trade effects are considered, but not second, third etc. round effects.

As far as spillovers are concerned, Bartkiewicz et al. estimate that total economic benefits to EU-15 arising from implementing CP in V4 amounted to EUR 97 bn in the period 2007-2015. These benefits consisted mainly of indirect export benefits that account for 80% of total benefits. Additional benefits were generated through a) contracts awarded to EU-15-based

companies because of CP projects (12% of total benefits) and b) contracts awarded to local V4 companies held by EU-15-based capital groups (8% of total benefits).

According to Bartkiewicz et al. EU-15 contributed around EUR 120 bn to CP. Correspondingly, the total economic benefits of EUR 97 bn account for around 80% of EU-15 CP funding. This substantially lowers the 'true' costs of CP for those countries. Still, the geographic distribution of benefits was unequal, with Austria, Germany, Belgium and the Netherlands benefitting most, given the strong trade links with the V4. In those four countries benefits from CP in the V4 outweighed their actual CP contributions. By contrast, Italy, the UK, France as well as the Southern and Nordic EU countries benefit much less according to Bartkiewicz et al.

2.2. Estimation of macroeconomic spillovers

To add to the discussion of CP spillovers this study employs two models to re-estimate them in a comprehensive way. The first model is the version of the Quest III model used by DG ECFIN and DG REGIO of the European Commission for their analysis of CP effects. It allows a consistent estimate of CP effects and spillovers taking into account both demand and supply side effects. The model is regularly used by the Commission for the analysis of key fiscal and monetary policy scenarios, like the DG Regio ex post evaluation of CP programmes 2007-2013 (Monfort et al., 2016). Therefore, the model results should not only illustrate CP spillovers, but also are consistent with direct CP effects estimated by the EU Commission (Monfort et al. 2016).

According to Davies (2017), the main strength of the model is that it simulates CP effects in comparison with a 'no-CP' scenario and includes a number of positive and negative economic effects and externalities, such as international R&D spillovers or crowding-out of private investment due to higher wages. However, the model has also a number of weaknesses. First, it is based on a wide range of theoretical assumptions about the economy and the actors therein. These assumptions might be disputed, as views on how the economy works differ. Second, the model is not publicly available, so that results cannot be easily verified. In this study all Quest III related results have been provided by DG Regio¹⁴.

Other macroeconomic models, such as RHOMOLO with regional disaggregation or E3ME¹⁵ and NEMESIS¹⁶ with sectoral disaggregation, might be used in this kind of exercise, but they are not specifically designed for analysing trade effects at national level and are not used as frequently by the EC as the Quest III model.

The second model used in the study is a WIOD (World Input Output Database) (Timmer et al., 2015) based model that allows a detailed estimation of the demand spillovers generated by CP expenditures. Although focussing only on demand effects, WIOD can estimate these quite precisely, thus promising more accurate results in this respect than other studies. Additionally WIOD is open source, so that results may be easily verified and replicated. Both models are described in more detail below.

¹⁴ As the Quest III model is based on EU Commission assumptions, it can be expected that the results are reasonable estimates of CP effects. Other models or Quest III based on different assumptions may obtain different results regarding the size of CP spillovers.

¹⁵ For more details on the E3ME model see <https://www.camecon.com/how/e3me-model>

¹⁶ For more details on NEMESIS see <http://www.erasme-team.eu/modele-economique-econometrie-nemesis-vp14.html>

Box: Quest III and WIOD model**QUEST III MODEL**

The Quest III model was developed by DG Economic and Financial Affairs (DG ECFIN) of the European Commission and is regularly used for the analysis of key fiscal and monetary policy scenarios, for assessing the impact of the structural reforms, or for contributing to the projections of economic development in the EU. (see Roeger et al., 2008 and Varga and in 't Veld, 2011).

Quest III is structured around a number of building blocks that represent the behaviour and interactions of fundamental economic agents such as households, government, final and intermediate goods and services producers as well as producers of R&D. Using a general equilibrium framework that transmits changes in one building block to all others, the model fully describes the dynamics of the economic system¹⁷. Also, Quest III covers 28 EU MSs as well as their trade links with each other and with the rest of the world.

The model makes it possible to estimate the economic effects of a wide range of policy interventions, such as CP. For example, R&D support is assumed to facilitate the adoption of innovation and thus is modelled by a reduction in the price paid for acquiring new processes. Likewise, the provision of infrastructure through CP is modelled by an increase in the stock of public capital, while CP funding of human capital is translated as a shift in the skill composition of the work-force in the model. The model also allows for international R&D spillovers, so that the support of R&D in one country will have positive impacts on other EU MSs.

The analysis of CP spillovers is conducted by simulating and comparing two scenarios. The baseline scenario relies on the natural trend in the economy, excluding any policy intervention. The second scenario features CP interventions in the cohesion countries. By comparing the results of the second scenario with the baseline, Quest III makes it possible to provide an estimate of the potential CP spillovers from the cohesion countries to the other EU MSs. Thus, the difference between the GDP levels obtained under the baseline and CP scenario is interpreted as the impact attributable to the CP spillovers. This impact is expressed as a percentage deviation from the baseline GDP and therefore represents the change in GDP caused by CP spillovers.

The Quest III model is especially suited to estimate medium to long run effects of CP as it considers changes in innovation, infrastructure and human capital due to CP. These changes are assumed to have lasting effects, still being visible after CP intervention has ended.

WIOD (World Input Output Database)

Differently from the Quest III model the WIOD based model focuses only on pure demand spillovers. For this reason it considers CP expenditures as demand injections to the economies in question that exert both immediate as well as indirect effects. The size of these effects is usually expressed in terms of GDP or Gross Value Added, but technically could also be translated in employment or wage (total wage sum) terms. The WIOD model is especially suited to estimating short run CP spillover, thus complementing the medium to long run Quest III. The structure of the WIOD model provides reliable short run estimates. Yet, as it makes no assumptions on how CP expenditures affect innovation, infrastructure or human capital it does not provide long run estimates of spillover effects

¹⁷ For more details see Monfort et al. (2016)

Immediate effects of CP expenditure in the cohesion countries arise from the demand for goods and services needed to realise CP projects. This short run increase in final demand is, by assumption, satisfied in a 'business as usual' scenario by assuming that cohesion countries source the products and services they need for the realisation of CP investments as they did in the past through domestic and foreign supply.

A non-cohesion country would benefit from CP expenditures in the cohesion countries, if (i) the CP projects increase demand for this country's goods or services, and/or (ii) the CP projects increase demand for goods or services in other countries, who in turn ask for this country's intermediate inputs.

These production networks are described in so-called multi-country input-output tables. These provide information on how much input an industry – such as the construction sector – needs for its own operation from other sectors and countries.

Accordingly, the estimates of (demand) spillovers from CP investments in cohesion countries to non-cohesion countries are based on a standard Leontief demand-driven input-output model, where the production is a function of final demand (consumption, investment, exports) given a certain production technology, derived from the World Input-Output Database (WIOD, 2016 version).

In this model, a CP investment in a specific cohesion country first triggers direct demand for products in various industries of that country, e.g. CP infrastructure investments demand goods and services from the construction industry. However, as these industries need inputs from other industries, which are partly sourced from industries in other countries, such an investment also generates demand and, therefore, production and income in the trading partners ('direct effect'). But, since each industry in each country itself has to source its production from other industries and countries, these direct effects trigger again demand for products in further industries and countries, which again need to source from other industries and countries. The sum of these second-, third-, fourth-, etc. round effects are the 'indirect effects'. Formally, these direct and indirect effects are calculated via the Leontief inverse derived from the technical input coefficients matrix (i.e. information which indicates the domestic and foreign sourcing structure of intermediates of each industry in each country).

Spillovers from cohesion to non-cohesion countries can be comprehensively estimated from this trade. Finally, by 'translating' these trade spillovers into value added terms the effects of CP spillovers on non-cohesion countries' GDP can be estimated.

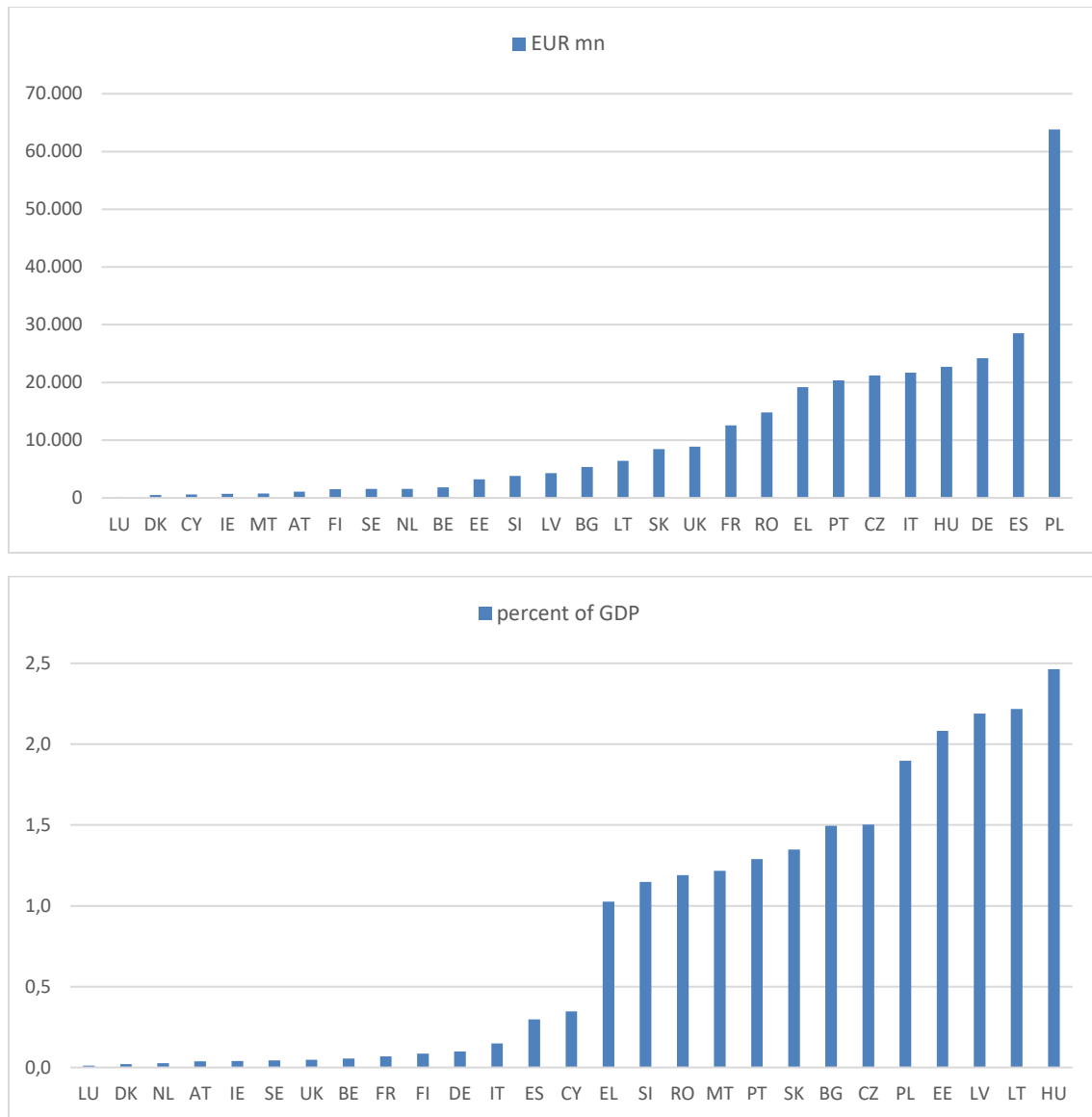
Source: Monfort et al. (2016), Timmer et al. (2015)

2.3. Cohesion policy data

The analysis of CP effects and spillovers covers the following funds: European Regional Development Fund (ERDF), Cohesion Fund (CF) and European Social Fund (ESF). In the 2007-2013 financing period total payments from these funds amounted to EUR 278 bn (cumulative data until end of 2014 at 2014 prices). From this, around 74% of these funds went to cohesion countries, i.e. EUR 206 bn. and 26% or EUR 72 bn. to non-cohesion countries. In absolute terms, the highest CP expenditures occurred in Poland, over EUR 54 bn over the period 2007-2014, followed by Spain, Germany and Hungary.

In relative terms, i.e. in percent of the annual GDP, CP expenditure were highest in Hungary (over 2.5% of the country's GDP) and the three Baltic countries (above 2% of GDP), followed by Poland, Bulgaria and the other cohesion countries. In all of them, except Spain and Cyprus, CP expenditures were at least 1% of annual GDP. In the non-cohesion countries CP expenditures reached 0.17% of annual GDP or less. For the detailed distribution of funds across countries see the following Figure 4.

Figure 4: Total Cohesion policy expenditures (ERDF, ESF and CF), 2007-2014 – upper graph: EUR mn at 2014 prices; lower graph: in % of annual GDP



Source: DG Regio

The ERDF, CF and ESF expenditure data are proxied by advance and interim annual payments collected from the System for Fund Management (SFC) of the European Commission. ERDF and CF data were adjusted to reflect the 86 expenditure categories of CP by using the breakdown of expenditure in 2014 provided by Work Package 13 of the ex-post evaluation 2007-2013 (Ismeri Europa and wiiw, 2015). ESF data is allocated to expenditure categories via an approximation using the distribution of latest decided ESF amounts across expenditure types for each country (Monfort et al., 2016).

CP funds used in the simulations are actual expenditures and, consequently, reflect the real absorption capacities recorded in recent years. It is not possible to make detailed assumptions on the quality of the funded projects, but it can be assumed that they are “average” quality projects, as the model is based on estimated average coefficients and correlations between variables.

For the simulation with the Quest III model CP expenditures were grouped into five large fields of interventions: a) infrastructure, b) human capital, c) research and development (R&D), d) aid to private sector, and e) technical assistance and other investments.

For the simulations using WIOD the CP expenditures were allocated to 56 sectors of industry according to the NACE revision 2¹⁸ classification, using a projection matrix (matching the 86 CP expenditure categories with the 56 NACE industries) developed by wiiw¹⁹. This allocation was subject to sensitivity tests in order to ensure the robustness of estimates (see Annex).

2.4. Main results of the simulations

2.4.1. Results of the analysis with Quest III

The analytical approach

In the Quest III model CP expenditures can affect economic development through five fields of interventions:

- *Infrastructure*: includes transport, telecommunications, energy, environmental infrastructure and social infrastructure. It is mostly modelled as government investment (rather than consumption) and as such has a strong short run demand as well as medium run supply effects through building up public capital.
- *Human capital*: includes spending on educational and vocational training as well as labour market interventions. Human capital spending has medium run effects of labour productivity, real wages and as a consequence consumption and also investment. Furthermore, it improves productivity in the R&D sector. Human capital is the main source for long run economic growth in the Quest III model
- *R&D*: includes all expenditures on R&D and innovation. In the model R&D improves total factor productivity, especially in the medium and longer run, thus having a significant impact on long run GDP development.
- *Aid to private sector*: includes support to small and medium sized enterprises, facilitation to credit and support for tourism. It stimulates private investment and thus has a positive short run demand as well as a longer run supply effect.
- *Technical assistance and other investments*: includes mainly expenditures for building administrative capacity. In the model such expenditures have short run demand effects.

The Quest III model assumes that Member States raise taxes in order to finance CP; *ceteris paribus*, this has negative effects on short run growth.

The estimated CP direct effects and spillovers from the Quest III model are reported for the year 2016, i.e. the first year, representing the medium run effects as well as for the year 2023 to illustrate long run effects.

Furthermore, the Quest III simulation results are split into, so called, 'Full effects' and 'CC effects':

- *Full effects* cover all CP expenditures, i.e. in both non-cohesion as well as cohesion countries,
- *CC (cohesion Countries) effects* only cover CP expenditures in the cohesion countries. Thus they give an estimate of the spillovers from cohesion to non-cohesion countries.

Finally, the CP effects and spillovers are given as percentage point deviations from the baseline GDP as well as in Euro terms (the latter only for 2016 effects and spillovers). For

¹⁸ NACE is the statistical classification of economic activities in the European Union.

¹⁹ The matrix and other WIOD related data are available upon request from the authors.

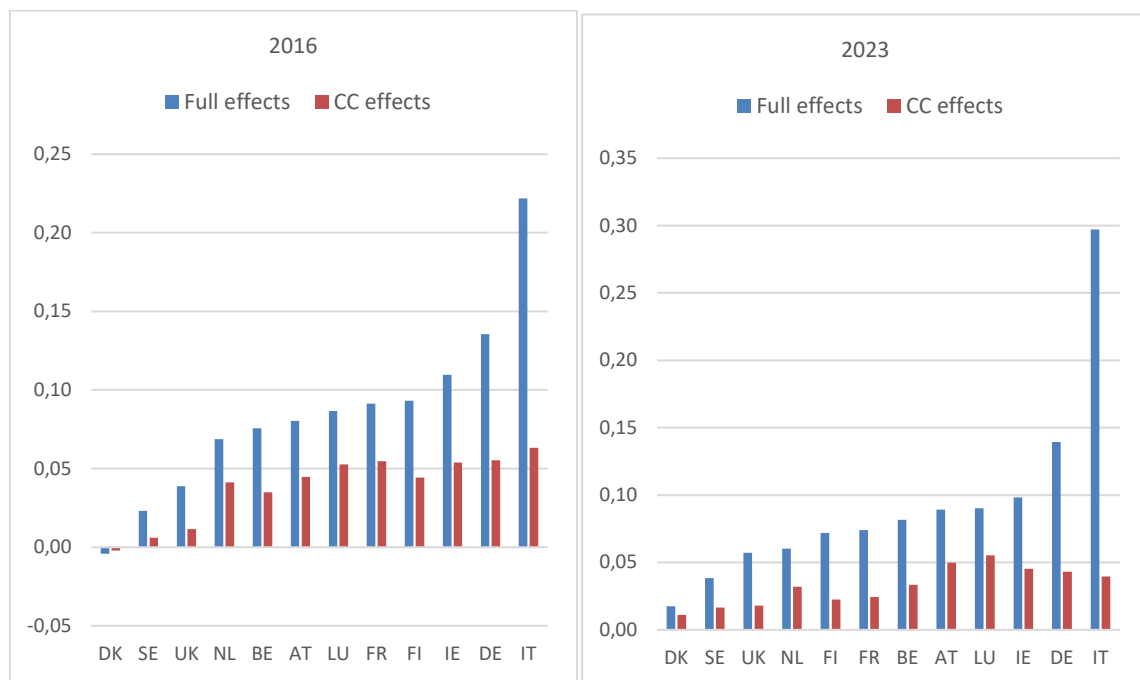
this reason, the baseline GDP is defined as the level of GDP in the absence of any CP. In the case of the “CC effects” (spillovers) the percentage points measure the share of GDP spent in foreign countries due to the CP investments in cohesion Countries.

Effects in non-cohesion countries

The Quest III simulation results in terms of GDP are presented in Figure 5 for non-cohesion countries and Figure 6 for cohesion countries. As far as non-cohesion countries are concerned the medium run effects of CP as well as the CP spillovers from cohesion countries are generally small. The maximum contribution to GDP is projected to occur in Italy, where CP spillovers tend to increase GDP by 0.06 percentage points. In all other non-cohesion countries medium term effects are smaller. In Denmark immediate medium term effects are marginally negative due to the reduction of the internal demand caused by taxes used to contribute to the EU budget. This negative effect disappears after 2016, when it is exceeded by a small positive CP spillovers coming from other countries.

Notably, despite their small size, CP spillovers from cohesion countries are a significant part of total CP effects in the non-cohesion countries. In France, Luxembourg and the Netherlands the share of CP spillovers in total effects is around 60%, in Austria, Belgium, Finland and Ireland around 50% and in Germany around 40%. Only in the UK and Italy do CP spillovers contribute less, i.e. around 30%, to total effects.

Figure 5: Increase in GDP (full effects) and spillovers (CC effects) due to CP – non-cohesion countries (% of national GDP)



Source: DG Regio estimates

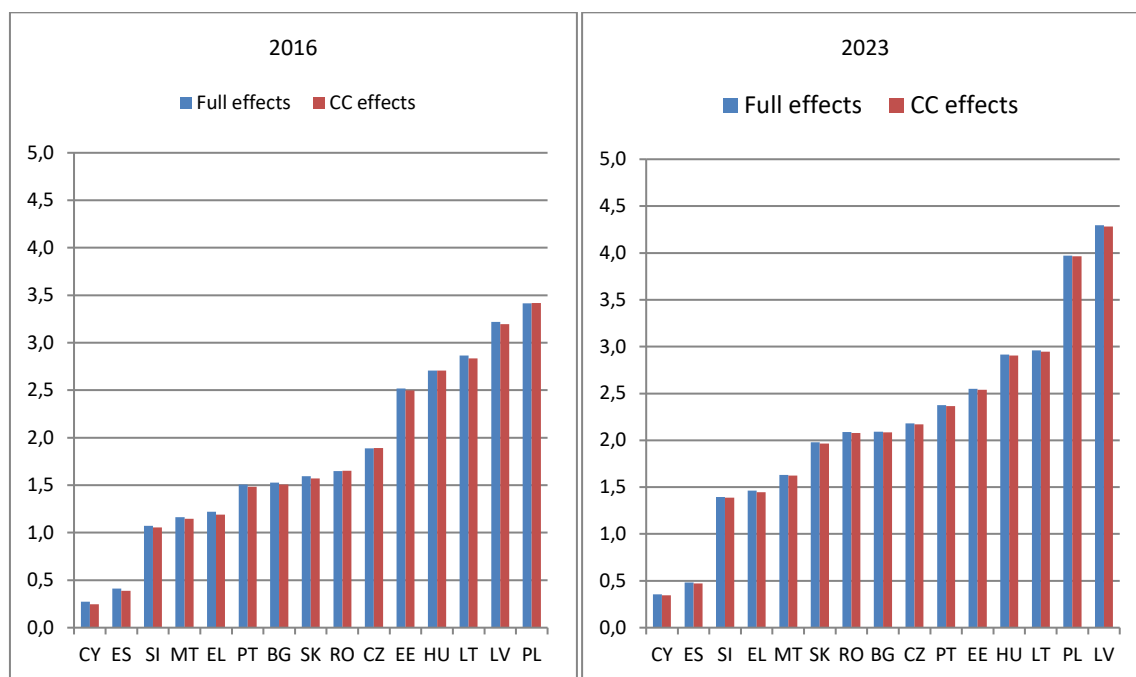
Effects in cohesion countries

Medium term effects are very positive for the cohesion countries, which is no surprise given the high amount of Structural funds those countries invested. The size of the positive effects correlates strongly with the amount of EU resources those countries received in terms of GDP. Thus, effects are lowest in Cyprus and Spain (GDP is 0.2 to 0.4 percentage points higher than in the baseline scenario), medium high (i.e. from 0.1 to 1.9 percentage points above baseline) for a range of countries from Slovenia to the Czech Republic (see left graph Figure

6) and highest for the Baltic countries, Hungary and Poland (from 2.5 to almost 3.5 percentage points above baseline).

Notably, for cohesion countries CP spillovers from other cohesion countries are negligible or very small and that is why the total spillovers and the spillovers originated by the cohesion countries illustrated in Figure 4 are practically identical.

Figure 6: Increase in GDP (full effects) and spillovers (CC effects) due to CP – cohesion countries (% of national GDP)



Source: DG Regio estimates

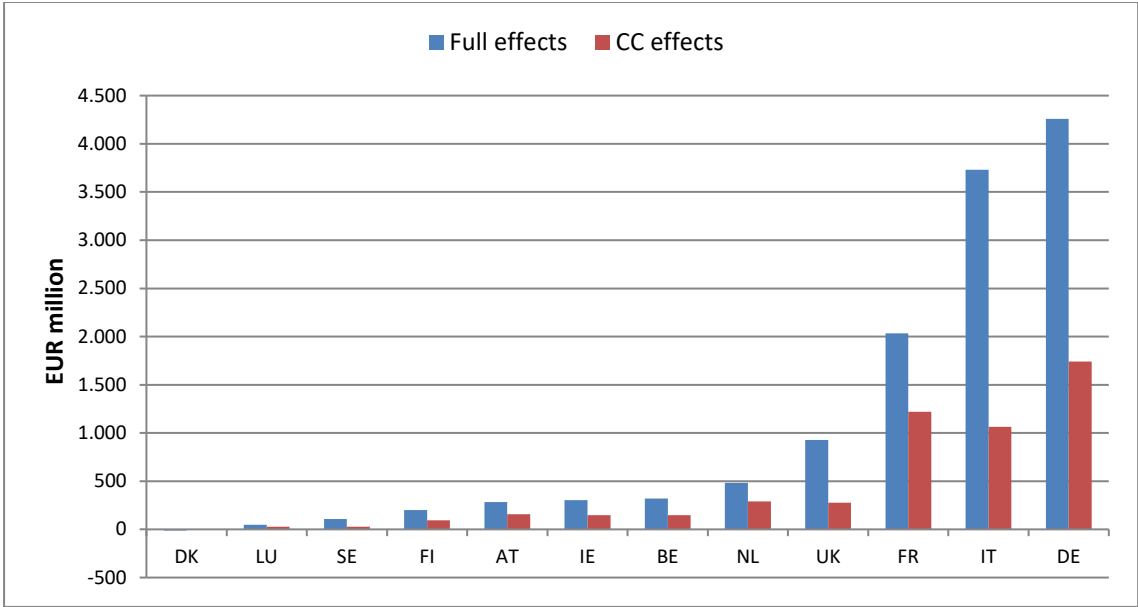
In the long run, i.e. in 2023, when the 2007-2013 period has long since ended, CP effects and spillovers are projected to be positive throughout the EU, due to the positive impacts CP on the production capacities and technology levels in each country. According to the Quest III model cohesion countries are the major beneficiaries in terms of GDP, as it is up to 4 percentage points higher compared to the baseline GDP (see right-hand Figure 6). For non-cohesion countries long run effects are positive but much lower (up to 0.3 percentage points above baseline in Italy) than in the cohesion countries (see right-hand Figure 7). Additionally, long run spillovers of CP from cohesion countries to non-cohesion countries are even lower. Thus, due to 2007-2013 CP expenditure in the cohesion countries, GDP in the non-cohesion countries is at maximum 0.05 percentage points higher compared to the baseline.

Direct and spillover effects in the medium term

Expressed in euro terms (see Figure 7 and Figure 8), the medium run effects of CP, both in cohesion and non-cohesion countries, depend strongly on the absolute amount of CP funds the countries spent. Thus they are highest in Italy and Germany among the non-cohesion countries (over EUR 3.7 bn), and by far the highest in Poland among the cohesion countries (over EUR 14.5 bn.).

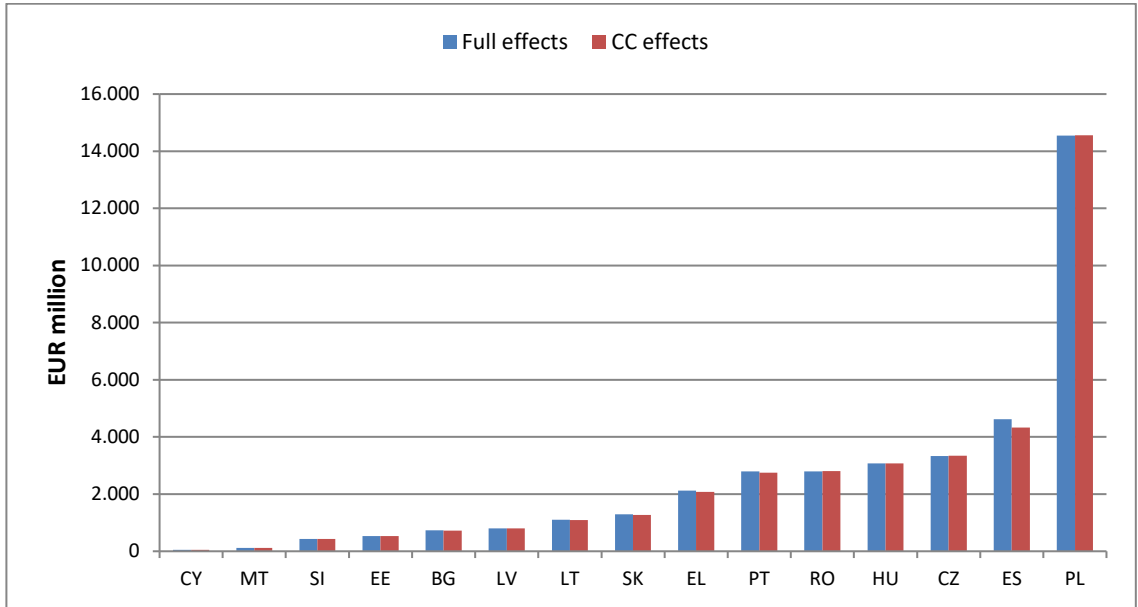
Regarding the spillover effects from cohesion countries to non-cohesion countries they are occasionally substantial, depending on trade and investment links (e.g. EUR 1.7 bn for Germany, EUR 1.2 bn for France and EUR 1 bn for Italy) but mostly relatively small (from EUR 375 mn in the UK to EUR 28 mn in Luxembourg).

Figure 7: Direct CP effects (full effects) and spillovers (CC effects) in non-cohesion countries (2016, in EUR mn.)



Source: DG Regio estimates

Figure 8: Direct CP effects (Full effects) and spillovers (CC effects) in cohesion countries (2016, in EUR mn.)



Source: DG Regio estimates

2.4.2. Results of the analysis with WIOD

The analytical approach

The WIOD model only simulates short-term demand spillovers of CP, not taking into account short- and long-term capacity and competitiveness effects as the Quest III model. The model translates CP expenditures into final investment or consumption demand of the various sectors of the economy and simulates how much of this created demand is sourced from the home country or from abroad via imports. That is, CP expenditures like infrastructure investments create a demand for goods or services from the construction sector. To meet this demand the construction sector itself needs inputs from other industries, which are either supplied domestically or by imports. Thus CP expenditures create a direct effect on the construction sector and a second round effect due to the construction sector's demand for inputs, which is partly satisfied by imports. As inputs are needed to produce those imports, the second round effect triggers a third round effect, which again triggers a fourth round effect and so on. The sum of these second-, third-, etc. round effects are the 'indirect effects'. By taking these indirect effects into account, WIOD gives a comprehensive estimate of the demand spillovers CP generates.

The estimated CP spillovers from the WIOD model are reported as annual average values over the period 2007-2014, thus representing only short-run demand effects. Unlike the Quest III model WIOD does not take into account increasing capacity effects deriving from investment in infrastructure, human capital and R&D, nor negative effects through taxation; however, WIOD makes it possible to consider source and destination of spillover effects (see Table 18 in the annex).

WIOD results are split into 'Total spillovers' and 'CC spillovers'.

- '*Total spillovers*' are the sum of spillovers of all EU countries CP expenditure to other countries, e.g. the sum of EU countries spillovers to Austria.
- '*CC (cohesion countries) spillovers*' are the sum spillovers only from the cohesion Countries expenditure to all other countries.

Unlike the Quest III model results that also showed the total effects of cohesion policy (i.e. direct effects plus spillovers), WIOD results focus only on spillovers. Direct effects calculated with WIOD, i.e. the effects CP has on the demand in the MSs where CP expenditure initially takes place are provided in the Annex.

As in the Quest III simulations, spillovers are given as percentage point deviations from the baseline GDP as well as in Euro terms. Again the baseline GDP scenario is defined as the GDP in the absence of CP expenditures.

The demand spillover effects in terms of GDP

The demand spillovers in terms of GDP are presented in Figure 9 for non-cohesion countries and in Figure 10 for cohesion countries.

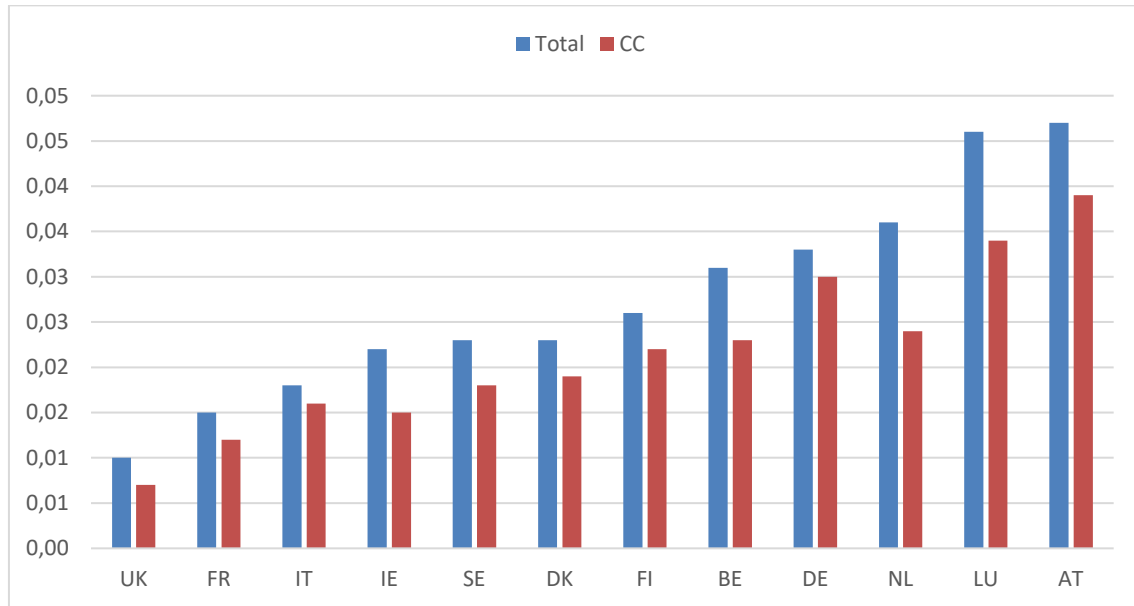
Following the WIOD model, pure demand spillovers of CP are positive in all EU countries. Demand spillover effects range between 0.01 to 0.09 percentage points of GDP (per year) in the EU countries. This result is relatively low if compared to the Bartkiewicz et al. study, but is approximately in line with the Quest III results.

Notably, CP demand spillovers seem to be strongest in the industrial core countries or financial centres of the EU. Additionally, spillovers also tend to be stronger, in terms of GDP, in the cohesion countries than in the non-cohesion countries. Thus, total as well as CC spillovers are highest in Slovakia, the Czech Republic and the Baltic states (around 0.06 to 0.09 percentage points above baseline GDP). In the non-cohesion countries total and CC

spillovers are highest in Austria, Luxembourg, the Netherlands and Germany (around 0.03 to 0.047 percentage points above baseline).

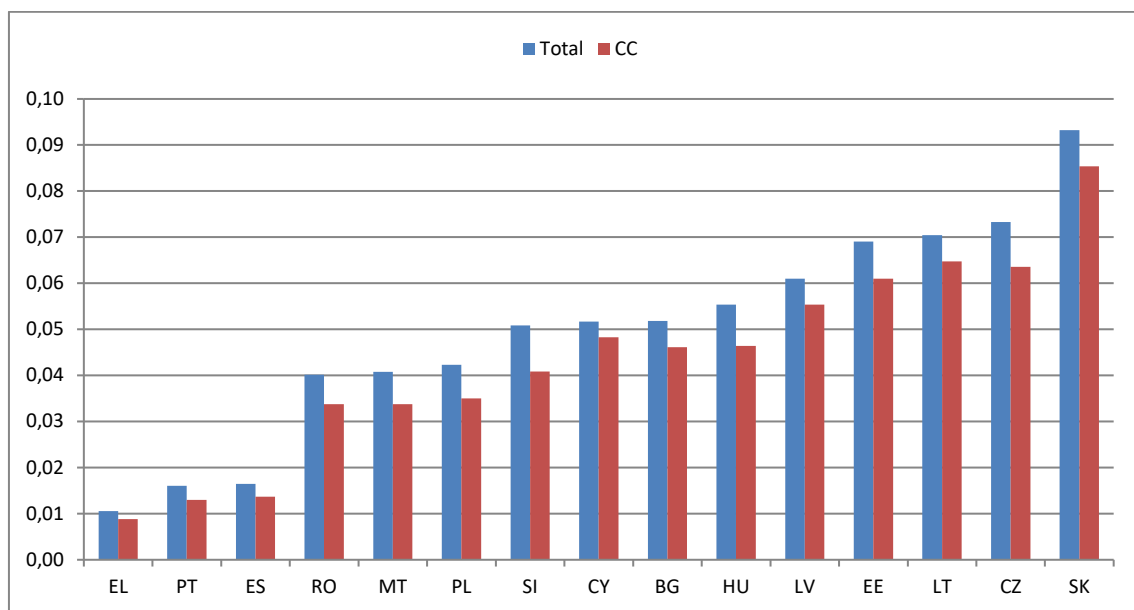
Given the high amount of CP expenditure in the cohesion countries, CC spillovers from cohesion countries, by nature, account for a large proportion of overall spillovers (from 66% to over 90%).

Figure 9: CP demand spillovers – non-cohesion countries (in % of GDP, annual average 2007-2014)



Source: wiiw estimates

Figure 10: CP demand spillovers – cohesion countries, (in % of GDP, annual average 2007-2014)



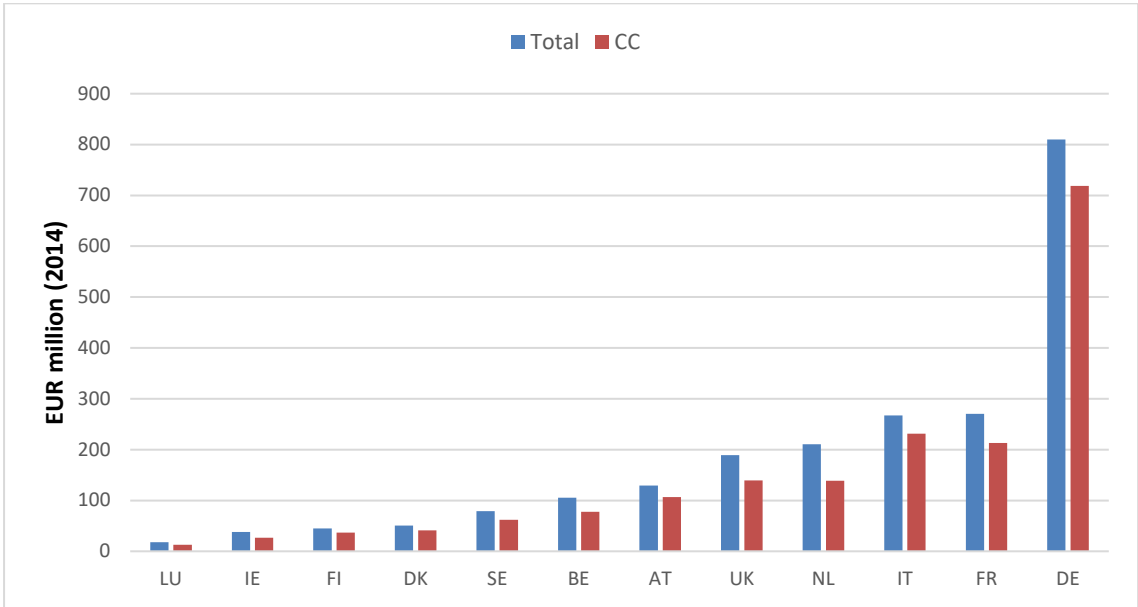
Source: wiiw estimates

The demand spillover effects in value

Expressed in Euro terms (see Figure 11 for non-cohesion and Figure 12 for cohesion countries), the size of spillovers depends largely on the size of the EU countries and their economies, respectively. Correspondingly, spillovers to Germany are by far the highest within the EU; CP expenditure in other MSs generated around EUR 800 mn. of additional annual demand in Germany, with EUR 700 mn. coming from CP in cohesion countries. In France, Italy, the Netherlands and the UK additional annual demand from CP spillovers exceeded EUR 200 mn, and for Belgium, Austria, the Czech Republic, Poland and Spain it was still over EUR 100 mn. per year, again with a significant proportion coming from cohesion countries.

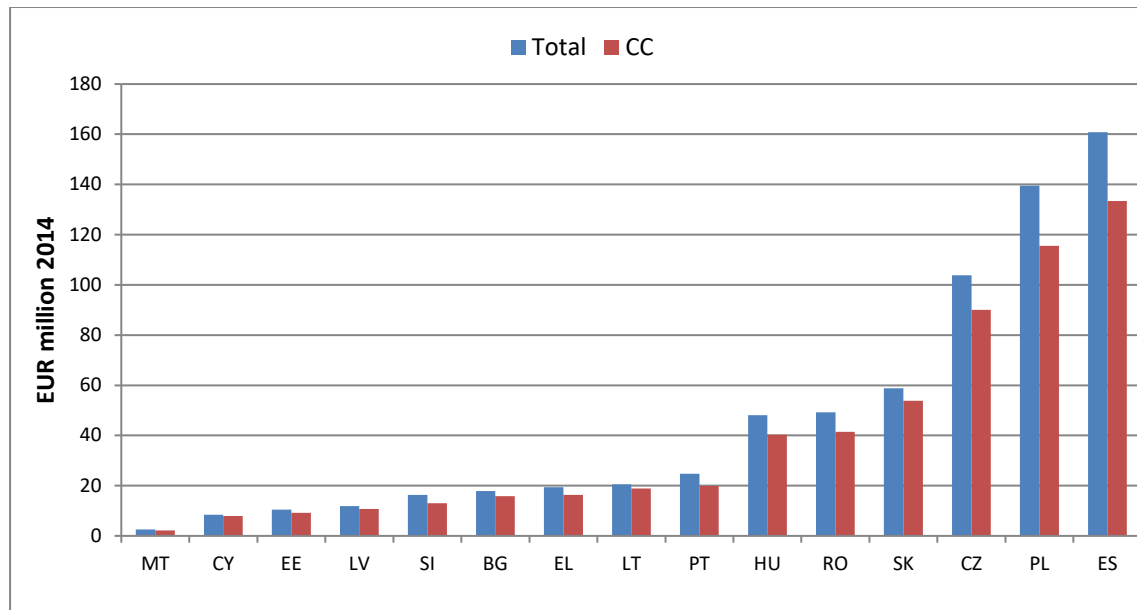
Aggregating the spillovers over all countries results in total spillovers worth EUR 2.9 bn, of which EUR 2.4 bn. from cohesion countries demand spillovers. Over 8 eight years it adds up to EUR 23.2 bn of CP spillovers of the period 2007-2014, with EUR 19 bn from cohesion countries. This corresponds to 8.4% of total and 9.3% of cohesion countries CP expenditures, i.e. much lower spillovers than estimated by the Bartkiewicz et al. study.

Figure 11: CP demand spillovers in non-cohesion Countries (EUR mn at 2014 prices; annual average 2007-2014)



Source: wiiw estimates

Figure 12: CP demand spillovers in cohesion countries, (EUR mn at 2014 prices; annual average 2007-2014)



Source: wiiw estimates

Estimations for the 2014-2020 period

Concerning the current 2014-2020 period estimated demand spillovers are presented in Annex A. This is because total expenditures as well as the distribution across expenditures are not fully known, thus allowing only a rough estimate. At the moment these estimates for the 2014-2020 period are higher than in the current period (on average around 20% on average).

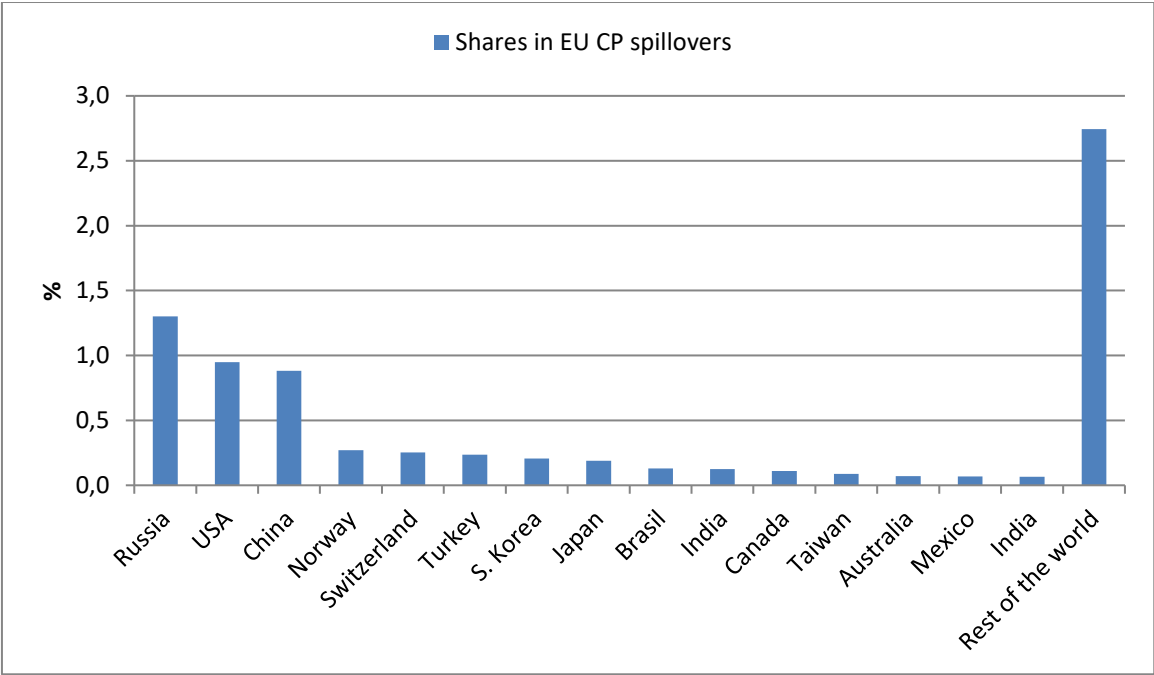
This is largely due to fact that a greater amount of funds will be distributed for CP than in the current period. While for the above analysis the total amount of cohesion funds amounted to EUR 278 bn, the assumption for 2014-2020 was that EUR 345 bn. were available for CP in the EU MSs²⁰. By the very nature and the mechanics of the WIOD model 2014-2020 spillovers are higher than the 2007-2013 period.

Spillover effects to extra-EU countries

The WIOD model makes it possible to estimate the amount of CP spillovers destined to countries outside the EU. In total, around 7.7% of the demand created by CP, i.e. around EUR 2.5 bn annually in the period 2007-2014, went to countries outside the EU, while the remaining 92.3% of the demand stays within the EU. Russia is the extra-EU country that benefits most, because of its energy exports, it absorbs around 1.3% of the demand created by CP. It is followed by the USA and China, which both absorb around 1% of all EU demand created by CP, while other non-EU countries benefit to a much lesser extent (see Figure 13).

²⁰ Based on the <https://cohesiondata.ec.europa.eu> dataset: "2014-2020 Member State Cohesion Financial Allocations - by category of region"

Figure 13: Cohesion policy spillovers to extra-EU countries: shares in the total demand created by EU CP (in %)



Source: wiiw estimates

In terms of GDP the CP spillover effects outside the EU are small. In Russia spillovers from EU CP are estimated to increase GDP by 0.035 percentage points annually, in Norway by 0.026 percentage points and in Switzerland and Turkey by 0.017 to 0.015 percentage points. In all other countries the contributions to GDP are even lower.

3. MICROECONOMIC ANALYSIS

KEY FINDINGS

- The analysis of the spillover effects at microeconomic level was carried out on Poland and the Czech Republic in the 2007-2013 period and in both cases **the role of foreign companies in the implementation of the CP was shown to be significant;**
- the **funds allocated to foreign enterprises range from 10% of the ERDF and CF resources in Poland to 5% in the Czech Republic;**
- the financial benefit, or microeconomic spillovers, for these enterprises **varies from 6% of the total ERDF and CF budget in Poland to 3% in the Czech Republic.**
- the majority of EU foreign beneficiaries came from the **United Kingdom, Luxemburg, Belgium, France, the Netherlands, Austria and Germany;**
- **Non-EU companies also received a significant amount of ERDF and CF resources,** especially in Poland. The USA was the major beneficiary of the microeconomic spillover effects outside the UE.

3.1. Introduction to the microeconomic analysis

The aim of this task is to analyse microeconomic externalities and estimate their size. These type of externalities refer to the benefits reaped by foreign enterprises that receive resources and advantages in the country where CP interventions are implemented. The analysis does not include firms which export to the country where CP funds are spent, but focuses on foreign enterprises which gain public contracts or use grants for investments in the spending country.

Firms choose to invest in foreign countries for a number of reasons (Dunning, J. H., 2002):

- *market seeking*: finding new buyers for their products;
- *resource seeking*: finding it cheaper to produce in a foreign country (superior or less costly access to inputs of production than at home);
- *strategic asset seeking*: building strategic assets with companies abroad, such as distribution networks or new technologies.
- *efficiency seeking*: reorganizing overseas branches of multinational companies in response to broader economic changes.

Investments in a foreign country can also require significant extra costs in comparison to “native” investments, such as costs for creating a new network of subcontractors and sellers, adapting the organisation to new rules, or simply working in a different language. Even in the EU common market where many barriers have been removed, these costs, technically called “sunk costs” (Sutton, J., 1991), may be considerable and act as an obstacle to firms that want to enter a new country.

For foreign companies public contracts and grants offered by CP are powerful opportunities to enter new markets, reduce sunk costs and expand their activities. It is noteworthy also that CP expenditures have to fully respect common market competition rules and, in general, this makes CP more favourable and accessible to foreign companies than national policies.

In addition, the economic advantages of CP support are not limited to the financial improvement of the balance sheet of the beneficiary company but include also long term advantages, such as a better market position in comparison to competitors. This is true for native companies as well as for foreign companies, but for the latter the advantage is relatively greater because of the extra-costs they would have add to sustain to enter the market.

3.2. Data Collection for the microeconomic analysis

To be able to analyse the companies that benefit from CP expenditure and are linked to a foreign country means tracing the nationality of the beneficiaries. This information is not generally available in the monitoring data of the CP and requires additional investigations.

The microeconomic analysis has been limited to the ERDF and the CF expenditures, which represent the major part of CP expenditure and includes interventions with a higher potential for microeconomic externalities (public procurements for implementing public investments and grants for private investments). In addition, the analysis of the ESF would have meant identifying the nationality of the final beneficiaries (students, researchers, etc.) and would have required analytical instruments not available in the present study.

In the first stage (December 2017 – January 2018) we verified the availability of information on nationality by asking the territorial units of the country selected for the study in DG Regio. This information is not required by the EU rules on monitoring, but it is generally collected in the administrative procedures. The survey indicated the lack of information on the nationality of the beneficiaries in the public monitoring data considered by the EC, but made it possible to identify the officials responsible for monitoring in the different MSs and OPs.

In the second stage (February 2018) we contacted the MAs and the monitoring offices of Poland, the Czech Republic, Hungary and Slovakia to know if the nationality of beneficiaries is tracked in a some way during their activities. We selected these countries because they make up the "Visegrád" countries on whom a Bartkiewicz et al. (2016) carried out a recent study on CP externalities, because they received a significant amount of CP funds and this makes large externalities possible. The exchange with the national officials confirmed the lack of systematic data collection on the nationality of the beneficiaries. According to the declarations of the interviewed officials, the EC database ARACHNE recently available for all the MAs makes it possible to verify the nationality of the beneficiaries, but this control is carried out for anti-fraud purposes and its results are not stored in the monitoring system.

In the third stage (March –April 2018) data was limited collection to Poland and the Czech Republic. These countries seemed to provide a better monitoring system and a quicker response. The data collection in this stage consisted in the following steps:

- Collecting data on the beneficiaries of the CF and the ERDF projects in the 2007-2013 and 2014-2020 periods of the two countries. Poland has a central monitoring systems and data have been g provided by the Polish Authority. The Czech Republic has a decentralized monitoring and data have been requested from all OP MAs and, when available, have been directly collected from their websites. Data included the fiscal code of the beneficiaries to help establish their nationality.
- Identifying the nationality of beneficiaries with the support of specific databases. In both countries ORBIS database²¹ was used, while in the Polish case the public register of enterprises (REGON) was also used²².

²¹ ORBIS Bureau van Dijk is a private database on companies; it also feeds the above mentioned ARACHNE database of the EC. Information on Poland and the Czech Republic has been derived from a study in progress at the Università of Calabria.

²² REGON was also used as an information source on nationality in Bartkiewicz et al. (2016).

- Implementing a survey on the 100 most important beneficiaries to ascertain their nationality or the nationality of the enterprises contracted by them. In fact, this group of beneficiaries include public administrations or public bodies responsible for the implementation of large public works that are normally contracted out. Unfortunately, few beneficiaries answered this survey in both the countries in time to complete the study.

It is important to underline that foreign firms funded by CP may enter the country for the first time or be already active there. However, no information on the date of establishment or purchase of a local firm is available.

3.3. Results of the microeconomic analysis

3.3.1. Results for Poland

Table 2 summarises the main data collected on Poland for the period 2007-2013. The monitoring data for ERDF and CF expenditure indicate almost 76 thousands projects, which received EU resources equal to EUR 58.8 billion. The largest 100 projects amounted to EUR 13 billion, equal to the 22% of the total EU expenditure.

Table 2: Poland: information on the nationality of the beneficiaries in the 2007-2013 period (ERDF and CF, number of projects, EUR and %)

	Number of Projects (N.)	Share of total projects (%)	Sum of received EU funds (MLN EUR)	Share of total allocated funds (%)
All projects	75 993	100.0	58 812.0	100.0
High Value Projects	100	0.1	13 060.7	22.2
REGON database	74 101	97.5	57 799.7	98.3
Foreign property ⁽¹⁾	1 034	1.4	930.8	1.6
Mixed national and foreign property (prevailing foreign property) ⁽²⁾	726	1.0	259.6	0.4
Mixed national and foreign property ⁽³⁾	162	0.2	101.2	0.2
Total foreign beneficiaries	1 922	2.5	1 291.6	2.2
ORBIS database	9 506	12.5	5 119.0	8.7
EU Member States ⁽⁴⁾	3 851	5.1	1 820.5	3.1
Non-EU States ⁽⁵⁾	1 981	2.6	1 945.2	3.3
Total foreign beneficiaries	5 832	7.7	3 765.7	6.4

Notes: (1) code 216 in REGON database; (2) code 226; (3) code 236; (4) EU MS: the Global Ultimate Owner (Guo; individual or entity at the top of corporate ownership of the enterprise beneficiary of the fund) is a foreign enterprise belonging to an EU MS; (5) Non EU States: the GUO is a foreign enterprise of an extra EU state. Exchange rate – December 2017.

Source: Ismeri Europa elaboration on Polish ERDF and CF monitoring, REGON and ORBIS data.

The REGON database identified beneficiaries for more than the 97% of the total projects and recognized 1 922 projects carried out by foreign enterprises and around 1.3 billion resources destined to these beneficiaries. The ORBIS database identified 5 832 projects of beneficiaries with entire or partial foreign ownership, equal to EUR 3.8 billion of EU resources and 6.4% of the total EU resources. Of these projects almost 2 000 are carried out by firms with Non-EU ownership and receive almost EUR 2 billion, while the projects carried out by enterprises with total or partial ownership of EU MSs number 3 850 and receive resources equal to around EUR 1 800 million. According to this last finding, spillovers were bigger in direction of non-EU countries than in direction of EU MSs.

The coverage and the detail of the two databases are clearly different. REGON covers a higher number of project beneficiaries but identifies a limited number of foreign owned companies and does not provide the origin of their ownership or participation. Differently, ORBIS covers a limited number of projects but provides a better detail of the ownership and its nationality.

Table 3 shows the results of the same analysis on data at December 2017 of the 2014-2020 period. At that date the monitoring data included more than 17 000 projects which received more than EUR 22 Billion of EU resources. According to the REGON database 2.6% of the projects are carried out by foreign, or foreign participated, beneficiaries and receive 2.7% of the total resources. According to the ORBIS database 1.3% of the projects and 1.8% of the resources are allocated to foreign, or foreign participated, beneficiaries. These percentages are similar to those of the 2007-2013 REGON percentages, but are significantly lower than the ORBIS percentages in the previous period. However, the 2014-2020 period is still in progress and data related to the two periods can only be compared upon its completion.

Table 3: Poland: information on the nationality of the beneficiaries in the 2014-2020 period (data at December 2017; ERDF and CF; number of projects, EUR and %)

	Numbers of projects (N.)	Share on total projects (%)	Sum of received EU funds (MLN EUR)	Share on total allocated funds (%)
All projects	17 047	100.0	22 254.5	100.0
High Value Projects	100	0.6	6 543.7	29.4
REGON database	16 778	98.4	21 948.0	98.6
Foreign property ⁽¹⁾	249	1.5	216.4	1.0
Mixed national and foreign property (prevailing foreign property) ⁽²⁾	259	1.5	188.2	0.8
Mixed national and foreign property ⁽³⁾	32	0.2	190.8	0.9
Total foreign beneficiaries	440	2.6	595.4	2.7
ORBIS database	3 198	18.8	4 518.6	20.3
EU Member States ⁽⁴⁾	173	1.0	356.9	1.6
Non-EU States ⁽⁵⁾	40	0.2	47.4	0.2
Total foreign beneficiaries	213	1.3	404.2	1.8

Notes: (1) code 216 in REGON database; (2) code 226 ; (3) code 236 ; (4) EU MS: the Global Ultimate Owner (Guo; individual or entity at the top of corporate ownership of the enterprise beneficiary of the fund) is a foreign enterprise belonging to an EU MS; (5) Non EU States: the GUO is a foreign enterprise of an extra EU state. Exchange rate – December 2017.

Source: Ismeri Europa elaboration on Polish ERDF and CF monitoring information, REGON and ORBIS data.

According to the available information, the majority of EU foreign beneficiaries came from the United Kingdom, Luxemburg, Belgium and Germany in the 2007-2013 period, while at the moment beneficiaries from France prevail in the 2014-2020 period (see Table 4).

Table 4: Poland: country of the foreign beneficiaries in the 2007-2013 and 2014-2020 periods (ERDF and CF; n. of projects, EUR and %)

Countries of foreign beneficiaries	2007 – 2013		2014 - 2020	
	Sum of received EU funds (MLN EUR)	Share of total funds (%)	Sum of received EU funds (MLN EUR)	Share of total funds (%)
Austria	15.4	0.4	0.2	0.1
Belgium	227.6	6.0	6.0	1.5
Cyprus	27.4	0.7	13.4	3.3
Czech rep	7.7	0.2	0.8	0.2
Germany	116.3	3.1	34.4	8.5
Denmark	3.5	0.1	1.2	0.3
Spain	2.4	0.1	22.8	5.7
Finland	6.0	0.2	8.8	2.2
France	41.7	1.1	190.1	47.0
Hungary	-	-	0.6	0.2
Ireland	5.4	0.1	0.1	0.0
Italy	34.5	0.9	2.4	0.6
Luxembourg	337.1	9.0	62.8	15.5
Malta	-	-	0.5	0.1
Netherlands	103.6	2.8	1.4	0.3
Sweden	5.0	0.1	1.8	0.4
Slovakia	0.0	0.0	-	-
United Kingdom	887.1	23.6	9.6	2.4
<i>Total EU Member States</i>	<i>1 820.5</i>	<i>48.4</i>	<i>356.9</i>	<i>88.3</i>
Non-EU States	1 945.2	51.7	47.4	11.7
Total Foreign Beneficiaries	3 765.7	100.0	404.2	100.0

Source: Ismeri Europa elaboration on ERDF and CF monitoring information and ORBIS data.

In the 2007-2013 period Non-EU states received more resources than EU states according to ORBIS estimations, while in the 2014-2020 period this quota decreases to 12%. In 2007-2013 68.8% of the total resources to Non-EU States (equal to Eur 1.3 bn) was destined to USA owned companies, 20.8% to Cayman Islands companies and 4% to Japanese companies. According to the provisional data in the 2014-2020 period the USA owned companies collected 53% **of the resources of the Non-EU countries**; 12.5% of the same amount went to China owned companies, 10.6% to Liechtenstein owned companies, 8.8% to South Korean companies and 7.9% Cayman Island companies.

In the 2007-2013 period 50% of the resources destined to foreign companies were concentrated in four categories of interventions: "Investments in firms linked to research and innovation" (07), "Advanced support services for firms" (05), "Natural gas" (36), "Management of household and industrial waste" (44). In the 2014-2020 period, the analysis shows that foreign companies are mostly present in the following categories of interventions: "Research and innovation in large enterprises"(002), "ICT: fast broadband network" (046), "Investments in infrastructure and equipment in SMEs related to research and innovation activities"(056) and "Research and innovation processes in SMEs" (064).

3.3.2. Results for the Czech Republic

The next two tables (Table 5 and Table 6) describe the results of the microeconomic analysis for the Czech Republic; here estimations are based only on the information from the ORBIS database. The database is able to match the beneficiaries of 27% of the total projects of the 2007-2013 period. 2.4% of the total projects turned out to be implemented by foreign enterprises and amounted to approximately EUR 600 million (2.4% of the total expenditure for ERDF and CF). The number of companies from the EU countries is greater than that of companies from third countries in terms both of number of projects and received resources.

Table 5: The Czech Republic: information on the nationality of the beneficiaries in the 2007–2013 period (ERDF and CF, n. of projects, EUR and %)

	Numbers of projects (N.)	Share on total projects (%)	Sum of received EU funds (MLN EUR)	Share on total allocated funds (%)
All projects	46 969	100.0	24 910.6	100.0
High Value Projects	100	0.2	6 448.1	25.9
ORBIS database	12 440	26.5	7 399.6	29.7
EU Member States ⁽¹⁾	851	1.8	414.3	1.7
Non-EU countries ⁽²⁾	295	0.6	183.6	0.7
Total foreign beneficiaries	1 146	2.4	597.9	2.4

Notes: (1) EU MS: the Global Ultimate Owner (Guo; individual or entity at the top of corporate ownership of the enterprise beneficiary of the fund) is a foreign enterprise belonging to an EU MS; (2) Non-EU States: the GUO is a foreign enterprise of an extra EU state. Exchange rate – April 2018.

Source: Ismeri Europa elaboration on the Czech Republic ERDF and CF monitoring information, REGON and ORBIS data.

The same elaborations for the 2014-2020 period (with data at December 2017) shows a slightly higher share of foreign beneficiaries (3% of projects and 4% of committed resources) than in the previous period, but results are only provisional and can be assessed only at the end of the period. The prevalence of EU companies among the foreign beneficiaries is confirmed also in this period.

Table 6: The Czech Republic: information on the nationality of the beneficiaries in the 2014–2020 period (data at December 2017, ERDF and CF, n. of projects, Eur and %)

	Numbers of projects (N.)	Share on total projects (%)	Sum of received EU funds (MLN EUR)	Share on total allocated funds (%)
All projects	8 458	100.0	4 426.1	100.0
High Value Projects	100	1.2	1 199.8	27.1
ORBIS database	1 693	20.0	1 211.80	27.4
EU Member States ⁽¹⁾	207	2.4	126.5	2.9
Non-EU States ⁽²⁾	72	0.9	53.0	1.2
Total foreign beneficiaries	279	3.3	179.5	4.1

Notes: (1) EU MS: the Global Ultimate Owner (Guo; individual or entity at the top of corporate ownership of the enterprise beneficiary of the fund) is a foreign enterprise belonging to an EU MS; (2) Non-EU States: the GUO is a foreign enterprise of an extra EU state. Exchange rate – April 2018.

Source: Ismeri Europa elaboration on the Czech Republic ERDF and CF monitoring information, REGON and ORBIS data.

In the 2007-2013 period the main origins of the foreign beneficiaries in the Czech Republic were Non-EU countries (31% of the resources went to foreign Non-EU beneficiaries) and Germany (18). In the 2014-2020 period, at the moment, Germany remains the most frequent nationality among foreign beneficiaries with 23% of the total resources allocated to foreign beneficiaries (see Table 7).

Table 7: The Czech Republic: country of the foreign beneficiaries in the 2007-2013 and 2014-2020 periods (ERDF and CF; n. of projects, Eur and %)

Countries of foreign beneficiaries	2007 - 2013		2014 - 2020	
	Sum of received EU funds (MLN EUR)	Share of total funds (%)	Sum of received EU funds (MLN EUR)	Share of total funds (%)
Austria	45.3	7.6	11.0	6.1
Belgium	10.5	1.8	1.1	0.6
Cyprus	30.9	5.2	15.3	8.5
Germany	105.7	17.7	40.5	22.6
Denmark	5.4	0.9	-	-
Spain	2.4	0.4	0.2	0.1
Finland	7.6	1.3	-	-
France	53.5	9.0	8.8	4.9
Croatia	0.1	0.0	0.1	0.0
Ireland	4.9	0.8	4.4	2.5
Italy	6.1	1.0	2.8	1.6
Luxembourg	7.8	1.3	2.8	1.6
Malta	0.2	0.0	-	-
Netherlands	30.6	5.1	14.0	7.8
Poland	45.3	7.6	3.4	1.9
Romania	0.0	0.0	-	-
Sweden	13.4	2.3	4.1	2.3
Slovakia	21.5	3.6	9.9	5.5
United Kingdom	23.3	3.9	8.2	4.6
<i>Tot EU Member States</i>	<i>414.3</i>	<i>69.3</i>	<i>126.5</i>	<i>70.5</i>
Non-EU States	183.6	30.7	53.0	29.5
Total Foreign Beneficiaries	597.9	100.0	179.5	100.0

Source: Iseri Europa elaboration on Czech Republic ERDF and CF monitoring information and ORBIS data.

In the 2007-2013 period the main Non-EU States benefitting from the spillovers from the Czech programmes were the USA (43% of the resources of Non-EU States), Switzerland (18%) and Japan (8%). 8% of the resources allocated to Non-EU owned companies referred to so called 'tax haven' States, such as Cayman Islands and Virgin Islands. In the 2014-2020 period the USA owned companies received 41% of the resources of Non-EU states, 19% went to Suisse companies and 16% to Japanese companies.

The monitoring data available for the 2007-2013 period was not sufficient to identify in which categories of interventions the foreign companies were more present. In the 2014-2020 period the categories of interventions where foreign companies are concentrated are: Investments in infrastructure, capacities and facilities in large enterprises directly related to research and innovation activities (057); Promoting energy efficiency in large enterprises (070); Research and innovation processes in large enterprises (002).

3.4. Synthesis of the micro-economic spillover effects

The previous elaborations provide an estimation of the resources attributed to foreign (or foreign owned) enterprises in the CP of Poland and the Czech Republic. In this section the benefits for these enterprises and, consequently, the microeconomic spillovers destined to foreign countries are estimated. This estimation includes the financial advantages for the foreign firms, but not the costs for intermediate goods or local labor force which are paid in the host country; these costs do not represent an advantage for the foreign firm because they would have been paid also by a national firm and, when related to imported goods, they have already been estimated in the macroeconomic spillovers (see section 2.2 in previous chapter 2). Hence, the total resources of the CP projects implemented by foreign, or foreign owned enterprises cannot represent the value of the microeconomic spillovers; the costs for intermediate goods and services locally acquired or imported as well as the compensation of local employees have to be deducted from the projects' total resources.

In order to perform this estimation, an in-depth analysis of the activities carried out by the enterprises within CP programmes is necessary. Foreign or foreign owned enterprises receive CP resources for three main reasons: 1) to implement public works required by the national authorities; 2) to implement services required by the national authorities; 3) to carry out their own productive investments or research activities. The financial advantage of the public support varies according to the type of investments:

- In the first two cases (public works or delivery of specialized services) the benefits refer to the added value of the project, while intermediate costs, which naturally occur, do not provide any specific benefits. We assume that all the operating surplus of the project and half of the salaries of the employees²³ correspond to the benefits of the origin countries of the foreign enterprises. According to the Input-Output 2010 tables of Poland and the Czech Republic²⁴ these benefits amount to around 30-40% of the total cost of the project.
- In the case of received grants for investments or research the financial benefit of the foreign enterprises can be assumed to amount to a 100% of the cost of the project. In fact, in this case the enterprise is fully reimbursed for an activity that would most likely have been implemented in any case. Even if we assume that the public subsidy may have been crucial in the decision to invest, the investment should generate future profits and ensure a high level of benefit²⁵.

We are also aware that the lack of detailed information on the 100 largest projects of the two examined countries (see Table 2 and Table 5) may imply a significant underestimation of the total benefit for foreign enterprises. For this reason, we decided to add a quota of the value of the 100 largest projects to the estimated resources on the percentage of resources allocated to foreign companies in Bartkiewicz et al. (2016), which is equal to 9% in the Czech Republic and 13% in Poland.

²³ According to the Eurostat data employment (see Employment by occupation and economic activity from 2008 onwards, NACE Rev. 2 - 1 000 [Ifsa_eisn2]) and earning (see Mean annual earnings by sex, economic activity and occupation, 2014) in the construction sector of EU 28, earnings of not manual workers is around the 40% of the total earnings. We assume that these earnings and a 20% of the earnings of the manual workers, equal to around half of the total labour cost of the projects, go to the staff of the enterprise paid in the foreign countries, while the other half compensation is devoted to local employees or employees which spend their wages in the country where the investments is implemented.

²⁴ See I-O tables at current prices published by Eurostat (<http://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/data/database#>).

²⁵ A more detailed specification of this kind of benefit would require the knowledge of the financing sources of the investment (own resources, bank credit, financial markets) and their weight on the financial structure of the company. However, these elements are out of the scope of the current analysis.

According to these assumptions and using the available information on the typology of investments carried out by foreign beneficiaries (for the complete methodology see Table 19 and Table 20 in the annex) we obtained the results summarised in Table 8.

Table 8: Estimations of the benefits for foreign enterprises (microeconomic spillovers) in Poland and the Czech Republic during the 2007-2013 period (Meur, %).

	Poland		Czech Republic	
	Meur	%	Meur	%
Total ERDF and CF resources	58 812.0	100.0	24 910.6	100.0
Resources allocated to foreign beneficiaries	4 376.3	7.4	597.9	2.4
Total resources allocated to foreign beneficiaries including an estimation on the 100 largest projects	6 057.1	10.3	1 178.2	4.7
Estimation of the benefits for foreign enterprises (microeconomic spillovers)	3 304.0	5.6	617.5	2.5

Source: Ismeri Europa processing on Polish and Czech Republic monitoring data and Bartkiewicz et al. (2016).

Estimations of the benefits for foreign enterprises and their origin countries are presented in the last row and are equal to 6% of the total ERDF and CF budget in Poland and to 3% in the Czech Republic. Benefits amount also to slightly more than the 50% of the total resources allocated to foreign enterprises including the 100 largest projects presented in the third row.

4. SCOPE AND SIZE OF THE POTENTIAL EXTERNALITIES BY SECTOR

KEY FINDINGS

- The literature analysis focuses on the mechanisms triggering transnational spillovers in higher education, transport and environment sectors, which are among the most sensitive sectors to external spillovers.
- In higher education and innovation sectors the **internalisation of the activity**, the participation in **international cooperation networks** and **people mobility** are key factors for generating spillovers;
- In transport, involvement in a transport **network** and a hierarchical **rank** in the integrated EU infrastructure system are fundamental factors for triggering spillovers, spatial **proximity also** plays a complementary and significant role.
- **Physical and geographical linkages**, as well as **biological and ecological** connections are crucial mechanisms for spillovers.
- Overall and according to our general assumptions, in the EU the **spillover potential in the three sectors is significant and** amounts to **around 18% of the total ERDF and CF expenditure**. Considering also the proximity effect on border regions the share increases to around 20%.
- Almost **90% of this potential spillover** is in transport, because it is allocated the highest amount of expenditure and associated with the highest percentage of earmarking.
- **Case study fiches provide concrete examples of transnational spillovers** in action also in the sectors with lower overall potential in financial terms.

4.1. Aims and delimitation of the sectoral investigation

This task analyses transnational spillovers in three specific policy areas: environment, higher education and transport. Investments in these sectors typically produce direct outcomes and sectoral externalities i.e. benefits/disadvantages impacting on other fields outside their direct scope. A typical example is the construction of a new road that reduces transport time for passenger and goods (direct result) and by doing so generates positive spillovers on the competitiveness and attractiveness of the area connected to the road but also negative externalities on the environment (this is a typical example of externality from the economic point of view, see section 1).

Therefore, to have a full picture of possible transnational spillovers of CP investments in the three sectors considered, it is necessary to examine both the direct effects and the externalities, positive and negative, which they produce.

This analysis is based on the review of literature and previous evaluation results, mainly at European level. As a systematic review is beyond the scope of this study, the following elements from the most relevant contributions have been selected:

- A map of direct effects of the investments in the three sectors;
- A map of positive and negative externalities (potentially) associated with them;
- Geographical range of direct effects and spillover effects;

- Mechanisms/criteria which trigger cross border spillovers;
- Examples of identified/studied transnational spillovers.

Each sector will be analysed in one of the following paragraphs; an outline of the model to investigate cross-country spillovers in the three sectors is provided in the last paragraph of this section.

4.1.1. Higher education and research

Higher Education (HE) institutions are 'multi-input multi-output' organisations engaged in three main streams of activities: i) education, ii) scientific research and iii) promotion of innovation and societal engagement - the so called "third mission"(OECD, 2007). All these activities are characterised by positive externalities²⁶.

Education - HE produces both individual and social benefits, monetary and non-monetary, measurable in the short and the long-term. Positive externalities emerge since society benefits from better-educated people and gains more than the individuals do (social return is higher than private return). As a result, spillovers cover any impact from increased HE that do not derive from the student/graduate or their immediate family, and are the main reason for public funding (McMahon, 2004; European Commission, 2010). The literature has listed a number of positive spillovers both at micro and macro level (Sianesi and Van Reenen, 2003), related to economic growth including productivity improvements (Mas and Moretti, 2006), labour market substitutes, consumption effects, fiscal externalities- and societal impact -civic engagement and democracy, health outcomes, crime and other aspects such as better life options (Hall, 2006; O'Carroll et al., 2006). It is Difficult to estimate the magnitude of these externalities and the need for further data and research at micro and macro level has been expressed (Hermannsson et al., 2017).

HE activities usually have a regional/national scope, although there is a process of growing internationalisation measured by the number of students from abroad or the share of international staff, to the opening of secondary campuses in other countries closely linked with the home headquarters. Hence the internationalisation of activities and the mobility of graduates are the main mechanisms triggering transnational spillovers from the education side²⁷.

Scientific research and innovation promotion - Besides education activities, HE institutions largely contribute to the creation and diffusion of knowledge, through R&D activities and promotion of innovation and entrepreneurship, triggering strong spillover effects on economic growth on different geographical scales. Externalities or spillovers of R&D activities emerge when an organisation acquires or benefits from knowledge without paying for it. This can happen both as involuntary leakage and as voluntary exchange in a collaboration activity. Although a large share of literature has focused on the role and importance of geographical proximity and co-location of activities in the emergence of regional innovation systems shaped by localised knowledge spillovers, some contributions highlight the importance of other forms of proximity: cognitive, social, institutional, organisational (Boschma, 2005; Paci et al., 2014; Balland et al., 2015). The relative importance of proximity depends also on the nature, codified or tacit, of that knowledge. Authors have also demonstrated that the mobility of people (researchers, inventors) may transcend geographical boundaries and open the way to global spillover (Breschi and Lissoni,

²⁶ Some authors also mentioned possible negative externalities of higher education i.e. exclusion of the non-qualified individuals of the new information societies (Coelho and Oliveira, 2011), increase in 'white-collar' crimes and in harmful technologies Winter and Pfitzner, 2013), but these aspects are not relevant for our study.

²⁷ ERASMUS is the most famous policy in this field, but also CP programmes promote mobility of students and researchers on a smaller scale.

2009). In a similar way 'social networks' linking individuals engaged in R&D complement and magnify the effects of mobility. Although the effects of European integration have been investigated mainly from the point of view of trade, there is evidence that it increases transnational knowledge flows, and especially the collaborations of inventors across countries (Cappelli and Montobbio, 2016).

Raunio and Kautonen (2014) described three models for transplanting innovation abroad implying an active role of HE institutions: bridging approach, global campus approach, and inclusive approach. Transnational bridging organizations refer to an intermediary with joint services of innovation and business-related policy-makers abroad. The global campus model is more intense transnational community-building that supports the emergence of transnational innovation-related communities. The inclusive model of international innovation policies promotes the development of an innovation economy, or its elements, abroad without direct benefits to the sending country (Raunio and Kautonen, 2014).

From these points of view the internationalisation of activities, including the participation in international networks and the mobility of people - both inventors and researchers - are the most important mechanisms triggering transnational spillovers.

A strong push to international knowledge spillover also comes from businesses. Indeed, firms with higher absorption capacity of university knowledge are often more connected to global networks and there are rising levels of national and transnational academic-industry partnerships; this process favours highly reputed HE institutions while universities in less competitive regions are more introverted (Huggins et al., 2012). Archibugi and Iammarino (2002) identified three main categories - complementary and not mutually exclusive - of the globalization of innovation: a) the international exploitation of technology produced on a national basis; b) the global generation of innovations within Multi-National Enterprises (MNEs); c) global technological collaborations among universities, research organisations and firms.

The increasing integration of firms in global value chains - which is often accompanied by foreign direct investment and international ownership - may lead to the circulation of knowledge beyond regional and national borders. Traditionally, R&D and innovation in MNEs remained close to parent companies, but there is evidence of changing patterns of location decisions driven by the possibility of exploiting local externalities (intra-industry spillovers or specialization externalities, inter-industry spillovers or diversity externalities and science-technology spillovers and externalities). In this sense, the location of foreign MNE research activity in a region is positively influenced by the presence of a munificent scientific and educational infrastructure in the region itself and in neighbouring ones (Cantwell and Piscitello, 2005).

The decentralisation of research in multinational enterprises and the fragmentation of enterprise structures along global value chains is an additional mechanism which ultimately leads to the generation of transnational spillovers from university-industry collaborations in R&D.

On this basis, the literature on international trade has also questioned the existence of international negative spillovers on foreign countries' welfare triggered by public support to science-industry collaborations in beneficiary countries (Hoekman, 2015).

4.1.2. Transport

In transport, and specifically in transport infrastructure investments, there is a literature dealing with the geographical scope of direct benefits associated with them as well as a wider literature on their externalities in other fields, namely environment and economic development. Specific literature deals with the geographical scope of direct benefits associated with transport, and specifically with transport infrastructure investments and a wider literature focuses on their externalities in other fields, namely environment and economic development.

The expected benefits and the potential spillover vary greatly according to the typology of intervention (building or renovation/qualification of transport infrastructures) and mode of transport. The geographical scope of the potential spillovers depends on the size of the infrastructure and its integration in the wider transport network. Punctual interventions may have only a limited cross-country impact, but if they are part of a wider national or transnational corridor their externalities affect a wider context (closure of gaps and accessibility to distant markets; solutions to bottlenecks and reductions in travel time and energy consumption, network continuity, etc.).

Being included in a network with a strategic position and rank, therefore, is the main mechanism fostering transnational spillovers. The spillover capacity, therefore, depends on the effective use of the infrastructure, i.e. the share of long-distance transnational traffic of the infrastructure, which may substantially differ from the expected potential.

These considerations guided the EU policy makers who focused European action on the need to address market failure – to fill persistent gaps, remove bottlenecks and ensure adequate cross-border connections - giving priority to multi-country, cross-border investments to equip the Single Market with the infrastructure it needs. Also, CP ensures a large support to the Trans-European Transport Network (TEN-T) to foster interconnection and interoperability of the European countries. This focus is confirmed also in the recent Commission proposals for the next multiannual financial framework for the 2021-2027 period, which obliges Cohesion Fund to dedicate special resources to TEN-T investments. Investments in TEN-T have a clear European added value and the greatest transnational spillover effects, since a large part of the benefits generated by each national section spreads to other countries along the corridor (Gutierrez et al., 2011). In this case, spillovers are closely related to the network effect. Therefore, removing bottlenecks has the highest value added for the network and the largest spillover potential. Several studies stated the importance of EU wide networks to support the single market, and identified the most relevant bottlenecks (Petersen et al., 2009).

During recent decades, in the European context Central and Eastern European Member States have experienced a substantial change in the transportation facilities due to a dramatic increase in trade with the West (Buckwalter, 2003).

Apart from wide networks and strategic EU level infrastructures, potential spillovers have a narrower scope and, therefore, proximity is their key mechanism. Only accessibility to highly attractive places with large international demand, i.e. top holiday destinations, may be an exception to this rule.

Including externalities in other fields, a large strain of literature focuses on negative externalities fostered by transport activities with special reference to a negative impact on the environment (air pollution and noise, climate change, land use effects, loss of biodiversity, nature & landscape, soil and water pollution, soil consumption) and society (congestion, cost of accidents). These are unintended and somewhat unavoidable effects. Externalities must be included in the evaluation of investment in transport infrastructure to decide if and how to invest (Shiftan et al., 2002); the scope and magnitude of such externalities should also influence the selection of the subjects that should be involved in the

decision-making process. These negative externalities are usually localised, although they potentially contribute to global scale phenomena like greenhouse gas emission, they are not very relevant to this study.

Some positive externalities have been observed. Transport infrastructures generate externalities in the markets where the transportation demand rises (i.e. productive system for freight transport, urban agglomeration and labour market for passenger mobility, etc.). Moreover, many new transport infrastructures are intended to reduce existing negative externalities (Blum, 1998). This is the case, for example, of investments aimed at promoting the shift to rail or inland water transport modes, specifically intended to reduce negative externalities of private road transport (greenhouse gas emissions, congestion, etc.). The balance between negative and positive externalities, therefore, should not be evaluated in abstract terms but in relation to the baseline situation before the intervention.

There is a rooted belief that investments in transport infrastructures generate large positive spillover effects on economic growth, especially in lagging behind regions. Empirical evidence demonstrates that this is not always the case. As synthesized by the OECD, *"Faster transport connections can exploit potential positive externalities that exist in various markets – typically unexhausted economies of scale, scope, agglomeration, density or network – and consequently improve (labour) productivity, enhance output, reduce production costs and promote more efficient use of resources. If such latent economies do not exist, however, improvements in accessibility could lead to changes in existing transport flows and spatial patterns without having long-term effects on growth"* (OECD, 2009). Anyway, when studying the effect of transport infrastructure on regional GDP the evidence shows the existence of significant spillover from neighbouring regions, which can also outweigh the internal capital endowment. The importance of this "imported capital" depends not only on geography but also on the intensity and directions of trade flows. In these terms, richer and more export oriented regions may benefit from investments in less productive regions lying along their export lines (Alvarez-Ayuso et al., 2014).

Specific attention has been reserved to investments in transport infrastructures when studying the impact of CP. In RHOMOLO (Brandsma et al., 2013; Lecca et al., 2018), the dynamic spatial general equilibrium model in use at DG REGIO and JRC, investments in transport are singled out and related gains are found also in regions other than where the investment is made, especially in the long-run, because of the overall improvement in the EU network. In a simulation conducted on Polish investments in transports the short term spillover effects resulted positive for neighbouring regions and countries and negative for more distant and less economically integrated regions and countries, such as Italy, Spain, France, Greece, Portugal and the UK due to a sort of crowding-out effect of these areas; however, after 20 years spillover effects were positive in all European regions and countries (DG Regio & JRC, 2016).

The consequences of investments in infrastructure on polarization and on accessibility can be ambiguous and vary according to the geographical scale. For example, the new high-speed train corridor connecting several Spanish cities to the French network reduces polarization at the European scale but increases polarization at regional level in Spain between directly connected cities and non-connected ones (Martín J. C. et al., 2004).

In any case, also the transnational potential of these externalities is linked with to network effect and to the rank of the infrastructure concerned.

4.1.3. Environment

In general terms, the environment is a facet of life, like economy and society. In this study, it is referred to in a narrower sense as an area of intervention by CP dealing with water and waste water management, adaptation to climate change, enhancement of natural heritage. The objective of many investments in the environment supported by CP is to provide basic services for the quality of life (water and waste water management, waste management) reducing the negative impact on the environment or to help face natural risks, also connected to climate change. In this sense, investments may be read as means to reduce negative externalities (pollution, waste of natural resources, natural hazards, biodiversity loss, etc.) generated by human activities. Given the impossibility of separating economic development from environmental impact, public policies have focused on the mitigation of and the adaptation to negative impacts. In economic literature, negative side effects on the environment have been presented as typical negative externalities of the development process, in the sense that they are not correctly reflected in the price structure of a market economy.

Negative externalities, and benefits associated to environmental investments, happen at very different geographical scales, ranging from local/regional level to global level (greenhouse gas emissions, deforestation, ocean pollution, etc.). The transnational dimension is somewhat less pronounced and is linked to specific geographical contexts (i.e. a large river basin lying across different countries) or closeness to the country border (i.e. polluting industrial plants impacting on neighbouring regions across the border). Therefore, the most common mechanisms triggering transnational spillovers are spatial proximity, special linkages related to geographical boundaries that cross institutional ones and connections within the natural environment.

More recently, the positive link between environmental quality, economic development and quality of life has gained growing attention, i.e. stressing positive externalities of biodiversity and natural heritage on the development of tourism and agriculture. Also, in this case spillovers are mainly localised, and the transnational dimension depends on specific geographical features.

In a broader sense beyond the scope of this study, investments in the “green” sector have become an opportunity to boost new productive sectors and employment (i.e. renewable energy, clean technologies), with spillovers linked to the international trade of green technology, goods and services. A strain of literature has investigated the linkages between globalisation and the natural environment arguing that besides negative impact due to increased transport and trade, globalisation triggered positive cross country spillovers through the transfer and diffusion of environmentally-superior technologies, organizational practices and public policies with positive impacts on the environmental efficiency of developing countries (OECD, 1997; McAusland, 2010). The empirical evidence on these aspects is still controversial and ambiguous, although higher pollution-efficiency in other countries have been found to spillover into improved domestic efficiency mainly due to imports (Perkins & Neumayer, 2009).

4.2. Identifying spillovers

The literature review briefly summarised above delimits the investigation field. This analysis focuses on spillovers triggered by mechanisms strictly related to the nature of the investments considered. In addition, we make an effort to consider the rationale of CP intervention, including both direct and indirect effects. For example, when looking at the investment in higher education we look at transnational spillovers triggered during the education cycle (i.e. students from abroad beneficiaries of CP grants) and beyond (i.e. emigrated graduates which raise productivity abroad).

Finally, transnational spillovers are included irrespectively whether they are part of the intervention logic or not. Except for specific cases (investments in the TEN-T, coordinated investments within a macro-regional strategy, etc.) spillovers are not considered in the intervention logic of CP programmes. Therefore, most of the spillovers detected are unintended consequences, sometimes undesirable effects potentially hampering the achievement of expected results (i.e. the emigration of graduates reduces the impact on increasing participation in higher education).

Summing up, the literature review points to the existence of multiple mechanisms potentially triggering transnational spillovers in our three sectors. Most of them are specific to each sector, while a few are common to all of them:

- in higher education and research, the internationalisation of the activities is accompanied by an increasing likelihood of broadening the spillover potential; the participation in transnational networks, both from the supply and demand side, is a further mechanism promoting spillovers abroad, together with the mobility of people. All these phenomena have gained importance in recent years, also in the framework of the European Higher Education Area and the European Research Area;
- in transport, network connections are of the greatest importance, and the spillover potential is magnified by the rank occupied in the European hierarchy of infrastructures. For lower rank infrastructure a major role is played by spatial proximity, weighted by the intensity of socio-economic relationships across country borders;
- in the environment, physical and geographical linkages are crucial, as well as biological connections and ecological networks. Proximity plays a role as well, especially when the environmental benefit associated with the investment has a limited regional scale.

Table 9 below provides a brief overview of the possible spillover effects of CP investments for each sector, including:

- the outcome associated with CP investments in the sectors (column A);
- the mechanisms that can trigger transnational spillovers, which can be associated with multiple typologies of CP interventions (column B);
- possible examples of transnational spillovers as a guiding grid for the identification of cases to be studied and presented below (column C).

Table 9: Possible sectoral spillovers and their mechanisms of transmission

Outcome (A)	Mechanism (B)	Cross country spillovers examples (C)
HIGHER EDUCATION SECTOR		
Participation in higher education	Internationalisation of activities	<ul style="list-style-type: none"> - International branch campus of a foreign HE institution located in the beneficiary country and receiving support from CP - Foreign students receiving grants from beneficiary country CP to study in domestic HE institutions - Foreign researchers/lecturers employed in domestic HE institution with support from beneficiary country CP - Domestic students receiving grants from beneficiary country CP to study and graduate in a foreign HE institution abroad
	Graduates mobility	<ul style="list-style-type: none"> - Students receiving CP grants in beneficiary country, living and employed abroad after graduation
Qualification of staff in HEIs	Internationalisation of activities	<ul style="list-style-type: none"> - Foreign researchers beneficiaries of fellowships funded by beneficiary country CP and going back to home country - Foreign researchers/lecturers trained in home country and employed in beneficiary country HE institution with the support from beneficiary country CP (negative externality for home country)
Increased R&D and Innovation activities	Hierarchy / Network	<ul style="list-style-type: none"> - Domestic HE institutions in the beneficiary country receiving support from CP for research activities, whose results are shared in a wider network of collaboration at international level (i.e. within H2020 projects) - Creation of EU level research infrastructure, accessible to foreign operators (at subsidised conditions)
	Internationalisation of activities	<ul style="list-style-type: none"> - Domestic HE institutions in the beneficiary country receiving support from CP for R&I facilities opening access to companies and start-ups from abroad (at non-market conditions) - Research collaboration or technology transfer from domestic HE institutions in the beneficiary country in favour of foreign enterprises (at subsidised conditions)
	Inventors mobility	<ul style="list-style-type: none"> - Researchers receiving support for innovation development from CP in beneficiary country being employed abroad because of acquired knowledge
University-industry collaboration in R&D and Innovation	Participation in global value chains	<ul style="list-style-type: none"> - Foreign owned enterprise in the beneficiary country benefitting from R&I collaboration with local HE institution, applying the knowledge acquired in productive plants abroad - Multinational company relocate a research centre in the beneficiary country to benefit from CP support (both direct or indirect through spillover from supported public R&D) reducing well-being in home country (negative externality for home country)

Outcome (A)	Mechanism (B)	Cross country spillovers examples (C)
TRANSPORT SECTOR		
Bottleneck removal	Network	– Building / renovation of a high-speed railway closing a gap in a EU wide corridor
Increased accessibility	Hierarchy / Network	– Creation of a world class airport hub in the beneficiary country with spokes in other EU (neighbouring) countries
	International demand	– New infrastructure to improve accessibility from abroad to a world class heritage or holiday destination (i.e. island)
	Proximity	– Renovation of a sea port in beneficiary country accessible to operators located in neighbour regions in a border country
Agglomeration	Proximity	– Creation of a regional electrified railway network allowing commuters from neighbouring regions across borders to reach the urban area
Economic development	Network	– Upgrade of a highway segment in the beneficiary country as part of a TEN-T corridor, thus reducing transport costs for goods produced in foreign regions upstream to reach final markets downstream
	Hierarchy / Network	– Upgrade of a TEN-T sea port in the beneficiary country crowding out traffic from pre-existing infrastructure in foreign countries (negative externality for foreign country)
ENVIRONMENT SECTOR		
Environmental benefits	Proximity	– Closure of a waste landfill in the beneficiary county and reclamation of the area, reducing natural hazard in the bordering foreign region
	Geographical linkages	– Water management intervention in the beneficiary countries improving water quality in river part of a transnational river basin (positive externality for downstream countries) – Intervention to reduce risk of flooding in the beneficiary country with an uncertain impact on downstream foreign regions
	Network / Biological Connections	– Natural heritage protection measures in the beneficiary country ensuring the continuity of ecological corridors across the borders – Habitat restoration in the beneficiary country favouring migratory species relevant to foreign country biodiversity
Economic development	Geographical linkages	– Upgrade of the sewerage facility in a city of a beneficiary country overlooking an international lake, improving the water quality and touristic attractiveness on the foreign shore

Source: Ismeri Europa elaboration

4.3. An estimation of the potential externalities by sector

Overall, considering the three sectors of activity in the European Union, almost EUR 170 billion were spent by CP through the three structural funds (ERDF, CF, ESF) in the 2007-13 programming period²⁸. Transport and transport infrastructure account for almost one half of the total amount, followed by higher education and research (EUR 47 billion) and environment (EUR 39 billion)²⁹.

In the eight countries covered by this study where the principal spillovers originate (i.e. Hungary, Poland, the Czech Republic, Slovakia, Romania, Lithuania, Slovenia, Spain) EUR 53 billion were spent on the transport sector, EUR 23 billion on the environment and EUR 20 billion on education and research (expenditure categories do not allow for isolation of higher education). Poland is the country with the highest expenditure EUR 35 billion), followed by Spain and Hungary (almost EUR 13 billion each), Romania (EUR 12.5 billion) and the Czech Republic (EUR 11 billion).

The estimation of the transnational spillover of CP interventions in these sectors needs much more detailed information at the project level and very complex calculations and is beyond the aim of this study. Here the available CP categories of expenditure are linked with the identified mechanisms generating the spillovers and, consequently, the categories of expenditure are classified according to the propensity to generate spillovers. The following make classification difficult and complex:

- in principle, within the same category of expenditure different typologies of intervention with a different spillover potential may coexist, as in the case of transport where TEN-T interventions are not distinguished from other national, regional or local infrastructures;
- when looking at the expenditure categories, the concrete linkage between the intervention and the mechanism triggering the spillover cannot be observed and there are no elements to approximate it without looking at individual projects (i.e. an intervention of urban waste water treatment has a high spillover potential only if it helps to improve the quality of the water of a river crossing the national border);
- when it is possible to estimate statistically the linkage between the intervention typology and the spillover potential, no data are available (i.e. there are no systematic data on the share of graduates from each EU region moving abroad for work);
- several triggering mechanisms may operate within the same expenditure category in a cumulative or alternative way (building new research facilities in a university department creates benefits both for students and researchers, and the mechanisms through which these benefits may spillover abroad are different).

Given the above methodological problems, which cannot be solved here, we opt for a simplified classification of expenditure categories in accordance with a four-level scale of the spillover potential : high, medium, low, none.

In order to allow for simple calculations these levels have been translated into a sort of a "spillover triggering percentage" ranging between 0% (no spillover potential) and 100%³⁰ (high degree, attributed to TEN-T projects which have a transnational impact by definition).

²⁸ Elaboration at the level of categories of expenditure based on "ERDF/ESF/CF Priority theme overview 2007-2013" available at http://ec.europa.eu/regional_policy/en/policy/evaluations/data-for-research/

²⁹ See below Table 10 for the list of expenditure categories taken into account.

³⁰ The approach is consistent with similar exercises in other policy fields. See for example the common methodology for tracking and monitoring climate expenditure under the European Structural and Investment Funds (2014-2020) issued by the European Commission (European Union, 2016).

A low level of spillover potential is associated with most categories, considering that there is no evidence of large scale application of the triggering mechanisms identified.

Nevertheless, the analysis of literature confirmed that spatial proximity plays a role in favouring spillovers, also across national borders and even if they still represent a significant obstacle in most EU Member States. For this reason, the percentage of “spillover triggering” resources applying to border regions has been increased, especially in the fields where geographical proximity is more important (the percentage is increased by 5% in higher education, 10% in environment and 15% in transports). In Table 10 this is referred to as ‘contiguity effect’

The focus is on mainstream ERDF-CF programmes under the Investments for growth and jobs objective. The investments under the European Territorial Cooperation objective is illustrated separately given their specific spatial approach. Indeed these programmes, especially cross-border and transnational ones, are aimed to promote the concrete exploitation of transnational externalities by removing obstacles and promoting common actions (European Commission, 2017); the programmes demonstrated a high EU added value as they promote a cross-country policy which is very limited, or completely missing, at national level.

Table 10 below summarises the exercise methodology with reference to the 2007-2013 categories of expenditures falling within our three sectors of activities³¹.

³¹ In the sector of higher education the expenditure categories refer to broader domains (respectively education and training at all levels or research and innovation)

Table 10: Spillover potential earmarking: methodology and assumptions

CP categories of expenditure 2007-13	Main mechanisms generating transnational spillovers ³²	Spillover triggering resources (% on total expenditure)	Spillover triggering resources With contiguity effect (% on total expenditure)
HIGHER EDUCATION AND R&I			
Education infrastructure for tertiary education *	Internationalisation of activities; mobility of Graduate	10%	15%
Research and innovation infrastructure and centre of competence **	Hierarchy / Network; mobility of Inventors	10%	15%
Research and innovation activities in research centres and centres of competence **	Hierarchy / Network; mobility of Inventors	10%	15%
Technology transfer and university-enterprise cooperation	Fragmentation and international ownership in GVCs	10%	15%
Developing human potential in the field of research and innovation, in particular through post-graduate studies	Internationalisation of activities; mobility of Graduates	10%	15%
Measures to increase participation in tertiary and equivalent education *	Internationalisation of activities; mobility of Graduates	10%	15%
TRANSPORT INFRASTRUCTURE			
Railways and mobile rail assets (TEN-T)	Hierarchy / Network	100%	100%
Railways and mobile rail assets (other)	Proximity	0%	15%
Motorways (TEN-T)	Hierarchy / Network	100%	100%
Motorways (other)	Proximity	0%	15%
National roads	Proximity	0%	15%
Regional/local roads	Proximity	0%	15%
Multimodal transport (TEN-T)	Hierarchy / Network	100%	100%
Multimodal transport (other)	Proximity	0%	15%
Airports (TEN-T and other) ***	Hierarchy / Network	50%	65%
Seaports (TEN-T and other) ***	Hierarchy / Network	50%	65%
Inland waterways and ports (TEN-T)	Hierarchy / Network	100%	100%
Inland waterways and ports	Proximity	0%	15%
Urban transport	Proximity	0%	15%
Intelligent transport systems	Proximity	0%	15%
ENVIRONMENTAL INFRASTRUCTURE			
Management of household and industrial waste	Proximity	0%	10%
Management and distribution of water (drinking water)	Geographical linkages	10%	20%
Waste water treatment	Geographical linkages	10%	20%
Air quality measures	Proximity	0%	10%
Integrated pollution prevention and control (IPPC)	-	0%	0%
Mitigation and adaption to climate change	Geographical linkages	10%	20%
Rehabilitation of industrial sites and contaminated land	Proximity	0%	10%
Promotion of biodiversity and nature protection (including Natura 2000)	Network / Biological Connections	10%	20%
Protection and development of natural heritage	Geographical linkages; Proximity	10%	20%
Promotion of natural assets	Geographical linkages; Proximity	10%	20%

* Included in a broader category referring to all levels of education

** Not confined to universities

*** In 2007-13 it is not possible to single out TEN-T interventions (possible in 2014-20 programming period)

Source: Ismeri Europa elaboration on categories of expenditure set out in Commission Implementing Regulation (EU) No 215/2014.

³² To simplify the analysis only positive spillovers were considered here.

For the 2007-13 period we have detailed information about the distribution of expenditure at regional level (NUTS 3 level) which makes it possible to isolate border regions³³ only for ERDF and CF³⁴. Therefore, the coverage of the higher education sector is partial, as the ESF support to the development of human potential in the field of research and innovation is missing.

With all the above-mentioned limitations, Table 11 table below shows the results of the application of the earmarking methodology to all countries.

Table 11: Share of CP expenditure in transport, environment and higher education potentially triggering spillover effects (estimated on ERDF and CF expenditure in the 2007-2013 period, % on total expenditure)

	Total spillover triggering resources without contiguity effect	Contiguity effect due to border regions	Total spillover triggering resources including contiguity effect
	(% on total expenditure)	(% on total expenditure)	(% on total expenditure)
Austria	1.8	0.6	2.4
Belgium	1.9	2.2	4.1
Bulgaria	17.0	2.1	19.1
Croatia	32.5	3.5	36.0
Cyprus	3.4	0.0	3.4
Czech Republic	20.2	4.6	24.8
Denmark	3.8	0.6	4.4
Estonia	19.6	2.3	21.9
Finland	4.5	1.2	5.7
France	27.2	0.6	27.8
Germany	9.3	1.1	10.4
Greece	26.8	1.0	27.8
Hungary	13.7	3.5	17.2
Ireland	3.5	5.1	8.6
Italy	4.8	0.1	4.9
Latvia	18.9	4.2	23.1
Lithuania	21.3	3.2	24.5
Luxembourg	4.8	4.0	8.8
Malta	15.6	0.0	15.6
Netherlands	2.5	1.6	4.1
Poland	23.9	1.4	25.3
Portugal	10.0	1.6	11.6
Romania	25.0	2.5	27.5
Slovenia	10.7	5.3	16.0
Slovakia	24.0	4.3	28.3
Spain	5.1	1.4	6.5
Sweden	3.4	2.0	5.4
United Kingdom	5.7	0.1	5.8
EU28	18.2	1.9	20.1

*contiguity effect is estimated in a country on the basis of the expenditure in transport, environment and higher education of foreign border regions.

Source: Ismeri Europa estimates on the basis of DG Regio data.

At European level the share of total expenditure potentially contributing to transnational spillovers in the three sectors is around 18% of total ERDF-CF expenditure. Considering the effect of proximity in border regions, as described above, the share rises to above 20%. The potential is higher on average in cohesion countries, given the higher share of resources

³³ Border regions are defined as regions participating in the core areas of cross-border cooperation programmes in the programming period 2007-2013, including a few regions that do not share a border but with pronounced cross-border projection. See: http://ec.europa.eu/eurostat/statistics-explained/index.php/Regional_typologies_overview#Border_regions

³⁴ Elaboration at the level of categories of expenditure based on "ERDF/CF RAW DATA 2007-2013" available at http://ec.europa.eu/regional_policy/en/policy/evaluations/data-for-research/ and derived from the Commission Implementing Regulation (EU) No 215/2014.

allocated to transport and basic infrastructures. In absolute terms, the expenditure in the transport sector shows the highest transnational spillover potential accounting for more than EUR 34 billion in EU – of which EUR 26 billion euros in the eight countries - mostly due to investments in TEN-T projects. A lower but significant potential is found also in the environment sector (EUR 2.8 billion) and in the higher education one (EUR 3.2 billion).

These figures are a very rough estimation to highlight that a significant amount of resources spent by CP may generate transnational spillovers, although this is rarely considered adequately in the programming phase.

Moreover, this exercise can tell us nothing about the direction of the spillovers and the country where they are most likely to occur. This is strictly related to mechanisms and concrete contents of the interventions and cannot be observed at this aggregated level.

The next two tables (Table 12 and Table 13) describe the potential spillover effects estimated for the 2007-2013 programming period in greater detail.

Table 12: Potential spillover without contiguity effect in the three examined sectors by country (estimated on ERDF and CF expenditure in the 2007-2013 period, % of total expenditure)

Country	Higher education				Transport			Environment			Total
	Total HE	education infrastructure	investing in higher education	R&D and Innovation	Total Transp.	transport infrastructure	sustainable transport	Total Env.	environmental infrastructure	environmental enhancement	
Austria	1.8	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Belgium	1.7	0.0	0.1	1.6	0.1	0.1	0.0	0.0	0.0	0.0	1.9
Bulgaria	0.3	0.3	0.0	0.0	15.1	15.1	0.0	1.7	1.5	0.2	17.0
Croatia	1.1	0.0	0.0	1.1	29.9	29.9	0.0	1.4	1.4	0.0	32.5
Cyprus	0.8	0.1	0.0	0.6	1.3	1.3	0.0	1.3	1.3	0.0	3.4
Czech Republic	1.1	0.2	0.0	0.9	18.1	18.1	0.0	1.0	0.7	0.3	20.2
Denmark	3.4	0.0	0.0	3.4	0.0	0.0	0.0	0.4	0.0	0.4	3.8
Estonia	2.2	0.9	0.0	1.3	15.7	15.7	0.0	1.7	1.6	0.1	19.6
Finland	2.7	0.1	0.1	2.5	2.1	2.1	0.0	0.3	0.1	0.1	5.1
France	2.1	0.3	0.0	1.8	1.6	1.6	0.0	0.9	0.4	0.5	4.5
Germany	2.1	0.3	0.0	1.8	6.9	6.9	0.0	0.4	0.2	0.1	9.3
Greece	0.5	0.4	0.0	0.0	26.1	26.1	0.0	0.7	0.6	0.1	27.2
Hungary	0.7	0.6	0.0	0.1	12.0	12.0	0.0	1.0	0.9	0.1	13.7
Ireland	3.1	0.0	0.0	3.1	0.0	0.0	0.0	0.4	0.3	0.0	3.5
Italy	1.2	0.2	0.1	0.9	3.2	3.2	0.0	0.4	0.4	0.1	4.8
Latvia	1.2	0.6	0.0	0.5	16.2	16.2	0.0	1.6	1.6	0.0	18.9
Lithuania	1.0	0.5	0.0	0.5	19.1	19.1	0.0	1.3	1.1	0.2	21.3
Luxemburg	4.8	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	4.8
Malta	1.4	0.8	0.0	0.6	13.0	13.0	0.0	1.2	1.2	0.0	15.6
Netherland	2.1	0.0	0.2	1.8	0.1	0.1	0.0	0.3	0.0	0.3	2.5
Poland	0.9	0.3	0.0	0.6	22.2	22.2	0.0	0.7	0.7	0.0	23.9
Portugal	2.4	1.8	0.0	0.6	6.7	6.7	0.0	1.0	0.8	0.2	10.0
Romania	0.6	0.2	0.0	0.4	22.6	22.6	0.0	1.8	1.6	0.2	25.0
Slovenia	1.4	0.1	0.0	1.3	7.5	7.5	0.0	1.8	1.7	0.1	10.7
Slovakia	1.8	1.0	0.0	0.8	21.3	21.3	0.0	0.8	0.7	0.1	24.0
Spain	1.0	0.2	0.0	0.8	24.2	24.2	0.0	1.5	1.2	0.3	26.8
Sweden	1.7	0.0	0.0	1.7	1.5	1.5	0.0	0.1	0.0	0.1	3.4
United Kingdom	1.5	0.1	0.0	1.4	3.8	3.8	0.0	0.3	0.0	0.3	5.7
EU28	1.2	0.4	0.0	0.7	16.1	16.1	0.0	0.9	0.8	0.1	18.2

Source: Iseri Europa estimation on DG Regio and Eurostat data

Table 13: Spillover potential including the additional effect of contiguity in border regions in the three examined sectors by country (% of total expenditure)

Country	Higher Education				Transport			Environment			Total
	Total HE	education infrastructure	investing in higher education	R&D and Innovation	Total Transp.	transport infrastructure	sustainable transport	Total Env.	environmental infrastructure	environmental enhancement	
Austria	2.3	0.0	0.0	2.3	0.0	0.0	0.0	0.1	0.0	0.1	2.4
Belgium	2.4	0.0	0.1	2.3	1.0	1.0	0.0	0.7	0.0	0.7	4.1
Bulgaria	0.4	0.3	0.0	0.0	15.8	15.7	0.1	2.9	2.6	0.4	19.1
Croatia	1.7	0.0	0.0	1.7	30.1	30.1	0.0	4.3	4.2	0.0	36.0
Cyprus	0.8	0.1	0.0	0.6	1.3	1.3	0.0	1.3	1.3	0.0	3.4
Czech Republic	1.6	0.3	0.0	1.3	20.6	20.4	0.2	2.5	1.7	0.8	24.8
Denmark	4.0	0.0	0.0	4.0	0.0	0.0	0.0	0.5	0.0	0.5	4.4
Estonia	2.9	1.2	0.0	1.7	16.1	16.1	0.0	2.8	2.5	0.4	21.9
Finland	3.4	0.2	0.1	3.2	2.6	2.5	0.0	0.5	0.3	0.2	6.5
France	2.4	0.3	0.0	2.0	2.1	1.9	0.2	1.3	0.6	0.7	5.7
Germany	2.3	0.3	0.0	2.0	7.6	7.5	0.0	0.5	0.3	0.2	10.4
Greece	0.5	0.5	0.0	0.0	26.4	26.4	0.0	0.9	0.8	0.1	27.8
Hungary	1.0	0.9	0.0	0.1	14.1	13.8	0.3	2.2	1.8	0.4	17.2
Ireland	3.7	0.0	0.0	3.7	4.2	4.2	0.0	0.8	0.7	0.1	8.6
Italy	1.2	0.2	0.1	0.9	3.3	3.3	0.0	0.5	0.4	0.1	4.9
Latvia	1.4	0.8	0.0	0.6	18.3	18.1	0.2	3.3	3.2	0.1	23.1
Lithuania	1.3	0.7	0.0	0.7	20.6	20.2	0.3	2.6	2.2	0.4	24.5
Luxemburg	7.2	0.0	0.0	7.2	0.0	0.0	0.0	1.6	0.0	1.6	8.8
Malta	1.4	0.8	0.0	0.6	13.0	13.0	0.0	1.2	1.2	0.0	15.6
Netherland	2.7	0.0	0.3	2.4	0.8	0.6	0.2	0.6	0.0	0.6	4.1
Poland	1.0	0.3	0.0	0.7	23.3	23.2	0.1	1.1	1.0	0.1	25.3
Portugal	2.9	2.2	0.0	0.7	7.1	7.0	0.1	1.5	1.2	0.3	11.6
Romania	0.7	0.3	0.0	0.4	23.9	23.8	0.1	2.9	2.6	0.3	27.5
Slovenia	2.1	0.2	0.0	1.9	10.0	10.0	0.0	3.9	3.6	0.3	16.0
Slovakia	2.8	1.5	0.0	1.2	23.4	23.2	0.2	2.2	1.9	0.3	28.3
Spain	1.1	0.2	0.0	0.9	24.7	24.6	0.1	2.0	1.6	0.4	27.8
Sweden	2.3	0.0	0.0	2.3	2.9	2.9	0.0	0.2	0.0	0.2	5.4
Unite Kingdom	1.5	0.1	0.0	1.4	3.9	3.9	0.0	0.3	0.0	0.3	5.8
EU28	1.4	0.5	0.0	0.9	17.2	17.0	0.1	1.6	1.3	0.3	20.1

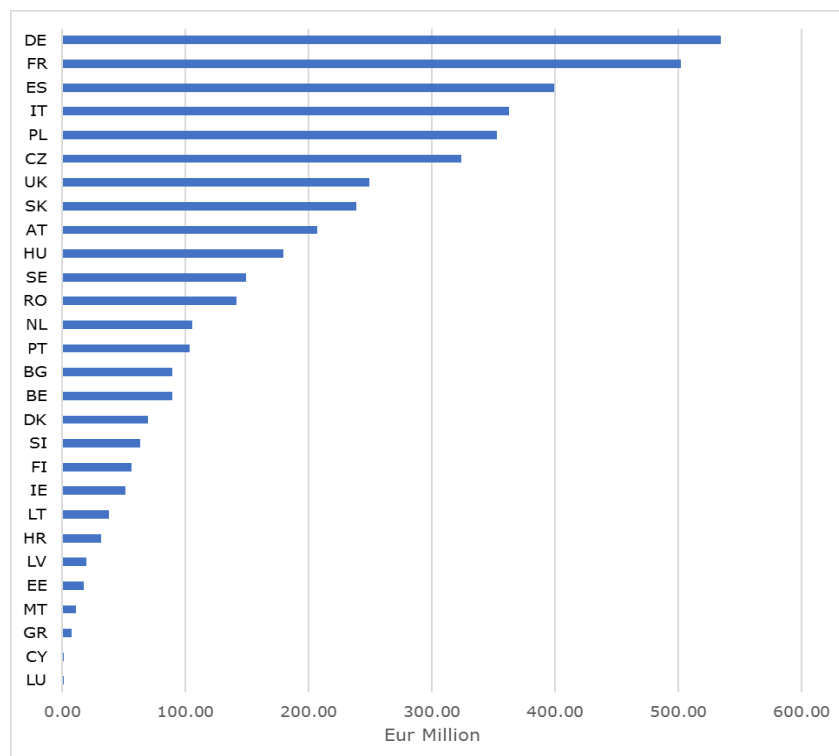
Source: Ismeri Europa estimation on DG Regio and Eurostat data

4.4. The role of European Territorial Cooperation

Within the different CP initiatives, European Territorial Cooperation (ETC) funded by ERDF is directly aimed at promoting cross-country interventions and effects, and within ETC cross-border cooperation is the main strand in financial terms. Previous analyses did not consider ETC interventions because they are to directly promote cooperation between countries and they consider cross-country spillovers not as an indirect effect but as an intended goal. However, these programmes have to be included among those CP initiatives that generate cross-country effects. In addition, cross-border programmes, by their nature, address issues and opportunities generated by the territorial proximity of the cross-border regions and in fact devote a significant amount of resources to transport and environment policy areas; this can produce spillovers beyond the boundaries of the funded regions. ETC can also exploit and magnify the transnational spillover of regional / national investment supported by “mainstream” programmes (i.e. creating cooperation schemes, opening access to facilities, promoting mobility, etc.).

Figure 14 shows the EU resources allocated to cross border cooperation programmes by country in the 2007-2013 period. The cross-border cooperation programmes do not provide direct information on the national allocation of resources, they have been estimated according to the results of a recent study carried out for DG Regio (Wiiw and Ismeri, 2015)³⁵.

Figure 14: Cross-border programmes in the 2007-2013 period: estimation of ERDF expenditure by country (only EU resources, Eur million)



Source: Ismeri Europa elaboration on DG Regio data and (Ismeri, wiiw, 2015)

³⁵ The study provides estimations of the regional, and consequently national, allocations of expenditure in the 2007-2013 cross-border cooperation programmes during the 2007-2014 period, with only year to go before the end of the programmes. In 2018, when the study was carried out in 2018 after the programmes had been concluded but official data on their final expenditure was still not available on the DG Regio website; hence, the present estimations consider the total EU planned resources – under the hypothesis that they have all been spent – and redistribute them by country according to the previous 2007-2014 estimations. The possible error is limited because in 2014 the programmes were significantly advanced and their absorption was generally close to the planned value.

Large countries with extended borders received the highest amount of resources (Poland, Italy, Spain, France and Germany received between Eur 350 and 530 million), while smaller countries were allocated limited resources. However, medium or small EU countries bordering on numerous other countries, such as Austria, Slovakia, the Czech Republic and Hungary, received a significant amount of resources in relation to their overall size.

On EU average 54% of resources are devoted to the three policy areas previously examined (RTDI and higher education³⁶, environment, transport) and able to trigger important spillover effects by proximity and networking mechanism (Table 14). This sectoral attitude confirms that cross-border cooperation programmes can develop significant territorial cooperation and spillover effects outside the programme areas. This potential is particularly evident in Bulgaria (73% of resources in the three mentioned sectors), Croatia (60%), Cyprus (70%), Hungary (60%), Malta (84%), Netherlands (65%), Portugal (76%) and Romania (83%).

Table 14: Allocation of resources to the Cross-border cooperation programmes in the 2007-2013 period by country and large policy areas (EU resources, % values).

	RTDI and education	Environment	Transport	Tourism, Culture and urban policies	Others policy areas	Capacity building and technical assistance	TOTAL
Austria	14.0	18.3	15.9	17.2	26.6	7.9	100.0
Belgium	27.9	14.0	7.0	19.0	29.2	2.9	100.0
Bulgaria	2.3	25.8	44.5	8.9	15.4	3.0	100.0
Croatia	10.2	39.4	10.8	23.1	16.5	0.0	100.0
Cyprus	10.0	31.9	28.0	16.1	11.4	2.6	100.0
Czech Republic	5.0	19.4	26.4	25.9	15.4	7.9	100.0
Denmark	37.4	12.7	1.6	16.1	28.3	3.9	100.0
Estonia	14.9	27.9	1.9	15.9	33.3	6.0	100.0
Finland	19.3	26.7	2.6	14.4	30.7	6.3	100.0
France	23.0	21.9	8.6	25.0	14.3	7.2	100.0
Germany	18.6	16.8	16.9	17.9	21.7	8.2	100.0
Greece	5.4	25.4	21.9	12.3	27.9	7.0	100.0
Hungary	17.8	21.9	21.1	18.0	19.5	1.8	100.0
Ireland	29.2	23.1	2.7	29.6	9.2	6.1	100.0
Italy	19.4	28.5	9.8	23.4	15.8	3.1	100.0
Latvia	11.9	20.9	5.4	19.2	33.7	9.0	100.0
Lithuania	13.6	12.3	6.1	33.0	34.0	1.1	100.0
Luxembourg	9.8	25.3	6.5	17.4	23.9	17.0	100.0
Malta	17.3	62.3	4.5	5.9	6.5	3.5	100.0
Netherlands	39.8	17.6	7.8	12.1	21.0	1.6	100.0
Poland	5.4	14.4	29.3	23.1	24.1	3.6	100.0
Portugal	58.8	13.2	4.0	9.7	7.5	6.9	100.0
Romania	6.2	42.4	34.5	4.2	10.8	1.9	100.0
Slovakia	11.5	16.6	27.2	23.5	17.5	3.6	100.0
Slovenia	12.8	31.5	5.8	29.1	16.6	4.3	100.0
Spain	26.3	18.5	7.0	20.2	23.2	4.8	100.0
Sweden	27.8	17.9	4.4	16.8	27.1	5.9	100.0
United Kingdom	24.7	15.5	6.0	12.5	31.5	9.7	100.0
EU 28	18.9	20.3	15.2	19.7	20.4	5.5	100.0

Source: Iseri Europa elaboration on DG Regio data and (Iseri, wiiw, 2015)

Also tourism, culture and urban policies, which have an important strategic territorial dimension and need for cross-border planning and networking, received a relatively important amount of resources (19.7% on EU average) in the 2007-2013 Interreg

³⁶ For the sake of simplicity and because they are relatively limited, all education and training interventions in this analysis have been aggregated with the higher education ones.

programmes. Finally the share of resources for capacity building and technical assistance (5.5% on EU average) highlights that changes in the administrative routine are necessary to support cross-country cooperation.

In conclusion, ETC programmes cannot be assimilated to national or regional CP programmes in the analysis of spillovers, because of their specific cross-country objectives. However, the significant amount of resources allocated to these programmes and their vocation to develop proximity and networking effects make them remarkable “spillovers triggering interventions”.

4.5. Selection and presentation of relevant cases

To show the concrete functioning of transnational spillover mechanisms in the three sectors considered associated to CP investments (both ERDF, CF and ESF interventions), ten cases have been identified and described in individual project fiches (in annex).

The cases of potential interest have been identified on the basis of the literature review and selected taking into account the balance between policy sectors and countries as summarised below in Table 15.

Table 15: Overview of case studies by country and policy sector

Country	Higher education	Transport	Environment
Bulgaria		Trakia Motorway - CF	
Croatia			<ul style="list-style-type: none"> – Osijek water infrastructure improvement project - ERDF – County waste management centre, Kaštijun - ERDF
Czech Republic	ELI (Extreme Line Infrastructure) Beamlines – ERDF		
Greece		New Patras port - CF	
Hungary	Improving the quality of higher education through centres of excellence in strategic areas at the University of Miskolc – ESF		
Lithuania		Port of Klaipeda leader of an Easter Baltic coast - CF	
Poland		Modernisation of the 59 railway line – CF	
Slovakia			TEKO II (Boiler denitrification and flue gas desulfurization) - ERDF
Spain	PIRTU - Personal Investigador de Reciente Titulación Universitaria – (Personal Researcher of Recent University Degree) – ESF		

Source: Ismeri Europa

In the higher education sector the **ELI (Extreme Line Infrastructure) Beamlines project** - consisting in the creation of an advanced research facility for fundamental and applied research which uses ultra-intense laser and particle beams - shows how benefits spread over the country improving overall EU research capacity. The mechanisms favouring the spreading of benefits are associated with the internalisation of activities (the use of the research infrastructure is open to the EU and world research community) and the strengthening of networks that raises critical mass.

Also in addition to the restricted number of identified European strategic research infrastructures (ERSI), investment in university facilities triggers transnational spillovers, as showed in the case of the centres of excellence in strategic research area at the **University of Miskolc in Hungary**. The project stimulated the setting up of research groups in order

to reach the necessary critical mass in R&D&I activities, strengthening their standing in the international research community. Research collaboration networks and mobility of people (researchers, lectures, PhD students) helped to spread the externalities beyond the national border.

Finally, the **PIRTU (Research Personnel of Recent University Degree)** project supported by ESF in Castilla y Leon (Spain) shows how people mobility can shape the return of investment in human capital within Europe. Although aimed at sustaining the research potential of universities and research organisation in the region, the project created externalities both in the home country of the selected early career researchers and even more so in the countries researcher were employed in after the project duration.

In the field of transport, the **Modernisation of the 59 railway line in Poland** (section Wroclaw-Poznan and Czempin-Poznan) is a typical example of transnational spillover triggered by the network mechanism. Indeed, the railway line is part of a TEN-T corridor which connects Scandinavian cities, such as Malmö and Ystad, with the Balkans, via Vienna, Prague and Budapest. Increasing speed and capacity for passenger and freight traffic, reduces long distance transport costs among the connected countries. With a similar mechanism, the project generates transnational spillovers removing a bottleneck in the TENT-T Corridor VIII between Albania and Macedonia to the Bulgarian ports on the Black Sea. The investment helps to increase travel speed, thus reducing travel time, and prepares the expected increase in passengers and freight demand, providing harmonised travelling conditions and improved services for users.

The positive spillovers of investment in transport infrastructure are not limited to countries involved, as demonstrated by the **upgrade of Klaipeda seaport facilities**. The increased cargo capacity of the port is beneficial for international trade of neighbouring countries (Baltic countries, Russia, Belarus, Ukraine etc.) but also for their counterparts in Western Europe and Scandinavian countries. The network mechanism is magnified by the rank position that the infrastructure occupies in the EU hierarchy, as emerges from the comparison of the upgrading of Klaipeda port with the intervention in the **port of Patras in Greece**.

In the environment sector, the **Osijek water infrastructure** improvement project clearly shows how investments primary devoted to providing basic services for the quality of life reducing the environmental impact of urban agglomeration, generates externalities on a wider scale. Here the spillover mechanism is associated with geographical settlements that often cross the administrative borders within the European Union. The Osijek project indeed contributes to the improvement of water quality in the river Drava, which in part forms the border between Croatia and Hungary and flows into the Danube about 25 km downstream from Osijek.

Still in Croatia **the Kaštijun Waste Management Centre** near Pula in Istria, helps to the reduce greenhouse gas emissions, thanks to a decrease in methane and carbon dioxide emissions. Through proximity mechanisms air pollution decreases in Italy and Slovenia and the cleaner environment can lead to a more attractive tourism sector in all the surrounding area.

In other cases the key mechanism behind transnational spillovers is spatial proximity. One example is the **TEKO II project** aimed at improving air quality and reducing PM10 dust particles in Košice (Slovakia). Positive externalities spread to a wider regional area including the Hungarian bordering regions just 20 km far from Košice.

Summing up, the project fiches provide diversified examples of transnational externalities triggered by CP in their concrete realisation in the field.

5. SYNTHESIS OF THE FINDINGS AND CONCLUSIONS

KEY FINDINGS

- **Spillover effects are an important component of the CP impacts;** they involve around 15-20% of the resources spent.
- **Spillover effects involve all MSs and to a significant extent also non-EU countries,** but their main direction goes from cohesion countries, which implement the large bulk of the CP expenditure, to non-cohesion countries which are the main exporters and have competitive multi-national companies.
- In the period analysed **spillovers benefited more Germany and the United Kingdom and originated principally from Poland, Hungary, the Czech Republic and Spain.**
- **Spillover effects are integrated in CP and cannot be separated from it,** consequently it has little sense to compare spillovers to the contribution to the EU budget, which follows solidarity principles. **However, spillovers demonstrated that the returns of CP are significant also for net contributors to the EU budget.**
- **Spillover effects are the results of increasing EU economic integration** and are part of the convergence process triggered by CP. In this sense, they have to be improved and addressed to support convergence and not considered as a loss. The Commission proposals of 2021-2027 Regulations include some positive propositions in this direction, but it is possible to introduce more specific indications on spillovers.
- **The development of virtuous process and spillover mechanisms,** such as reinforcement of the tradable sectors in the weakest regions, international networking and mobility in research and higher education, transnational planning of key transport and environment infrastructures, can develop effective spillover effects.
- **The improvement of the knowledge of the spillover effects is possible and not expensive.** It mainly requires the coordination and the provision of some macroeconomic studies at EU level and the inclusion of the nationality of the beneficiaries in the CP monitoring systems; what's more this information has usually already been collected for administrative aims. The Commission proposals of 2021-2027 regulations do not include propositions on this and some specific requirements should be included in the future regulations.

5.1. General considerations

The findings of the study underline the importance and the notable size of the spillover effects which result from CP investments³⁷. Different dimensions (macroeconomic, microeconomic and sectoral) of the spillovers have been explored providing estimations of their magnitude and confirming in all the cases their significant scale.

Spillover effects are part of the normal interactions between open economies in an open market and for this reason spillovers cannot be untangled from the output of CP. Consequently, spillovers of CP affect all the MSs and also non-EU countries to a different extent. **The sensitivity of a country to the spillover effects, both as origin and as destination, depends on:**

³⁷ Spillover or externalities refer to the effects which occur in countries different from the one where the CP resources are spent.

- **the degree of openness and competitiveness** of its economy and, in this case, of the economic sectors funded by CP;
- **its participation in physical networks**, such as transport or energy networks, **or in collaboration networks** such as research networks;
- **the propensity of its citizens to move** to a different country;
- **its geo-political position** and the extension of its borders.

The complexity of the economic mechanisms behind the externalities make it impossible to use one econometric model or technique to investigate the different dimensions of spillovers. In addition, the different analytical approaches are often constrained by the lack of adequate information in CP monitoring or official statistics. Macro-economic models assess the overall spillover effects in the short- and long-term. Micro-economic analyses enable us to identify spillover effects at a company level (foreign companies receiving CP resources). Sectoral analyses conversely allow for a more in-depth investigation of the mechanisms triggering spillovers and their potential extensions, but cannot produce accurate predictions. Nevertheless, these different approaches when considered together offer a complete, and almost exhaustive, picture of the extension and influence of these externalities.

The analytical and informative limitations require caution in the interpretation of the results to avoid superficial conclusions. The different financial estimations of spillovers produced in the study cannot be simply added up. For instance, microeconomic estimations are already included in macroeconomic estimations provided by the QUEST III econometric model. Differently, estimations of the microeconomic spillovers can be associated with effects estimated with WIOD model, which does not consider microeconomic changes.

With these preliminary remarks in mind, a review of the main findings and their policy implications is provided.

5.2. Direct effects and externalities of Cohesion Policy

The analysis carried out with macroeconomic models offers an overview of the direct effects of CP and the related spillover effects. In general, during the 2007-2013 period, **for every CP Euro spent in the cohesion countries, 9 cents (9% of the total) flowed into non-cohesion countries as imports. And, other 8 cents flowed into non-EU countries in large part as imports of raw material. In total, 17 cents out of 1 Euro went to countries different from the direct beneficiary countries where cohesion resources were spent.**

In the richer non-cohesion countries direct effects of CP are on average 0.02% of GDP and spillover effects are smaller (less than 0.01% of GDP). In the short-term spillovers may be negative in some of these countries (around -0.02% of GDP), as a result of the extra taxes needed for contributing to the EU budget and financing the CP.

In the long-run (2023) the same analysis shows slightly stronger direct effects (around 0.1% of GDP) and positive spillover effects for all non-cohesion countries. **In the long-run spillovers contribute around a third to the total direct effects of non-cohesion countries.** It is remarkable that in some non-cohesion countries, spillover effects derived, from the expenditure in cohesion countries, are sometimes higher than the direct effects of their own CP expenditure.

Consequently, spillovers spread the increase in demand promoted by CP expenditure and turn part of this demand towards the economies trading with the spending country. This process involves all EU countries, but it is stronger in the cohesion countries, the most

important CP spending countries, and in the most competitive exporters of non-cohesion countries.

In fact, the same analysis for the cohesion countries shows high direct effects of CP expenditure both in the short term (between 1% and 2% of GDP) and in the long term (between 1.5% and 4% of GDP), **while benefits from spillover effects are rather negligible for these countries.**

The analysis highlights the importance of spillover effects from cohesion countries to non-cohesion countries, but it also identifies the capacity of some cohesion countries, in particular Spain and Poland, to capture a part of these spillovers.

These findings confirm that spillovers are an important component of the final impact of CP. They have a relatively higher impact in non-cohesion countries and are prevalently, but not exclusively, generated by cohesion countries. However, spillover effects do not hinder the economic convergence objective pursued by CP and in terms of economic growth its overall effects continue to benefit mainly cohesion countries.

5.3. Economic benefits produced by the externalities

The macroeconomic analysis carried out on demand and trade spillover effects shows high benefits for Germany (Eur +800 million) and significant benefits for other non-cohesion countries (Italy and France +270, Netherland +210 and United Kingdom +190). The benefits for cohesion countries are more limited because they are less equipped to exploit the increased demand for imports. Looking at Non-EU countries, they absorb macroeconomic spillovers totalling close to 2.5 bn Eur (46% of total spillovers).

The microeconomic analysis provides additional findings about the benefits stemming from the spillover effects. This analysis focused on the spillover effects deriving from the funding of foreign companies. Two countries, Poland and the Czech Republic, were chosen as case studies. **The participation of foreign (or foreign owned) beneficiaries in the implementation of 2007-2013 CP investments was significant both in Poland and the Czech Republic.** This participation continues to be significant in the current programming period, but these results are necessarily provisional. Non-EU enterprises play also a significant role in exploiting investment opportunities; in Poland during the 2007-2013 period the non-EU controlled companies collected more CP resources than EU controlled companies (especially the USA companies).

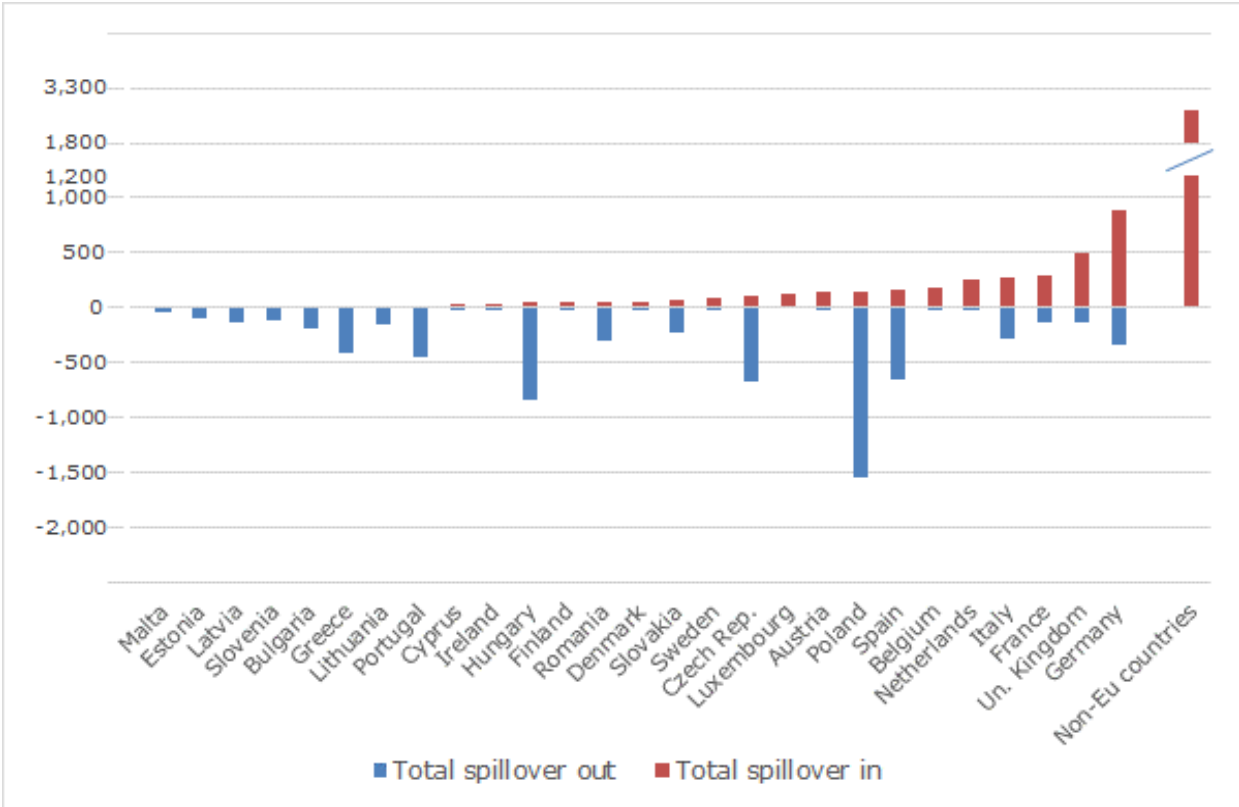
The EU countries which benefited more from microeconomic spillovers are the UK, Luxemburg, Belgium, Germany and France. The estimated quota on total CP expenditure of resources allocated to foreign (or foreign owned) companies was equal to 10% in Poland and 5% in the Czech Republic. The financial benefits for the foreign enterprises (or spillovers) was equal to 6% of total the resources in Poland and 3% in the Czech Republic³⁸.

On the basis of the above mentioned demand side macroeconomic spillovers and supply side microeconomic spillovers, it is possible to estimate the overall externalities (see Table 16). The production and the absorption of the spillover effects by country is summarised in Figure 15. As mentioned before, **Non-EU countries are the main beneficiaries, followed by Germany** - the principal producer of spillovers among the non-cohesion countries - and the United Kingdom. Poland in turn produces the highest amount of spillovers among the cohesion countries followed by Spain and the Czech Republic.

³⁸ The benefits for foreign companies are calculated only on their value added and do not include the costs for intermediate goods, services and part of the employees employed by foreign companies during the implementation of CP projects because these costs do not represent an advantage or a return for these companies.

In absolute terms the EU countries which benefited most from spillovers (net spillovers) are Germany, the United Kingdom, the Netherlands, France, Belgium, Luxemburg, Italy and Austria. **While the cohesion countries which contributed to the highest spillovers were Poland, Hungary, the Czech Republic, Portugal, Spain and Greece**³⁹. Figure 16 below presents this data excluding Non-EU spillover beneficiaries, (Eur 3.2 bn).

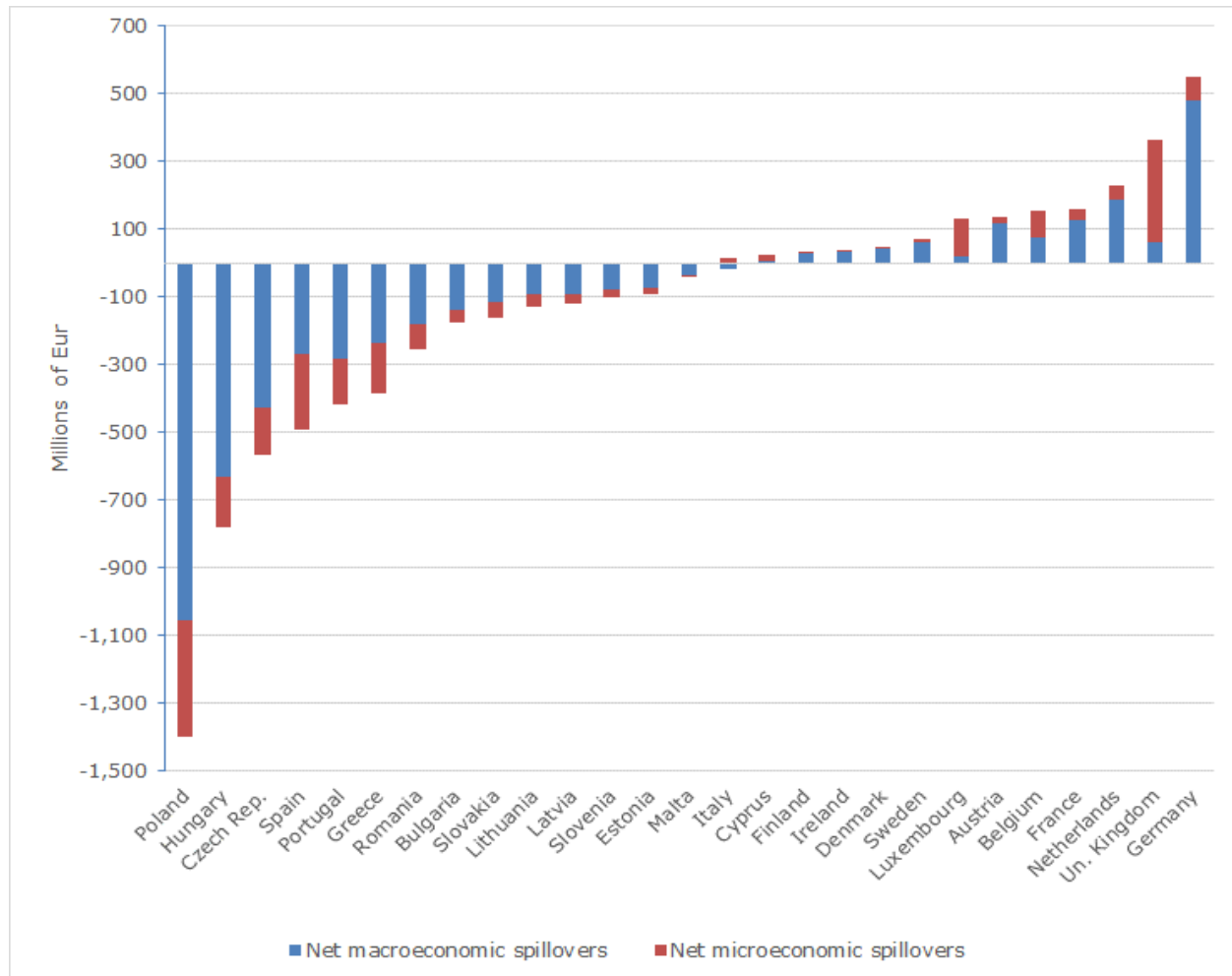
Figure 15: Total spillovers in and out by country (millions of EUR, calculations on annual average expenditure data of ERDF and CF in the 2007-2014 period)



Note: for methodological details see Table 16.
 Source: Ismeri Europa and wiiw estimations

³⁹ Croatia is excluded from these estimations because it was a new MS in 2007-2013 period and was not included in the DG Regio simulations of the Quest III model.

Figure 16: Total net macroeconomic and microeconomic spillovers by country (millions of EUR, annual average expenditure data of ERDF and CF in the 2007-2014 period)

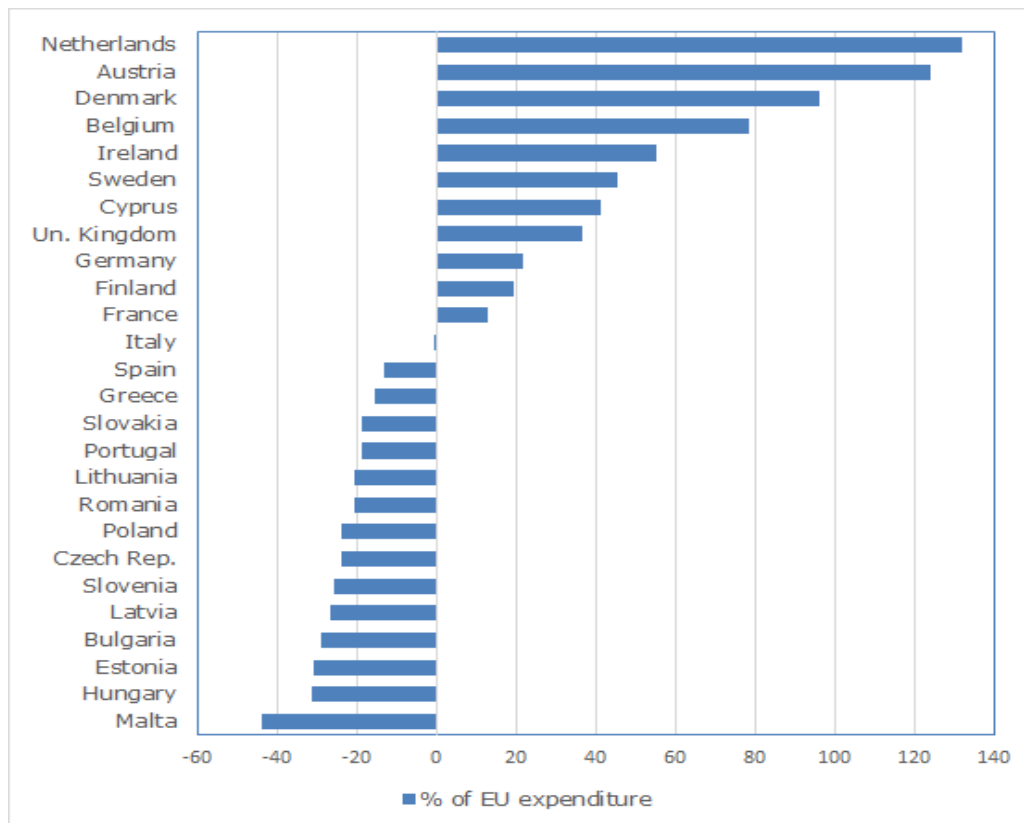


Note: for methodological details see Table 16. Benefits for Non-EU countries (3.2 bn.) not included because out of scale.

Source: Ismeri Europa and wiiw estimations

Luxemburg collects spillovers equal to 37 times its annual CP expenditure and Austria and the Netherlands spillovers superior to their annual CP expenditure (see Figure 17). The cohesion countries produce the most of the spillovers; among these countries, the spillovers towards other EU and Non-EU countries range from 13% of the CP expenditure in Spain and 44% in Malta.

Figure 17: Total net spillovers in percentage of the EU expenditure in CP by country⁽¹⁾ (% , calculations on annual average expenditure data of ERDF and CF in the 2007-2014 period)



(1) Luxembourg is not included because out of scale with a % equal to 3,669. Non-EU countries are not included because do not produce any CP expenditure.

Note: for methodological details see Table 16

Source: Ismeri Europa and wiiw estimations

It is should be noted that the estimations of the spillover effects do not differ greatly from those previously calculated with the support of the QUEST III model. Even if the two sets of results are not directly comparable because they are based on different methodologies, this confirms the order of magnitude of the spillovers and their territorial distribution. In addition, the similarity of the two results reinforce their validity.

The magnitude of EU spillover effects proposed here is inferior to that of other recent estimations (Bartkiewicz P. et al., 2016); as explained before in the study this difference depends on duplications in the calculation at macroeconomic level of that study and different methodological assumptions at microeconomic level. **Notwithstanding these differences in the estimated effects, the present study and the previous research agree upon the important role of externalities in CP functioning and the need to pay them full attention in the policy debate.**

Table 16: Summary of macro and microeconomic spillover by country of origin and destination. Calculations on annual average expenditure data of ERDF and CP (2007-2014)

	Macroeconomic spillovers ^(a)					Microeconomic spillovers			Total Spillovers	
	Total CP expenditure	Expenditure in the country	Spillovers out	Spillovers in	Net macro spillover	Micro-economic spillovers – out ^(b)	Micro-economic spillovers – in ^(c)	Net micro spillover	Total net spillovers	Total spillovers on CP expenditure
	(A)	(B)	(C)	(D)	(E=D-C)	(F)	(G)	(H=G-F)	(I = E+H)	(J=I/A)
	Meur	Meur	Meur	Meur	Meur	Meur	Meur	Meur	Meur	%
Austria	108.5	94.3	14.2	129.2	114.9	0.0	20.0	20.0	134.9	124.3
Belgium	196.0	166.2	29.8	105.2	75.4	0.0	78.4	78.4	153.7	78.4
Bulgaria	605.1	447.4	157.7	17.7	-140.0	36.3	0.0	-36.3	-176.3	-29.1
Cyprus	53.1	50.6	2.5	8.4	5.9	3.2	19.2	16.0	21.9	41.3
Czech Rep.	2 380.7	1 850.9	529.8	103.8	-426.0	142.8	2.5	-140.3	-566.3	-23.8
Germany	2 533.3	2 202.9	330.4	807.4	477.0	0.0	73.1	73.1	550.1	21.7
Denmark	49.4	43.2	6.2	50.7	44.5	0.0	2.9	2.9	47.4	96.0
Estonia	306.8	220.6	86.2	10.4	-75.8	18.4	0.0	-18.4	-94.2	-30.7
Greece	2 512.1	2 258.0	254.1	19.3	-234.8	150.7	0.0	-150.7	-385.5	-15.3
Spain	3 744.7	3 316.1	428.6	161.2	-267.4	224.7	1.6	-223.1	-490.5	-13.1
Finland	159.3	141.3	18.0	44.6	26.6	0.0	4.5	4.5	31.1	19.5
France	1 234.4	1 096.0	138.4	266.5	128.1	0.0	31.3	31.3	159.4	12.9
Hungary	2 503.7	1 824.1	679.5	47.9	-631.6	150.2	0.0	-150.2	-781.8	-31.2
Ireland	69.1	65.5	3.5	38.1	34.6	0.0	3.4	3.4	38.0	55.0
Italy	2 595.4	2 311.6	283.8	265.5	-18.3	0.0	13.4	13.4	-4.9	-0.2
Lithuania	630.6	519.4	111.2	20.5	-90.7	37.8	0.0	-37.8	-128.5	-20.4
Luxembourg	3.6	3.6	0.0	17.7	17.7	0.0	113.5	113.5	131.2	3 668.6
Latvia	449.1	344.7	104.4	11.8	-92.6	26.9	0.0	-26.9	-119.5	-26.6
Malta	94.4	55.9	38.5	2.6	-36.0	5.7	0.1	-5.6	-41.6	-44.1
Netherlands	174.9	151.3	23.6	210.0	186.4	0.0	44.2	44.2	230.5	131.8
Poland	5 917.2	4 721.0	1 196.2	139.4	-1 056.8	355.0	14.9	-340.1	-1 396.9	-23.6
Portugal	2 236.1	1 929.6	306.5	24.9	-281.5	134.2	0.0	-134.2	-415.7	-18.6
Romania	1 238.5	1 006.7	231.8	49.4	-182.4	74.3	0.0	-74.3	-256.7	-20.7
Sweden	152.3	136.0	16.3	79.4	63.1	0.0	6.1	6.1	69.2	45.4
Slovenia	394.0	300.2	93.9	16.2	-77.6	23.6	0.0	-23.6	-101.3	-25.7
Slovakia	867.8	693.3	174.6	58.9	-115.6	52.1	7.1	-45.0	-160.6	-18.5
Un. Kingdom	981.6	852.7	128.8	190.5	61.7	0.0	299.6	299.6	361.3	36.8
<i>Non-Eu countries</i>				2 491.3	2 491.3		700.5	700.5	3 191.9	0.0
TOTAL	32 191.6	26 803.0	5 388.5	5 388.5	0.0	1 436.0	1 436.0	0.0		

Note: (a) calculations with WIOD model; (b) calculated as 6% of the expenditure of the Cohesion countries, the parameter is derived from the estimation of the microeconomic benefits in Poland; (c) calculated on the basis of the distribution of CP expenditure allocated to foreign companies (when the origin country was known) in Poland and the Czech Republic. In the table Croatia is excluded as it was not part of mainstream CP programmes in the period 2007-2013 and CP effects were not estimated in QUEST III model simulations of DG REGIO.

Source: Ismeri Europa and wiiw estimations

5.4. Impact of externalities on the cost of the Cohesion Policy

The previous findings demonstrated that spillovers are an important component of CP effects. It is reasonable to assume that the significant amount of spillovers from cohesion to non-cohesion countries results in a **substantial impact of CP on the growth of the entire EU**, even if its most positive effects are concentrated in the cohesion countries.

In addition, macro and micro **spillovers indicate that CP plays an important role in increasing the integration of the common market**, in strengthening the interactions between firms and in promoting the specialization of the different countries. As well as, the increasing economic integration strengthens and extends spillover effects. These mutual effects increase the overall productivity of the EU and balance the possible competitive disadvantages produced in some countries by the major growth of other countries where CP investments are more substantial. However, the exploitation of these positive inputs depends on the broader ability of each MS to adapt its economy to innovation and international growth and it cannot be expected of CP only.

In this context and especially in cohesion countries, spillovers are not only an indirect, or unintended, outcome of CP but are rather **one of its implicit objectives**; for instance, the attraction of foreign investments is pursued in many OPs to increase the productive capacity, technological innovation and the competences of the host country⁴⁰. Similarly, the increase in imports is a way to reinforce and update capital endowment.

In view of these considerations, a detailed comparison of the estimated spillover benefits with the net CP contribution in the different countries is not appropriate. It is clear that non-cohesion countries, which are the net contributors to the EU budget and CP, have a return from macroeconomic and microeconomic spillover effects and this element has to be considered in the definition of the CP budget. At the same time, cohesion countries cannot benefit from CP without producing spillovers effects. **Spillovers are incorporated in CP and cannot be reduced to a "do ut des" bargaining**; on the contrary, they should be encouraged to reinforce EU economic integration and stimulate competitiveness.

Last but not least, **just under half of the total spillover flows from all the EU countries towards Non-EU countries**. This flow reduces net spillovers for all the EU countries, and in particular mitigates the advantages for non-cohesion countries, which now import also from Non-EU countries, as well as it increases the negative net position of cohesion countries. This element introduces a 'third part' in the controversy and limits the strength of the argument about spillovers when debating the CP budget among EU countries.

5.5. Conclusions

Around 15-20% of ERDF and CF expenditure, either directly or indirectly produces cross-border effects. The proposed estimations indicate that spillover effects represent more than 15% of the annual expenditure. The sectoral analysis suggests that more than 20% of ERDF and CF expenditure related to transport, environment and higher education can trigger spillovers effects. In addition, in the current period almost 5% of ERDF is allocated to territorial cooperation programmes, which by their very nature aim at promoting cross-border effects between MSs.

These results corroborate the conclusion that CP is not limited to the actual region where funding is spent. CP is also a powerful tool to support EU economic growth and integration. This is not a new phenomenon and has been present in the economic literature for a long time, however, it has been rarely debated. The debate on CP externalities is politically sensitive because it encourages the screening of pros and cons of CP expenditure

⁴⁰ See KPMG and Prognos (2016).

in each Member State. The analysis demonstrated that this “cost-benefit” vision is an undeniable dimension of spillover effects but that vision is too restricted and it does not allow a full understanding of the broader impulse they produce on the development and the competitiveness of all the MSs.

In the debate on the future CP these lessons should be put into practice. This means that spillovers could support the overall effects of CP, which, as demonstrated, are not limited to the net receiver countries. However, spillovers should not be used as a mere accountability tool of the contribution to the EU budget but rather they should be interpreted as a means for reinforcing and extending CP. The possibility of extending CP effects beyond the administrative borders of a country or a region should be better addressed. For instance, networking mechanisms may be encouraged and directly supported, as is already happening in the ERANET initiatives in research policy. Transnational planning in environment and transport infrastructures should become a priority when proximity or networking advantages are evident; this already works for TEN-T but could be extended to other interventions.

In this context, spillovers are not unintended or unexpected effects and can be promoted and governed. The strategy of sectoral investments, such as transport, environment, research, higher education, and the attraction of foreign investments needs to go beyond the administrative borders and adopt a broader view. Macro-regional strategies and territorial strategies (such as urban strategies or rural development) already address the issue of a more open and integrated CP, but further improvements are possible. The proposed new regulations for the 2021-2027 period address in part this issue in territorial cooperation programmes by introducing “component 5” of the territorial goal: “*interregional innovation investments through the commercialisation and scaling up of interregional innovation projects having the potential to encourage the development of European value chains*”.⁴¹

However, more marked international and interregional strategic visions and operational solutions may be introduced also in the mainstream CP programmes of the new generation. In the current proposal of the Common Provisions Regulation⁴², article 17 (content of programmes), paragraph 3 states that the OP has to specify the strategic relations of the programme with challenges of “macro-regional strategies and sea-basin strategies where Member States and regions participate in such strategies” and for each specific objective “*the interregional and transnational actions with beneficiaries located in at least one other Member State*”. These rules not only facilitate but implicitly promote transnational projects, however **more focused requirements in this direction may be included in the regulation, such as the identification of transnational implementation “models”** in some critical sectors (education, research and SME collaboration) similar to what happened in integrated territorial investments ('ITI') and community-led local development ('CLLD')⁴³. This kind of transnational operations may be optional but, when implemented, they should receive an

⁴¹ European Commission, COM(2018) 374 final, Proposal of a regulation of the European Parliament and of the Council on specific provisions for the European territorial cooperation goal (Interreg) supported by the European Regional Development Fund and external financing instruments.

⁴² European Commission COM(2018) 375 final, Proposal for a regulation of the European Parliament and of the Council laying down common provisions on the European Regional Development Fund, the European Social Fund Plus, the Cohesion Fund, and the European Maritime and Fisheries Fund and financial rules for those and for the Asylum and Migration Fund, the Internal Security Fund and the Border Management and Visa Instrument.

⁴³ See article 23, 24 and 25 of the European Commission COM(2018) 375 final, Proposal for a regulation of the European Parliament and of the Council laying down common provisions.

“award” in term of EU co-financing; the higher technical and administrative complexity of these interventions in comparison to the national ones justifies the award⁴⁴.

A analogous approach should be taken when looking at spillovers in Non-EU countries. Spillovers in low value-added sectors, such as energy imports or funding enterprises of ‘tax heaven’ countries should be reduced whilst attempting to promote collaboration in high value added sectors, such as the environment and RTDI.

5.6. Suggestions for reinforcing knowledge of spillover effects in the future

The study used a wide range of information and analytical tools. However, a number of significant limitations in the availability of data and in the possibility of adjusting the analytical tools have been met. Similarly to previous studies, this report confirmed the crucial role of spillovers in the analysis of the CP impacts. Hence, this role should be fully recognized and better analytical tools and available information should be developed in the future.

Here, some possible improvements concerning CP monitoring and the use of the analytical tools that may be implemented in the future are suggested.

Macroeconomic analysis - The macroeconomic analysis of externalities is relatively advanced. However, **the use of the QUEST III model should be further oriented towards this aim by DG REGIO and DG ECFIN.** The possibility of analysing expenditure in cohesion countries as a source of spillovers, proved to be a relevant source of information in this study. A more articulated set of simulations would be necessary to refine the analysis of spillovers in each Member State; this should be possible with a relatively limited efforts of the research centres of the EC. A free, or easier, access to the model would also permit a better understanding of the interactions between demand and supply effects and a more transparent interpretation of the results of the simulations. For instance, the generation of short term-advantages or disadvantages in the competitiveness of the MSs assessed in our study may be better investigated, or different baseline scenarios may be tested. A more flexible access to QUEST III model would also allow its integration with other models such as WIOD, ultimately improving the capacity of these instruments to analyse and understand data.

Apart from the mentioned methodological improvements, **QUEST III and WIOD models may be used by the EC for systematic analysis of the spillover effects.** In particular, these models could analyse the benefits of CP for non-EU countries, where significant. To date, these analyses have not been conducted frequently but could be implemented at the mid-term and at the end of the programming period aiming at highlighting size and trends of macro-economic spillovers. Specific requests in this direction may be also advanced within the terms of reference of the intermediate and ex-post evaluations of the ESI Funds.

Microeconomic analysis -At microeconomic level major improvements are possible in the information of the CP monitoring system. **Minor and not too burdensome improvements may result in a substantial advancement in the capacity of tracking spillover effects.** Two pieces of key information should be made available in the list of selected

⁴⁴ The complexity of transnational actions supported by public funds has to be mentioned and many past experiences provide evidence on this. The main one is perhaps the transnational priority included in the 2014-2020 programming period with the ESF, which encountered many implementation difficulties and was significantly downscaled during the period in many countries. The new European Commission, COM(2018) 373 final, proposal of a regulation of the European Parliament and of the Council on a mechanism to resolve legal and administrative obstacles in a cross-border context aims to provide for a legal tool to reduce these issues in the Interreg programmes and in the cross-border context.

operations expressly requested by the Commission proposal of the Common Provisions Regulation (COM(2018) 375, article 44 paragraph 3):

- *The names of the companies called to implement projects*, which are currently unknown because only the name of the administrations or the bodies responsible for the project (the “beneficiaries” of the EU resources) are monitored. In the future, the administrations should publish the list of companies selected to undertake public works or deliver services. This information should then be integrated into monitoring data. At the moment, this improvement does not seem to have been incorporated in the proposal of regulation for the 2021-2027 period.
- *The nationality of the ownership of the company receiving CP resources*, often this information is required at the contract signature phase, or could be easily requested.

Collecting this information **would require a limited effort because it is normally collected for administrative aims**; it would easily allow to analyse the participation of foreign companies in the OPs and the capacity of the country to attract foreign investments with CP, which is often an explicit objective of the OPs. Together with an improved monitoring system, the analysis of spillovers would always require surveys directed at MAs and/or companies to understand motivations, procedures and effects of the involvement of foreign companies.

Sectoral analysis - Sectoral spillovers, as noted in the study, are not easily estimated and are, to some extent, a meso effect that lies between micro and macroeconomic spillover effects. The in-depth studying of the sectoral externalities requires a knowledge of the single projects which may be complex and expensive. However, transport econometric models could help understand the effects of CP expenditure on TEN-T in different countries; the EC has already used these models, which would lead to effective analyses of spillovers with a relatively limited effort. In the environment and higher education sectors, modelling is not that helpful, making it necessary to implement thematic analyses aimed at assessing the cross-border effects of key and/or large projects. These analyses are relatively expensive, because they require the production of original data and a significant field work but may be implemented in the evaluation of CP or in specific studies.

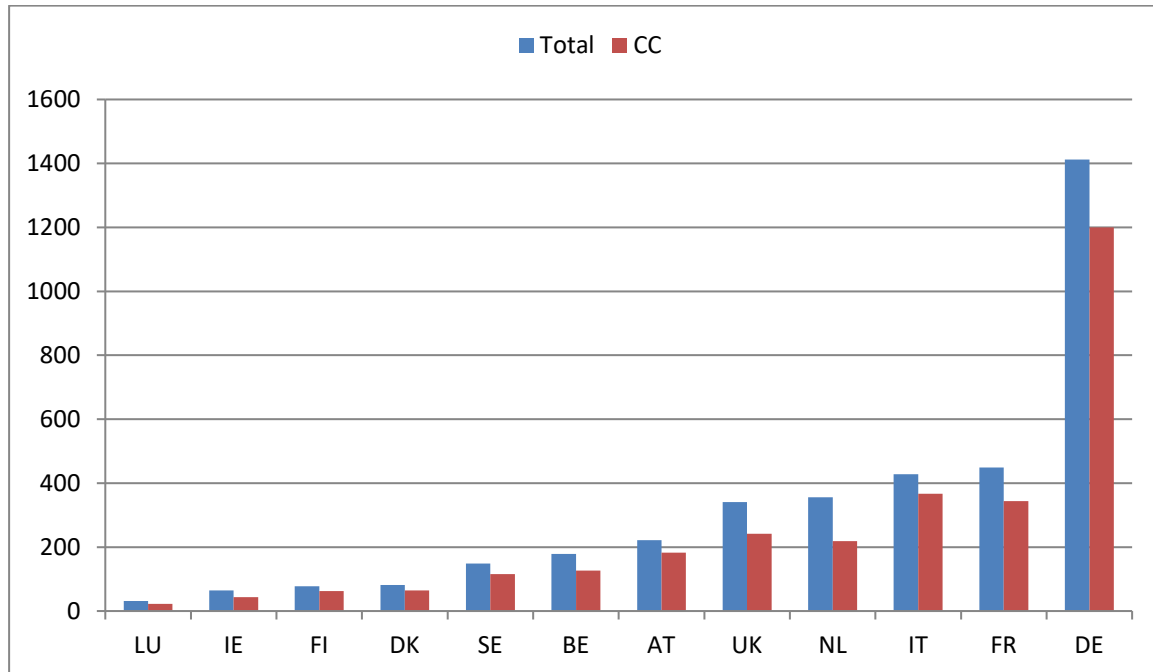
An interesting **improvement to the analysis of spillovers, may be its extension to the regional level**, in order to assess how spillover effects influence different territories of a country. At macroeconomic level, some attempts may be made with the support of RHOMOLO model, which works at regional level and simultaneously allows analyses on transports and other sectors.

At microeconomic level this analysis would be simpler, if the nationality of companies receiving grants were known, and particularly interesting as the localisation of their investments would help to explain the attractiveness and capacity of using CP to promote foreign investments. At territorial level, some recent evolutions in the econometric analysis focus on the spatial effects of development policies; these approaches may be applied to foreign investments and microeconomic spillovers when they are numerous and large enough to be investigated.

More generally, **a strategy for a systematic knowledge of spillover effects may be implemented**. This requires the integration of the above proposals and an accurate analysis of the phenomenon, to be performed at least twice during each CP programming period. The analysis should be connected to the impact evaluations of CP and it should not be limited to the investigation of the size of externalities, but also assess their influence on the trade balance of the MSs, the convergence process between MSs and regions as well as the reinforcement of the common market.

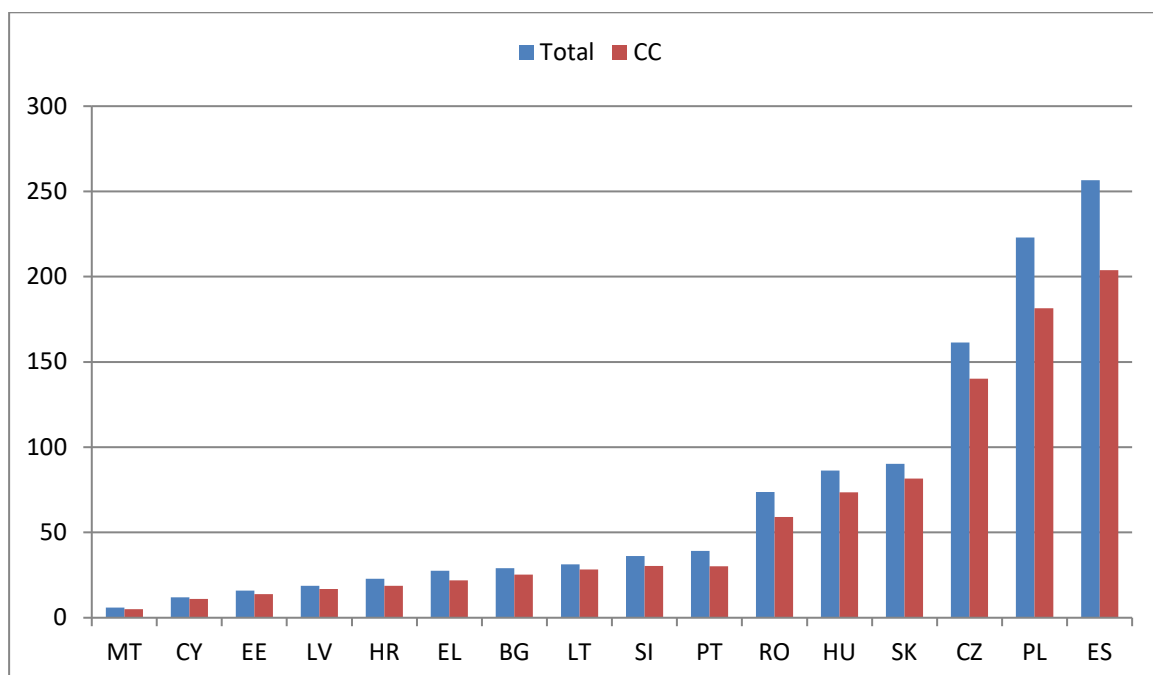
Annex A – Chapter 2: additional tables and graphs

Figure 18: Estimated CP demand spillovers in non-cohesion countries, split in total spillover effects and spillover effects deriving from cohesion countries (CC); in EUR mn (2014 prices) and annual average 2014-2020.



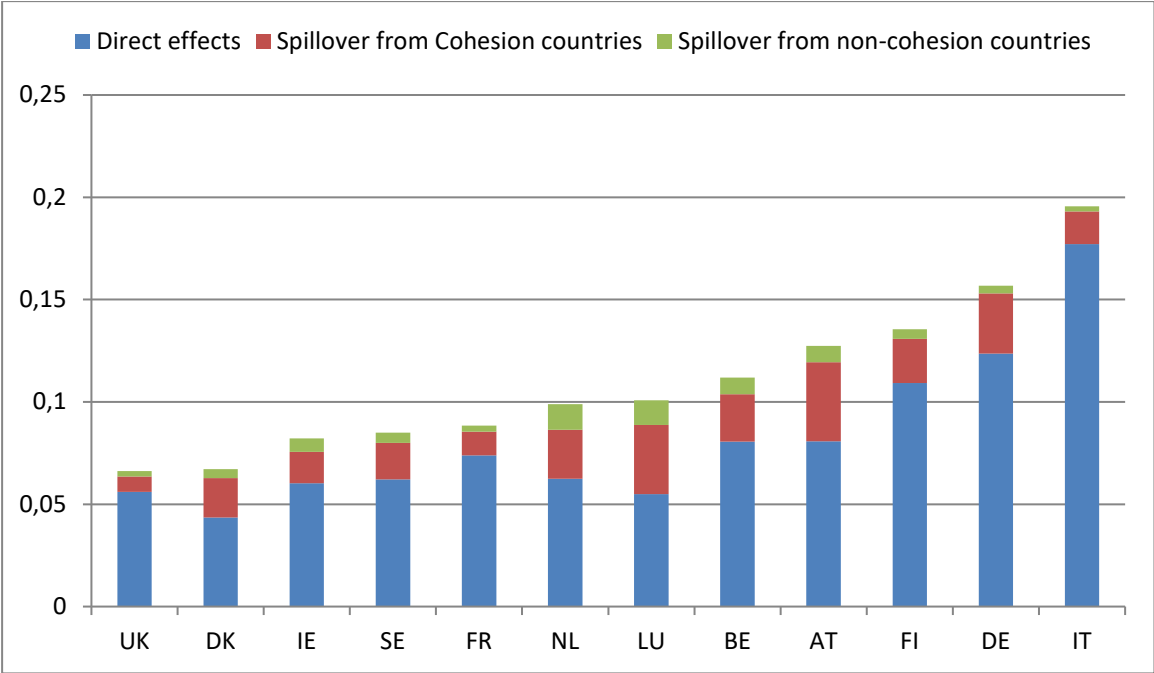
Source: wiiw estimates

Figure 19: CP demand spillovers in cohesion countries, split in total spillover effects and spillover effects deriving from cohesion countries (CC); in EUR mn (2014 prices) and annual average 2014-2020.



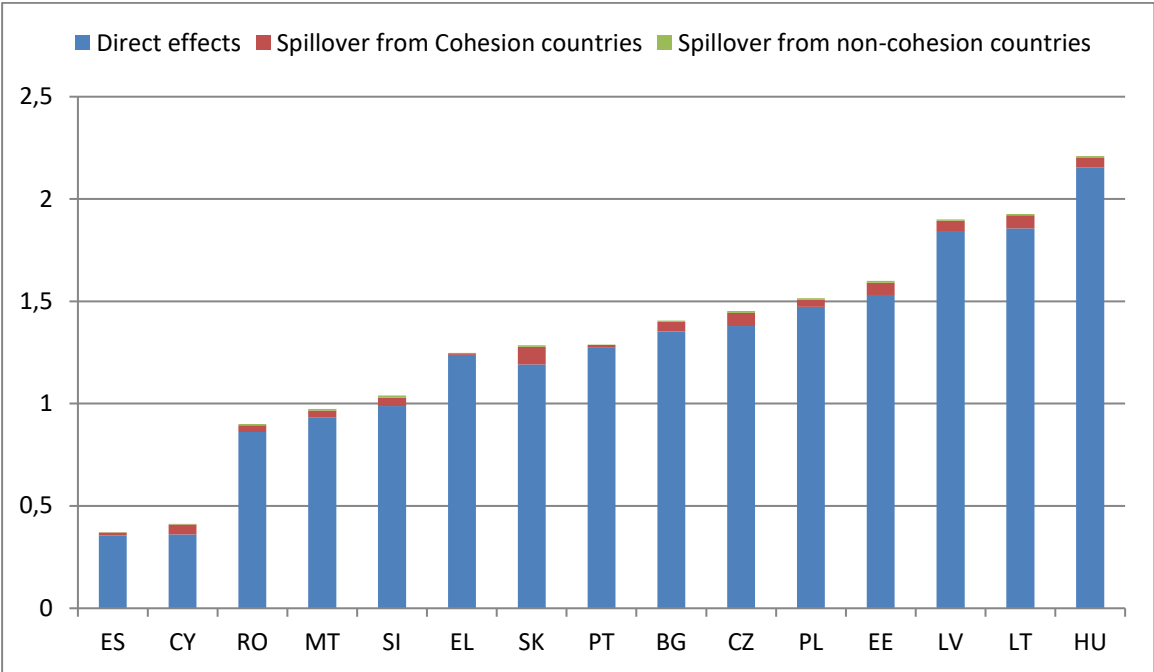
Source: wiiw estimates

Figure 20: Total CP effects in non-cohesion countries split in direct effects, spillovers from cohesion countries and spillovers from non-cohesion countries - in % of GDP (annual average 2007-2014)



Source: wiiw estimates

Figure 21: Total CP effects in cohesion countries, split in direct effects, spillovers from cohesion countries and spillovers from non-cohesion countries - in % of GDP (annual average 2007-2014)



Source: wiiw estimates

Table 17: Sensitivity analysis. Total CP effect in % of GDP and EUR mn, mean, upper and lower bound values, annual averages 2007-2014.

	IN % OF GDP				IN EUR MN.		
	LOWER BOUND	MEAN VALUE	UPPER BOUND		LOWER BOUND	MEAN VALUE	UPPER BOUND
Austria	0.086	0.088	0.089		256.2	260.2	264.3
Belgium	0.078	0.079	0.080		278.4	283.1	287.8
Bulgaria	1.260	1.267	1.274		467.8	470.4	472.9
Cyprus	0.331	0.334	0.337		51.1	51.6	52.1
Czech Rep.	1.246	1.252	1.258		1 764.0	1 772.6	1 781.2
Denmark	0.047	0.048	0.049		107.6	110.7	113.7
Estonia	1.380	1.387	1.394		237.3	238.5	239.7
Finland	0.109	0.111	0.112		192.9	195.8	198.7
France	0.070	0.072	0.073		1 356.9	1 381.2	1 405.5
Germany	0.123	0.125	0.126		3 251.8	3 293.7	3 335.6
Greece	1.171	1.176	1.181		1 849.9	1 857.8	1 865.7
Hungary	1.954	1.962	1.971		1 739.9	1 747.6	1 755.3
Ireland	0.059	0.060	0.061		105.1	107.2	109.3
Italy	0.166	0.168	0.170		2 416.5	2 445.4	2474.3
Latvia	1.732	1.739	1.746		360.2	361.7	363.1
Lithuania	1.707	1.714	1.721		564.5	566.8	569.2
Luxembourg	0.065	0.066	0.067		28.9	29.5	30.0
Malta	0.811	0.817	0.823		60.1	60.6	61.1
Netherlands	0.070	0.071	0.073		417.2	427.1	437.0
Poland	1.395	1.401	1.407		5 084.2	5 106.0	5 127.8
Portugal	1.141	1.147	1.153		1 727.7	1 736.8	1 746.0
Romania	0.803	0.808	0.813		1 068.6	1 075.0	1 081.4
Slovakia	1.058	1.064	1.070		728.8	733.1	737.4
Slovenia	0.952	0.957	0.963		309.6	311.3	313.0
Spain	0.330	0.333	0.336		3 118.3	3 146.9	3 175.4
Sweden	0.066	0.068	0.069		254.7	259.5	264.3
United Kingdom	0.055	0.056	0.057		1 116.1	1 136.4	1 156.7

Note: The mean, upper and lower bound values are based on 500 samples of random allocations of CP expenditures to WIOD NACE sectors. Upper and lower bounds are 99% confidence intervals

Source: wiiw estimates

Table 18: Matrix of country to country annual spillovers. In rows “destination” countries and in columns “origin” countries

	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK	Total
AT	94.3	0.3	3.5	0.0	17.3	12.4	0.0	0.7	3.5	3.8	0.3	1.4	32.5	0.0	6.2	1.0	0.0	1.0	0.3	0.3	21.8	2.1	5.9	0.3	7.3	6.2	1.0	223
BE	0.4	166.2	2.5	0.0	10.9	10.5	0.0	1.3	4.6	8.8	0.4	5.0	12.2	0.0	5.9	1.7	0.0	1.3	0.4	1.7	21.0	5.9	2.9	0.8	1.3	2.5	2.9	271
BG	0.0	0.1	447.4	0.0	1.5	0.6	0.0	0.1	5.4	0.5	0.0	0.2	2.2	0.0	0.7	0.2	0.0	0.2	0.0	0.0	1.8	0.3	2.7	0.0	0.6	0.4	0.1	465
CY	0.0	0.0	0.3	50.6	0.7	0.1	0.0	0.8	1.4	0.1	0.0	0.0	1.1	0.0	0.2	0.1	0.0	0.2	1.3	0.0	1.3	0.1	0.3	0.0	0.1	0.1	0.1	59
CZ	0.5	0.4	2.7	0.0	1 850.9	7.6	0.2	0.9	1.2	2.8	0.2	1.1	22.7	0.0	2.5	1.4	0.0	1.2	0.2	0.2	32.8	1.6	3.5	0.2	1.9	17.2	0.9	1 955
DE	6.1	3.0	15.2	0.0	121.9	2 202.9	3.0	9.1	24.4	48.7	3.0	18.3	128.0	0.0	36.6	12.2	0.0	9.1	3.0	3.0	240.7	30.5	33.5	3.0	12.2	30.5	12.2	3 010
DK	0.0	0.3	0.8	0.0	2.7	3.2	43.2	1.3	1.3	2.4	0.8	0.8	13.2	0.0	1.3	1.6	0.0	2.1	0.3	0.3	11.8	1.3	1.1	1.3	0.5	0.8	1.3	94
EE	0.0	0.0	0.2	0.0	0.2	0.3	0.0	220.6	0.2	0.3	0.4	0.1	0.4	0.0	0.1	1.7	0.0	4.5	0.0	0.0	1.3	0.2	0.1	0.2	0.1	0.1	0.1	231
EL	0.0	0.0	6.0	0.7	0.7	0.7	0.0	0.2	2 258.0	1.1	0.0	0.2	1.1	0.0	1.4	0.2	0.0	0.2	0.2	0.0	2.5	0.7	2.3	0.0	0.2	0.2	0.5	2 277
ES	0.0	1.2	12.2	0.0	7.3	7.3	0.0	1.2	8.5	3 316.1	0.0	7.3	8.5	0.0	8.5	1.2	0.0	1.2	1.2	0.0	20.8	62.3	4.9	0.0	2.4	2.4	2.4	3 477
FI	0.0	0.2	0.4	0.0	2.1	3.2	0.2	7.7	1.5	2.6	141.3	0.6	2.8	0.0	1.5	2.1	0.0	3.4	0.0	0.2	11.5	1.1	0.6	1.1	0.2	0.6	0.9	186
FR	0.0	2.3	4.6	0.0	20.9	20.9	0.0	2.3	9.3	51.0	0.0	1 096.0	25.5	0.0	20.9	2.3	0.0	2.3	2.3	2.3	51.0	20.9	9.3	0.0	2.3	7.0	9.3	1 363
HU	0.3	0.1	1.7	0.0	7.6	3.6	0.0	0.4	1.0	1.8	0.1	0.5	1 824.1	0.0	2.2	0.5	0.0	0.5	0.1	0.1	11.7	0.8	7.2	0.1	1.7	5.1	0.5	1 872
IE	0.2	0.4	0.9	0.0	2.8	2.8	0.2	0.4	2.1	4.5	0.2	1.1	4.1	65.5	3.0	0.4	0.0	0.4	0.2	0.4	6.4	2.4	1.1	0.2	0.4	0.6	2.8	104
IT	1.8	1.8	9.1	0.0	20.0	16.4	0.0	1.8	21.8	27.3	0.0	10.9	30.9	0.0	2 311.6	3.6	0.0	3.6	3.6	0.0	60.0	12.7	18.2	0.0	9.1	7.3	5.5	2 577
LT	0.0	0.0	0.1	0.0	0.7	0.7	0.0	2.8	0.2	0.3	0.1	0.2	1.2	0.0	0.3	519.4	0.0	6.5	0.0	0.0	6.0	0.3	0.2	0.1	0.3	0.2	0.1	540
LU	0.1	0.3	0.6	0.1	1.8	1.8	0.0	0.3	1.3	0.9	0.0	0.6	2.6	0.0	1.1	0.2	3.6	0.3	0.7	0.1	2.3	1.1	0.4	0.1	0.3	0.4	0.3	21
LV	0.0	0.0	0.1	0.0	0.3	0.4	0.0	3.9	0.2	0.3	0.1	0.1	0.5	0.0	0.1	3.0	0.0	344.7	0.0	0.0	1.9	0.1	0.1	0.1	0.2	0.1	0.2	356
MT	0.0	0.0	0.2	0.0	0.3	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.3	0.0	0.2	0.1	0.0	0.0	55.9	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.1	58
NL	0.7	2.9	2.9	0.0	18.8	34.0	0.7	2.9	6.5	13.8	1.4	8.0	21.7	0.7	16.7	2.9	0.0	2.9	1.4	151.3	43.4	8.7	5.1	0.7	2.2	4.3	6.5	361
PL	0.4	0.8	3.3	0.0	34.6	12.0	0.4	4.5	2.9	4.9	0.8	2.1	24.3	0.0	4.5	9.1	0.0	6.2	0.4	0.4	4 721.0	2.5	7.0	0.8	2.1	13.2	2.1	4 860
PT	0.0	0.2	0.6	0.0	1.2	1.3	0.0	0.2	1.2	10.4	0.0	1.0	1.9	0.0	1.3	0.2	0.0	0.2	0.2	0.2	2.9	1 929.6	0.8	0.2	0.2	0.4	0.6	1 955
RO	0.3	0.3	6.6	0.0	3.2	3.1	0.0	0.3	3.4	2.0	0.0	0.9	15.5	0.0	2.8	0.3	0.0	0.2	0.2	0.2	6.6	0.9	1 006.7	0.2	0.9	1.4	0.3	1 056
SE	0.4	0.4	1.3	0.0	5.6	5.6	0.9	6.0	2.6	4.7	2.6	1.7	6.9	0.0	3.0	3.5	0.0	3.5	0.9	0.4	20.3	3.0	1.7	136.0	0.9	1.3	2.2	215
SI	0.2	0.1	0.5	0.0	1.8	1.1	0.0	0.1	0.5	0.5	0.0	0.2	4.6	0.0	1.4	0.2	0.0	0.1	0.0	0.0	3.0	0.3	0.7	0.0	300.2	0.9	0.1	316
SK	0.3	0.1	0.7	0.0	17.2	2.2	0.0	0.2	0.6	0.9	0.1	0.4	16.1	0.0	1.3	0.9	0.0	0.5	0.1	0.1	13.4	0.5	1.9	0.1	1.0	693.3	0.5	752
UK	0.0	2.3	4.6	0.0	13.9	16.3	0.0	2.3	11.6	13.9	2.3	9.3	18.6	2.3	13.9	2.3	0.0	2.3	4.6	2.3	37.2	13.9	7.0	2.3	2.3	4.6	852.7	1 043
Tot EU	106	184	529	52	2 167	2 371	49	273	2 375	3 524	154	1 168	2 223	69	2 449	572	4	399	78	164	5 355	2 104	1 125	148	351	801	906	29 700
Tot Non-EU	2	12	76	2	214	162	0	34	137	220	5	66	280	0	146	58	0	50	17	11	563	133	113	4	43	66	75	2 491
Total	109	196	605	53	2 381	2 533	49	307	2 512	3 745	159	1 234	2 504	69	2 595	631	4	449	94	175	5 917	2 236	1 238	152	394	868	982	32 192

Notes: The numbers present CP expenditures from the EU MSs to all other EU MSs. The columns represent the source countries and the rows the destination countries. The matrix diagonal are CP effects in the respective country. E.g. CP effects in Austria amount to EUR 94 mn. per year (over an 8 year period); CP effects from Austria to Belgium amount to EUR 0.4 mn. per year etc. Croatia is excluded as it was not part of mainstream CP programmes in the period 2007-2013.

Source: wiiw

Annex B – Chapter 3: Estimation of microeconomic spillovers

Table 19: Poland: Estimation of the microeconomic spillovers during the 2007-2013 period (Meur, and absolute values)

2007 -2013 and ERDF and CF resources	Resources allocated to Foreign companies (ORBIS + Regon)	Resources of the 100 largest projects	Estimation of the large projects attributed to foreign enterprise (13%)	Total resources attributed to foreign companies	Type of investments	Share of the total cost to attribute to the benefits	Benefits / Spillovers
Fields of interventions	Meur	Meur	Meur	Meur			(Meur)
01 B + RT activity carried out in research centers	17.1			17	GRA	1.00	17
02 B + RT infrastructure (including equipment, equipment and fast IT networks connecting research centers) and specialized centers of technological competence	63.2	247.7	32	95	COS	0.30	29
03 Technology transfer and improvement of the cooperation network between SMEs, between SMEs and other enterprises, universities, all types of institutions at the level of post-secondary education, regional authorities, research centers and scientific and technological poles (science and technology parks, technopoles, etc.)	60.6			61	GRA	1.00	61
04 Support for the development of B + RT, in particular in SMEs (including access to services related to B + RT in research centers)	112.5			112	GRA	1.00	112
05 Advanced support services for companies and groups of companies	493.2	251.9	33	526	GRA	1.00	526
06 Support for SMEs in the promotion of environmentally friendly products and processes (implementation of effective environmental management systems, implementation and application / use of pollution prevention technologies, implementation of clean technologies for manufacturing operations of enterprises)	3.8			4	GRA	1.00	4
07 Investments in enterprises directly related to the field of research and innovation (innovative technologies, creation of enterprises by universities, existing B + RT centers and companies, etc.)	967.4			967	GRA	1.00	967
08 Other investments in companies	157.1			157	GRA	1.00	157
09 Other activities aimed at stimulating research, innovation and entrepreneurship in SMEs	75.0			75	GRA	1.00	75
10 Telecommunications infrastructure (including broadband networks)	24.3	132.1	17	41	COS	0.30	12
11 Information and communication technologies (access, security, interoperability, prevention of threats, research, innovation, digital content, etc.)	47.1			47	ICTSER	0.37	17
13 Services and applications for citizens (e-health, e-administration, e-education, e-inclusion, etc.)	132.8	80.2	10	143	ICTSER	0.37	53
14 Services and applications for SMEs (e-commerce, education and training, networking, etc.)	27.5			28	ICTSER	0.37	10
15 Other actions aimed at improving SMEs' ICT access and their efficient use	32.7			33	GRA	1.00	33
16 Railway		487.2	63	63	COS	0.30	19
17 Railway (TEN-T networks)	107.7	1 177.8	153	261	COS	0.30	78
20 Highways		342.8	45	45	COS	0.30	13
21 Motorways (TEN-T networks)		6 523.0	848	848	COS	0.30	254
22 National roads		694.3	90	90	COS	0.30	27
25 Urban transport		172.8	22	22	COS	0.30	7
26 Multimodal transport	26.2			26	COS	0.30	8

2007 -2013 and ERDF and CF resources	Resources allocated to Foreign companies (ORBIS + Regon)	Resources of the 100 largest projects	Estimation of the large projects attributed to foreign enterprise (13%)	Total resources attributed to foreign companies	Type of investments	Share of the total cost to attribute to the benefits	Benefits / Spillovers
Fields of interventions	Meur	Meur	Meur	Meur			(Meur)
27 Multimodal transport (TEN-T networks)	36.9			37	COS	0.30	11
29 Airports	70.2	69.4	9	79	COS	0.30	24
30 Ports		254.1	33	33	COS	1.30	43
33 Electricity	2.8			3	COS	0.30	1
34 Electricity (TEN-E networks)	215.1			215	COS	0.30	65
35 Natural gas	70.7			71	COS	0.30	21
36 Natural gas (TEN-E networks)	356.9	213.2	28	385	COS	0.30	115
39 Renewable energy: wind	137.8			138	COS	0.30	41
40 Renewable energy: solar	3.2			3	COS	0.30	1
41 Renewable energy: biomass	12.3			12	COS	0.30	4
42 Renewable energy: hydroelectric, geothermal and other	0.8			1	COS	0.30	0
43 Energy efficiency, combined production (cogeneration), energy management	38.2			38	GRA	1.00	38
44 Municipal and industrial waste management	353.2	168.3	22	375	COS	0.30	113
45 Economy and supply of drinking water	1.0			1	COS	0.30	0
46 Wastewater treatment	255.4	341.3	44	300	COS	0.30	90
47 Air quality	8.3			8	COS	0.30	2
48 Integrated pollution prevention and control system	12.8			13	COS	0.30	4
51 Promoting biodiversity and nature protection (including NATURA 2000)	8.4			8	COS	0.30	3
52 Promoting clean urban transport	0.5	1 690.3	220	220	SER	0.40	88
53 Prevention of threats (including the development and implementation of plans and instruments for the prevention and management of natural and technological hazards)	0.1	214.1	28	28	SER	0.40	11
54 Other actions to protect the environment and prevent threats	3.0			3	COS	0.30	1
57 Other support to strengthen tourism services	62.4			62	SER	0.24	15
58 Protection and preservation of cultural heritage	8.8			9	COS	0.30	3
59 Development of cultural infrastructure	1.1			1	COS	0.30	0
60 Other support for improving cultural services	0.2			0	SER	0.40	0
61 Integrated projects for the revitalization of urban and rural areas	148.5			149	COS	0.30	45
75 Infrastructure of the education system	1.1			1	COS	0.30	0
76 Health care infrastructure	17.9			18	COS	0.30	5
77 Guardianship and childcare infrastructure	0.4			0	COS	0.30	0
78 Housing infrastructure	0.3			0	COS	0.30	0
79 Other social infrastructure	8.1			8	COS	0.30	2
85 Preparation, implementation, monitoring and control	184.3			184	SER	0.40	74
86 Evaluation, research / expertise, information and communication	7.6			8	SER	0.40	3
Total	4 376.3	13 060.7	1 697.9	6 057.1			3 304

Note: 1) GRA= grants for investments or research; COS = public works; ICT SER = service in telecommunication; SER = Legal and accounting services; services of head offices; management consultancy services. **Source:** Ismeri Europa on Polish monitoring data and Bartkiewicz et al. (2016).

Table 20: Czech Republic: Estimation of the microeconomic spillovers during the 2007-2013 period (Meur, and absolute values)

2007 -2013 ERDF and CF resources		Resources allocated to Foreign companies (ORBIS + Regon)	Resources of the 100 largest projects	Estimation of the large projects attributed to foreign enterprise (13%)	Total resources attributed to foreign companies	Type of investments	Share of the total cost to attribute to the benefits	Benefits / Spillovers	
OP	Priority axis	Meur	Meur	Meur			Meur	Meur	
CZ.1.01 OP Transport	1.1	Upgrading and Development of the TEN-T Railway Network	0.1	1 992.3	179.3	179.4	COS	0.23	41.3
	1.2	Construction and Upgrading of Motorways and Roads in the TEN-T Network		1 564.7	140.8	140.8	COS	0.23	32.4
	1.3	Upgrading Railway Networks outside of the TEN-T Network		276.8	24.9	24.9	COS	0.23	5.7
	1.4	Improving Transport on Class I Roads outside of the TEN-T Network		973.0	87.6	87.6	COS	0.23	20.1
	1.5	Upgrading and Development of the Prague Underground and Systems for Managing Road Transport in the City of Prague		352.0	31.7	31.7	COS	0.23	7.3
	1.6	Support of Multimodal Freight Transport and Development of Inland Waterway Transport	2.3	63.9	5.8	8.1	COS	0.23	1.9
OP Environment	2.1	Improvement of water management infrastructure and reduction of flood risk		111.0	10.0	10.0	COS	0.23	2.3
	2.2	Improvement of air quality and reduction of emissions	57.1	55.8	5.0	62.1	COS	0.23	14.3
	2.4	Improvement of waste management and rehabilitation of old ecological burdens	9.8	54.5	4.9	14.7	COS	0.23	3.4
	2.5	Limitation of industrial pollution and environmental risks	7.3			7.3	COS	0.23	1.7
OP Enterprise and Innovation	3.2	Development of firms	118.8			118.8	GRA	1.00	118.8
	3.3	Effective energy	73.9			73.9	GRA	1.00	73.9
	3.4	Innovation	252.3			252.3	GRA	1.00	252.3
	3.5	Environment for enterprise and innovation	47.7			47.7	COS	0.23	11.0
	3.6	Business development services	2.4			2.4	GRA	1.00	2.4
OP RDI	5.1	European Centres of Excellence		555.3	50.0	50.0	COS	0.23	11.5
	5.2	Regional R&D Centres	19.8	253.1	22.8	42.6	COS	0.23	9.8
	5.4	Infrastructure for University Education related to Research		112.1	10.1	10.1	COS	0.23	2.3
Integrated OP	6.3	Improving the quality and accessibility of public service		83.5	7.5	7.5	SER	0.29	2.2
	6.5	National support for tourism	0.4			0.4	SER	0.29	0.1
ROP Northwest	9.4	Sustainable development of tourism	1.6			1.6	GRA	1.00	1.6
ROP Moravia-Silesia	10.2	Support for the Prosperity of the Region	1.7			1.7	COS	0.23	0.4
ROP Southwest	14.1	Accessibility of centres	1.0			1.0	COS	0.23	0.2

2007 -2013 ERDF and CF resources			Resources allocated to Foreign companies (ORBIS + Regon)	Resources of the 100 largest projects	Estimation of the large projects attributed to foreign enterprise (13%)	Total resources attributed to foreign companies	Type of investments	Share of the total cost to attribute to the benefits	Benefits / Spillovers
OP	Priority axis		Meur	Meur	Meur			Meur	Meur
ROP Middle Ages	15.1	Transport	1.3			1.3	COS	0.23	0.3
OP Prague Competitiveness	16.3	Innovations and Enterprise	0.5			0.5	GRA	1.00	0.5
Total			597.9	6 448.0	580.3	1 178.2			617.5

Note: 1) GRA= grants for investments or research; COS = public works; ICT SER = service in telecommunication; SER = Legal and accounting services; services of head offices; management consultancy services.

Source: Ismeri Europa on Czech Republic monitoring data and Bartkiewicz et al. (2016).

Annex C – Case studies

Project title	PORT OF KLAIPĖDA – LEADER OF AN EASTERN BALTIC COAST-LITHOUANIA
Context information	<p>Operational Programme: ERDF-CF Operational Programme Economic Growth 2007–2013</p> <p>Programming period: 2007-2013</p> <p>Beneficiaries: Klaipėda State Seaport Authority and JSC “Lithuanian railways”</p> <p>Financial value(*): EUR 141 mln</p> <p>EU resources: CF EUR 137 mln ERDF EUR 4 mln</p> <p>(*) data on national resources are not available</p>
Objectives	<p>The Port of Klaipėda is uniquely situated at the crossroad of two international transport corridors: it serves as a bridge between the markets of the Commonwealth of Independent States and the Asian region on the one hand, and the European Union and other markets on the other. The Port of Klaipėda is located closely to the ports in the North-West of Europe and southern parts of Scandinavia.</p> <p>The project contributes to improving the potential of Klaipėda Sea port as the most important transit hub of the country, increasing its competitiveness. The project is in line with the second priority of the long-term development strategy of the Lithuanian transport system, which is: “the modernisation and development of the west-east transport axis and its sustainable integration into trans-European networks of Denmark, Sweden, Germany and other EU States through the motorways of the Baltic Sea that are planned to be developed” The investment is justified both by direct (higher accessibility, economic and employment opportunities in the port activities) and indirect (regional attractiveness, location factors for external enterprises) effects. The project is part of the broader priority to develop the trans-European transport networks in Lithuania and is part of the EU wide strategy for TEN-T corridors and the development of the sea motorways.</p> <p><i>Specifics</i></p> <ul style="list-style-type: none"> • Improving incoming roads to multimodal cargo terminals on the southern part of the port, reducing the negative impact of heavy traffic (damage to road surface, traffic jams, pollution and noise) on Klaipėda citizens. The projects increases the capacity and safety of roads, integrating them with other means of transport such as shipping lines and creating a stronger connection with the European highway Vilnius-Kaunas-Klaipėda. • The Klaipėda Free Economic Zone (FEZ) is established in adjacency to the port to promote the industrial development of the city. • New Klaipėda Passenger and Cargo Terminal is built in the central part of the port, enabling the port to serve more vessels, vehicles and passengers. The terminal represents an additional axis of intermodal transportation in the port and is directly linked with the international transport corridor IXB by the motorway Klaipėda–Vilnius. • Port dredging (deepening and widening of the port fairways) to increase the cargo turnover handled and the number of vessels arriving in the port, as well as improving the safety and minimizing the environmental damage caused by the ships.

- **Construction of the new Marina** (Quay for Small and Pleasure Boats) which can accommodate up to 690 boats in the southern part of the port. This quay is situated beyond the existing navigation channel which allows small boats to avoid crossing the intensive transport and ferry navigation channels.

Facts

- The annual capacity of the port has been increased up to over 52 million tons of cargo.
- The cargo handling turnover has reached a total amount of 36.6 million tons in 2011 and 43 million in 2017.
- Ports account for 50% of all freight imports and exports in the EU.

Externalities and main transmission mechanisms

Hierarchy effect: After the intervention, Klaipeda seaport became the largest port in the Baltic countries and primary hub for passenger and freight traffic thanks to the intermodal connection with road and rail TEN-T corridors. Both its rank in the Baltic Sea area and the connection with intermodal transport networks will widen the geographic area of influence of its spillovers. Through the *network effect* there will be three different groups of foreign companies benefiting from the spillover effects .

- Foreign companies in Western Europe and Scandinavian countries using the seaport for import/export with markets in Russia, Belarus, Ukraine, Kazakhstan and other CIS countries.
- Foreign companies in Baltic countries, from Russia, Belarus, Ukraine etc. using the seaport as shipping location for their international trade activities.
- Foreign shipping companies operating in the area, enjoying higher accessibility, security and quality of services in the Klaipėda port. This would mainly include shipping companies from Estonia, Finland, Latvia as well as shipping companies from Switzerland, South Korea and Taiwan.

Furthermore the railway lines connect the Port of Klaipeda to Russia, Belarus, Ukraine, Kazakhstan and other Commonwealth of Independent States (CIS) countries thus ensuring access to the market of 250 million consumers in the continental part, 30 million consumers in Western Europe and 110 million consumers in the Baltic region.

Proximity effect: Productive sectors in border regions outside Lithuania benefit from the relative closeness of an infrastructure of international standing. Also, the tourist sector in border regions benefitted from the new Marina for private boats which attracts more tourists in the area.

Competition: Although the port would increase the competitiveness of the whole Baltic Sea, it should be noted that increased competition may be a potential negative externality for the surrounding regions; the ports potentially affected would include -Gdansk, Gdynia, Gothenburg, Danzig, Königsberg and Kaliningrad.

An additional important point to note is that in the case of Klaipeda the transnational spillovers are more pronounced as its size far outweighs the demands of the Lithuanian market.

Website and contacts:

<https://sumin.lrv.lt/en/eu-investment/structural-funds-period-for-2007-2013>

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Sources:

<https://sumin.lrv.lt/en/eu-investment/structural-funds-period-for-2007-2013/about-eu-investment-in-2007-2013/water-transport-infrastructure>

<http://www.portofklaipeda.lt>

Project title	MODERNISATION OF THE E 59 RAILWAY LINE, SECTION WROCLAW – POZNAŃ, STAGE III, SECTION CZEMPIŃ – POZNAŃ PHASE II - POLAND
Context information	<p>Operational Programme: Infrastructure and Environment Operational Programme</p> <p>Programming period: 2007-2013 /2014-2020</p> <p>Beneficiaries: PKP PolskieLinieKolejowe S.A. (PKP Polish Railway Lines S. A)</p> <p>Financial value: EUR 221 mln</p> <p>EU resources: EUR 104 mln</p> <p>National resources: EUR 117 mln</p>
Objectives and territorial scope	
<p>This project focuses on an important stretch of rail line that runs through the western Polish region of Wielkopolska. The goal is to modernize both track and stations along the route between Wrocław and Poznań, and on sections between Czempień and Poznań. The total length of track to be renovated amounts to 32 km.</p> <p>This ambitious project aims to attract investments for jobs and growth, relieve road traffic between Poznan and Wroclaw and increase the share of environmentally friendly transport. The project will transform rail transport in western Poland and help make the region more accessible to the rest of Europe.</p>	
<i>Specifics</i>	
<ul style="list-style-type: none"> • Modernisation of the main tracks, track systems, and substructures. • Infrastructure surrounding the tracks are being built or modernised. Seven bridges and viaducts, eight underpasses and 14 culverts are planned. Out of the currently existing 29 rail crossings, 17 will be rebuilt and the remaining 12 removed in order to improve safety. • An entirely new power supply network will be built. In addition, new signalling systems and new automatic line blockings will be installed. The project also includes the replacement of the telecommunication network along the line, and the refurbishment of platforms and buildings. • Environmental protection installations are foreseen as well, including seven animal passages, acoustic barriers, and drainage systems. • The refurbished line sections will allow top speeds of 120 km/h,160 km/h for passenger traffic. Furthermore, the improved line will allow trains to carry more freight. The maximum axle load will be increased to 22.5 tonnes per axle, enabling more goods to be transported more efficiently. 	
<i>Facts</i>	
<ul style="list-style-type: none"> • The shorter journey times resulting from the project are estimated to add up to time savings of about EUR 23.4 million per year. • With over 19 thousand km of lines, Poland has one of the largest railway infrastructure networks in the European Union. Only German and French rail networks are considerably larger with respectively 37 and 29 thousand km. This 	

shows the potential of the Polish railway market and the scope of interventions that need to be implemented in order to renew the network.

Externalities and transmission mechanisms

The main spillover effect from the railway system will be the *Increased accessibility* achieved through:

- *Network mechanism.* The project will benefit operators of freight transport, not only in Poland but also European businesses interested in transporting goods efficiently from one end of Europe to the other. The section of modernized rail line forms part of a corridor which connects Scandinavian cities such as Malmö and Ystad with the Balkans, via Vienna, Prague and Budapest.
- *Proximity effect:* The main beneficiaries of the project are passengers using refurbished railway connections and a modernized line which will allow them to reach their destinations swiftly. As it is an important transport axis, these will include national as well as international travellers.

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Sources

<https://reconasia.csis.org/database/projects/modernisation-railway-e-59-wroclaw-poznan-phase-iii-section-czempin>

[http://ec.europa.eu/regional_policy/en/projects/major/poland/polish-rail-project-promises-to-help-connect-scandinavia-to-eastern-europe;](http://ec.europa.eu/regional_policy/en/projects/major/poland/polish-rail-project-promises-to-help-connect-scandinavia-to-eastern-europe)

[http://ec.europa.eu/regional_policy/en/projects/poland/complete-overhaul-for-czempin-poznan-section-on-railway-line-e59-wroclaw-poznan,](http://ec.europa.eu/regional_policy/en/projects/poland/complete-overhaul-for-czempin-poznan-section-on-railway-line-e59-wroclaw-poznan)

Project title	TRAKIA MOTORWAY - BULGARIA
Context information	<p>Operational Programme: Transport Operational Programme</p> <p>Programming period: 2007 - 2013</p> <p>Beneficiaries: The Bulgarian Road Infrastructure Agency</p> <p>Financial value: EUR 357 mln</p> <p>EU resources: CF EUR 286 mln</p> <p>National resources: EUR 71 mln</p>
<p>Objectives and background</p> <p>The A1 Trakia Motorway links Sofia with the Black Sea⁴⁵. The motorway is part of the Trans European Network Transport Corridor VIII the (Orient/East-Med Corridor) which links Albania and Macedonia to the Bulgarian ports on the Black Sea. The project consists of a 116 km two-lane motorway between Stara Zagora and Karnobat in the south west of Bulgaria. The project was implemented in three lots (Lots 2, 3 and 4) which progressed in parallel. The construction of the three lots started between June and October 2010. Lots 2 and 3 opened in mid-2012 and Lot 4 opened in July 2013 and completed the project.</p> <p>The project completes the Trakia Motorway from Sofia to the Black Sea port of Burgas. The sections of the motorway completed under this project were part of Pan-European transport corridor VIII, which starts at the Italian Ports of Bari and Brindisi and passes through Durres/Vlora, Tirana, Skopje, Sofia and Burgas/Varna. The main objectives were:</p> <ul style="list-style-type: none"> • To improve the performance of the national and Trans-European network by completing the southern part of the Bulgarian motorway 'backbone' increasing the travel speeds and reducing travel time. • To meet the expected increase in passengers and freight transport demand, both at local and international level. • To provide harmonised travelling conditions and improved services to users. • The closure of gaps and accessibility, bottlenecks, and network continuity. <p><i>Specifics</i></p> <ul style="list-style-type: none"> • The construction of motorway sub- and superstructure, plus major infrastructure such as five road junctions, 10 bridges, and dozens of road and rail overpasses and underpasses; the relocation of public utilities, safety and environmental protection measures and eight symmetrically placed service/rest areas. <p><i>Facts</i></p> <ul style="list-style-type: none"> • The benefits include higher travel speeds (from 68 km/h to 105 km/h) and a reduction in travel time. • Since opening, the traffic using the scheme has been lower than expected by circa 25%, this is mostly attributed to assumptions of GDP growth for Bulgaria that ended up falling short. 	
<p>Externalities and transmission mechanisms</p> <p>The main externalities achieved through the project are</p>	

⁴⁵ See map: http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2013/wp5_task3_en.pdf

Increased accessibility through the network- and proximity effect. The Trakia Motorway is part of a wider transnational corridor and the spillover effects spread to other countries along the corridor. Although the Black Sea is not a designated Ten-T corridor, it is considered one of the primary transport routes for goods being imported to and exported from Bulgaria as well as a vital transit trade route for international goods passing through Bulgaria.

Economic development through the network effect. Despite the relatively limited volume of domestic coastal freight traffic, the majority of Bulgaria's imports (67%) and exports (60%) pass through the Black Sea. Further economic development spillovers will come through the reduction in transport costs for goods produced in foreign regions.

The spillover will gain a wider geographical range as the Black Sea ports will turn into an eastern border of the EU. In the future, these ports will mainly perform transit functions, serving as a link between the EU and Central Asia, the Middle and Far East and the Black Sea countries.

Website and contacts:

<http://www.api.bg/index.php/en>

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Sources:

http://ec.europa.eu/regional_policy/en/projects/bulgaria/better-road-link-to-the-black-sea;

http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2013/wp5_task3_en.pdf;

Project title	NEW PORT OF PATRAS – 3 rd PART – GREECE
Context information	<p>Operational Programme: “Western Greece – Peloponnesus Ionian Islands” Operational Programme</p> <p>Programming period: 2007 - 2013</p> <p>Beneficiaries: Special Service for Public Works Construction and Maintenance of Transport Infrastructure</p> <p>Financial value: EUR 52 mln</p> <p>EU resources: ERDF EUR 45 mln</p> <p>National resources: EUR 7 mln</p>
<p>Objectives and background</p> <p>The Port of Patras is located on the north-west coast of the Peloponnese, in the region of Western Greece and is adjacent to the town of Patras. The port of Patras forms part of the Ten-T Orient-East Med corridor.</p> <p>The Port of Patras is active in the market of passenger and cargo vehicle transportation mainly between mainland Greece and the Italian ports of the Adriatic Sea and, to a lesser extent, between mainland Greece and the nearby Greek islands of Cephalonia and Ithaca.</p> <p>The intervention aims at upgrading the existing transnational maritime routes, in particular to and from major ports in Italy. The investments will enable to concentrate freight flows and enhance the integration of the port in the Core Network Corridors and thus improve the efficiency of the logistic chain.</p> <p>The upgraded infrastructure will allow the Port of Patras to make better use of its capacity and to provide services to foreign traffic mainly by the southern site, which will have a total of 5 piers. The northern site will continue to provide services to domestic traffic and to be employed as a fall-back infrastructure for any foreign traffic that cannot be served by the southern site.</p> <p><i>Specifics</i></p> <ul style="list-style-type: none"> • Building a fifth pier and the extension of a breakwater. • The construction of utilities and vessels that allow access for wheeled cargo vehicles. • Terminal, auxiliary buildings. The Southern Passenger Port of Patras has a platform of 992m total length, built with caissons of reinforced concrete in a zigzag alignment. It consists of 4 dock stations and it has 15 docks, 11 of which can be used for mooring by stern and 4 can be used for side-mooring. In addition, the Southern Port has breakwaters of 1.236m total length, built with caissons of reinforced concrete • A new drainage network, water supply, sewage networks and a control tower were built. • Commercial buildings constructed featuring shops and markets. • Associated infrastructure built and road works will be carried out, including a new road network within the controlled land area of the port. <p><i>Facts</i></p> <ul style="list-style-type: none"> • In 2012, 37% of the total traffic between Greek and Italian ports passed through the Port of Patras. 	

- The new port is divided into passenger terminals and a commercial port. The port of Patras is an economic engine and can dock 11 ferries simultaneously. Thanks to this modernization a total of 3 720 maritime routes (pathways used for the commercial maritime transport of cargo) have been created through the port, up from 2 976 in 2013.

Externalities and transmission mechanisms

The increased accessibility will be transmitted as a spillover to other regions through the *proximity and network effects*. The investment facilitated flows of foreign traffic to Greece from Italy and vice versa. It strengthens TEN-T corridors namely the Baltic-Adriatic, Mediterranean and Orient-East Med Corridors. Most significantly it will improve foreign accessibility to Italian ports such as Brindisi, Bari, Ancona, Trieste and Venice. Improved accessibility to these ports will lead to positive trade externalities associated with lower transport costs and a boost to the tourism sector in the Italian ports in the Adriatic sea which include a range of world class heritage sites or holiday destinations.

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Sources:

http://ec.europa.eu/regional_policy/en/projects/major/greece/new-port-facilities-to-increase-shipping-capacity-in-western-greece

Project title	ELI - EXTREME LIGHT INFRASTRUCTURE – CZECH REPUBLIC
Context information	<p>Operational Programme: Operational Programme for Research, Development and Education</p> <p>Programming period: 2014-2020</p> <p>Beneficiaries: Institute of Physics of the Czech Academy of Sciences</p> <p>Financial value: EUR 72 mln</p> <p>EU resources: ERDF EUR 59 mln</p> <p>National resources: EUR 13 mln</p>
<p>Objectives and background</p> <p>Eli is an international research infrastructure that will be based on 3 specialised facilities located in the Czech Republic, Hungary and Romania.</p> <p>The Extreme Light Infrastructure (ELI) is part of the European Strategy Forum on Research Infrastructure (ESFRI) Roadmap. The mission of the ESFRI, which was formed in 2002, is to keep Europe at pace with the rapidly evolving forefront of science and technology and to increase the capacity to meet the needs of the EU and the world scientific community.</p> <p>ELI – Beamlines is one of the facilities built in Dolní Břežany on the outskirts of Prague. The center in Hungary works on ultra-short light sources such as ultraviolet rays and x-rays, while the Romanian facility focuses on the use of lasers in nuclear physics.</p> <p>ELI Beamlines facility will provide research opportunities for a wide range of world-class secondary sources, driven by ultra-intense lasers. These secondary sources, partially based on entirely new concepts, will produce pulses of radiation and particles of highest intensity and beam quality, including electromagnetic radiation over a broad spectral range and charged particles like electrons, protons and ions.</p> <p>Technology transfer is central to the project, therefore in addition, the project includes the setting up of a technology transfer center. Further facilities such as a library and general services will be constructed as well so that Beamlines fully complies with the standards of a world-class research centers.</p> <p>The equipment is to be openly available for use by researchers from academia, as well as the private scientific sphere and the business community.</p> <p><i>Specifics</i></p> <ul style="list-style-type: none"> • Advancing a number of scientific fields far beyond laser science. New techniques for medical image-display and diagnostics, radiotherapy, tools for new materials developing and testing, and the latest in X-ray optics are just a few items on the research and application agenda defined in the ELI Beamlines Strategic Development Plan 2018 – 2024 (source below) • Industrial exploitation of ELI Beamlines technologies and instrumentation in real life is a part of their strategy to bring the results of laser research to society. This provides newly developed cutting-edge technologies to applications such as oncology treatments, medical and biomedical imaging, fast electronics, and our understanding of aging nuclear reactor materials through to the development of new methods of nuclear waste processing. • Raising awareness in students, teachers, and the general public in the area of laser technology through a rich programme of educational activities. The centre 	

organises lectures at high schools and universities, conferences, workshops, and offers regular tours into the ELI Beamlines centre, along with summer schools which involve international students.

Facts

- Due in part to the success of the ELI-structure, In January 2017 the European Regional Development Fund and the Czech Ministry of Education, Youth and Sports awarded EUR 10,4 mln to the ELIBIO project which explores the new frontiers in light and optics to create breakthrough science in biology, chemistry and physics. In this respect, ELI is pioneering a novel funding model combining the use of structural funds for the implementation of the infrastructures and contributions to an ERIC ([European Research Infrastructure Consortium](#)) for the researches.
- The largest vacuum compressor in the Czech Republic belongs to ELI Beamlines

Main transmission mechanisms and externalities

The Network effect is an important transmission mechanism here as the Eli beamlines is overtly aimed at facilitating multilateral activities. By its very nature eli beamlines forms part of an international research initiative, promoting European cooperation. Furthermore, there is a significant technology transfer from the research done at the centre to the fields of: laser and particle accelerator engineering, nuclear pharmacology, oncology, X-ray and gamma-ray imaging. The location of Extreme Light Infrastructure (ELI) facilities in Central and Eastern Europe will equally act as a *transmission network effect* as it allows the use of scientific and technological potential of the new EU-member countries that have become involved, and accelerates European integration into European research areas.

As it is a facility of international standing, a *hierarchy effect* will take place promoting national- and European-level research, leading to the launch of a range of projects, as well as work on practical applications of laser technology and their transfer to business.

This research will be an attractive platform for educating a new generation of scientists, engineers, and PhD students. With a *higher participation in higher education* the Czech Republic will become the host country for top international research, and this may attract further investment in advanced technologies with high added value. Through *graduate mobility* the knowledge will then be able to spillover into other countries

The Internationalisation of activities will further act as a transmission mechanism as the facilities will provide access to international scientists selected on the basis of excellence ("peer-reviewed open access"), according to the principles advocated by ESFRI and the European Commission.

ELI Beamlines has a large potential for the application sphere and potential partners can come from all over Europe. For instance, ELI BEAMLINES experts have been included in the project team of RI2INTEGRATE project, which is mainly funded by the INTERREG Danube programme and includes all member states of the Danube Region.

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Sources:

[https://www.eli-beams.eu/en/about/;](https://www.eli-beams.eu/en/about/)

https://www.eli-beams.eu/wp-content/uploads/2018/08/ELI_BL_Strategic-development-plan_2018-2024.pdf

Project title	PIRTU RECENTLY GRADUATED RESEARCHER PROGRAMME-SPAIN
Context information	<p>Operational Programme: European Social Fund Operational Programme for Castilla y León</p> <p>Programming period: 2007-2013</p> <p>Beneficiaries: University graduates, through research organizations</p> <p>Financial value: EUR 16 mln</p> <p>EU resources: ESF EUR 12 mln</p> <p>National resources: EUR 4 mln</p>
<p>Objectives</p> <p>The project contributes to the objective of improving human capital in Castilla y Leon developing human potential in the field of research and innovation. In particular, the ESF funding goes towards the post-graduate study and training of around 200 researchers (hence the title PIRTU (Personal Investigador de Reciente Titulación Universitaria or Recently Graduated Researchers). In particular the project intends to:</p> <ul style="list-style-type: none"> • Ensure that capable young researchers can build a career in Spain, rather than having to work abroad or leave the profession; • Offer qualified employment opportunities in the field of research to young graduates; • Strengthen the research capacity of the institutions involved through the availability of additional young and qualified researchers. <p><i>Specifics</i></p> <ul style="list-style-type: none"> • Financial aid for the hiring of research staff that obtained a degree in one of the research organisations (universities, public research organisations, university hospitals) located in Castilla y Leon region. • Successful applicants are hired with a temporary contract for a three/four year duration to carry out research work under the supervision of a senior researcher in the selected institution. Benefits are reserved to recent graduates with Spanish degrees or equivalent degrees obtained within the European Area of Higher Education, legally residing in Spain. • The ESF Programme covers the labour costs incurred by the research organisation involved for the hiring of graduates (EUR 81 307 each). <p><i>Facts</i></p> <ul style="list-style-type: none"> • Spain has lost more than 12 000 scientists between 2010 and 2015 • The ratio of PhD graduates per full time researcher in Spain grew from 1.79 in 2010 to 2.28 in 2014. 	
<p>Externalities and main transmission mechanisms</p> <p>Potentially, all European countries can benefit from the effects of this project. The increased R&D will produce spillovers through the following two transmission mechanisms:</p> <ul style="list-style-type: none"> • <i>Internalisation of activities:</i> since universities and research institutions are increasingly more open to foreign students and staff, recent graduates from abroad may apply for the ESF grants (on condition that they take legal residence in Spain), enjoying the benefits for their career start-up. Therefore, the opportunity offered is valid also for 	

foreign graduates who have obtained their degree in another country within the European Higher Education Area. Foreign graduates may benefit from the research contract, enriching their work experience and improving the chance of getting future employment opportunities.

- *Researchers mobility*: after the duration of the temporary contract, experienced researchers may be employed abroad in other universities or research organisations. The skills acquired in their early career contract may therefore produce benefits in the researchers' destination country. Furthermore, foreign hiring entities will significantly benefit from the researchers' subsidised contracts.

The transnational spillovers noted above are unintended effects of the project, which is focused on fostering and retaining Spanish graduates. In particular the spillover associated with the mobility of the researchers after the conclusion of the contracts is an unintended negative result that goes against one of the main aims which is to ensure that the young researchers build a career in Spain. Nevertheless, given the importance of collaboration and networks for the development of knowledge, both these externalities may not be completely negative for Castilla y Leon if social relationships and international contacts help improve research productivity in the institutions hosting the projects.

Website and contacts:

<http://www.jcyl.es/>

Junta de Castilla y Leon - Consejería de Educación
Dirección General de Universidades e Investigación
Servicio de investigación científica, transferencia de conocimiento e infraestructura universitaria

Sources:

<http://ec.europa.eu/esf/main.jsp?catId=46&langId=en&projectId=501>

<http://www.educa.jcyl.es/universidad/es/servicio-investigacion-cientifica/ayudas-subvenciones-investigacion/ayudas-realizacion-contratos-personal-investigador-recien-t>

Project title	IMPROVING THE QUALITY OF HIGHER EDUCATION THROUGH CENTRES OF EXCELLENCE IN STRATEGIC RESEARCH AREAS AT THE UNIVERSITY OF MISKOLC - HUNGARY
Context information	<p>Operational Programme: Economic Development and Innovation</p> <p>Programming period: 2007-2013</p> <p>Beneficiaries: University of Miskolc</p> <p>Financial value: EUR 7.6 mln</p> <p>EU resources: ESF EUR 7.3 mln</p>
Objectives and background	
<p>The aim of the project is to support the setting up of research groups with the aim of reaching the critical mass needed for pursuing R&D&I activities at an international level.</p>	
<p>The project implies a focused and long-term commitment to stimulate the development of teaching and learning methods at bachelor, masters and research levels. The objective is to promote higher education around these centres through the employment of researchers recognised at international level. The involvement of talented young people in outstanding doctoral programmes is a priority task, thus training the new generation to carry on the academic and research work of the institution (and, in general, of higher education in Hungary).</p>	
<i>Specifics</i>	
<ul style="list-style-type: none"> • Increasing the attraction of research through improved quality and excellence; this can be achieved by ensuring the critical accumulation of infrastructure and intellectual capacity in priority research fields of strategic importance both for the economy and society. • Supporting research activities in order to improve the University's scientific impact and international profile. By keeping local young researchers in the region and attracting PhD students, post-doctoral researchers and renowned senior researchers to Northern Hungary and creating the commensurate research jobs. • Fostering the development of environmentally friendly technologies. Actions include the development of the university's laboratory infrastructure and equipment, the development of an advanced computer network and the strengthening of the national and international network of the University of Miskolc, which includes among others: Hungarian Bosch companies, which founded the Robert Bosch Department of Mechatronics in 2005, Electrolux Lehel Hűtőgépgyár Ltd., Jászberény, PREC-CAST Foundry Ltd. 	
<i>Facts</i>	
<ul style="list-style-type: none"> • The number of full-time lecturers and researchers with an academic degree increased from 359 to 374. • 1302 periodical and conference articles as well as 10 monographs were published during the last two years. • Research, development and innovation activities include 111 research subjects at centres of excellence. • 468 lecturers and researchers (national and international), as well as 60 students in doctoral training participated in research activities promoted by the project. 	

Externalities and main transmission mechanisms

All EU countries can benefit from the research centres of Miskolc University; at the moment major collaborations in applied research of the Hungarian research centres are with German companies. The spillovers should be activated by the following mechanisms:

- *Researcher mobility*: part of lecturers and researchers, as well as students in doctoral training are from abroad. Due to their potential mobility the skills acquired in centres of excellence in strategic research areas of Miskolc University may produce long-term benefits in other destination countries and could provide real, attractive options to young researchers in the region.
- *Hierarchy/Network effect*: The improved quality level of the centres is attractive both for researchers from the academia, and the private scientific sector and the business community. This should promote research at national and European level, resulting in the kick off of a number of additional projects, developing also international academic and research networks.

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Sources:

<http://ec.europa.eu/esf/main.jsp?catId=46&langId=en&projectId=941>

https://tka.hu/docs/palyazatok/4_viskolcz_heicc_miskolc_tempus_final.pdf

<https://hipa.hu/images/HIP/Innovation%20sector%20overview.pdf>

<http://nkfih.gov.hu/innovation/regional-knowledge/knowledge-intensive>

Project title	OSIJEK WATER INFRASTRUCTURE IMPROVEMENT PROJECT PHASE II - CROATIA
Context information	<p>Operational Programme: Competitiveness and Cohesion Operational Programme</p> <p>Programming period: 2014-2020</p> <p>Beneficiaries: Vodovod-Osijek d.o.o.</p> <p>Financial value: EUR 33 mln</p> <p>EU resources: ERDF EUR 19 mln</p> <p>National resources: EUR 4 mln</p>
<p>Objectives and background</p> <p>Situated in the eastern part of the country, Osijek is Croatia's fourth largest city with a population of around 110 000 inhabitants. It is the seat of Osijek-Baranja County and the economic and cultural centre of the historical region of Slavonia. The city is also an important production centre for the chemical industry as regards products such as soaps, cosmetics and detergents. Water is an essential feature of Osijek. The city lies on the right bank of the river Drava.</p> <p>The project involves the construction of a plant for the treatment of waste water generated both in the urban agglomeration of Osijek and the neighbouring villages of Bilje and Darda covering 170 000 inhabitants. The sewerage system is being extended to the town of Čepin and the villages of Brijesće and Tenja, resulting in the coverage of 100% of the population of the Osijek area.</p> <ul style="list-style-type: none"> • This treatment stage further improves the quality of effluent before it is discharged into rivers, lakes, wetlands, the ground or the sea. The project ensures full compliance with EU standards related to the treatment of urban waste water. <p>Specifics</p> <ul style="list-style-type: none"> • Construction of a plant for the treatment of waste water generated both in the urban agglomeration of Osijek and the neighboring villages of Bilje and Darda, with a treatment capacity for a population of 170 000. A new sewage collector will also be built to the north of the city. • Extending the sewerage system to the town of Čepin and the villages of Brijesće and Tenja means it will cover close to 100 % of the population within the wider Osijek area. • Sewage overflows are rebuilt to reduce the frequency of flooding from the network, as well as the resulting sewage and its infiltration into and contamination of groundwater. • The supply of the latest equipment required to carry out sewer inspections are ensured. Such equipment should contribute to the long-term effectiveness of sewer-system management in the area. 	

Facts

- 98 % of the area's population will be connected to infrastructure for the tertiary treatment of waste water this amounts to a treatment capacity for a population of 170 000.

Externalities and transmission mechanisms

The positive externalities on environmental benefits come from reduced discharge of saline wastewater into natural water bodies. The objective of the investment is to provide basic services for the quality of life reducing the environmental impact and improving water quality management. In this sense, the project spillover effect may be the reduction of the negative externalities of pollution and waste of natural resources generated by human activities.

The *Geographical Linkage* of the river Dravda generate positive externalities which will be transmitted to downstream countries.

The Drava is around 710 km long and, after rising in the north of Italy, close to the Austrian border, flows through Austria, Slovenia and Croatia, before forming part of the border between Croatia and Hungary. Consequently all these countries will benefit from cleaner river water.

Website and contacts:

<http://vodovod.com/>

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E-mail uprava@vodovod.com

Sources: http://ec.europa.eu/regional_policy/en/projects/croatia/better-water-supply-and-waste-water-collection-and-treatment-infrastructure-in-osijek

Project title	BOILER DENITRIFICATION AND FLUE GAS DESULFURIZATION –SLOVAKIA
Context information	<p>Operational Programme: Environment Operational Programme</p> <p>Programming period: 2007-2013</p> <p>Beneficiaries: TepláreňKošice, a.s.</p> <p>Financial value: EUR 24 mln</p> <p>EU resources: ERDF EUR 6 mln</p> <p>National resources: EUR 18 mln</p>
<p>Objectives and background</p> <p>The Teko Kovice powerplant is located just outside Kovice, the second most populous city of Slovakia, located in the Eastern part of Slovakia, closely bordering Hungary to the south and Ukraine to the west. The Teko powerplant is one of the largest producers and distributors of heat and power in Slovakia with a production of 806886 Mwh.</p> <p>The aim of the project is to harmonise the functioning of the PK4n boiler in accordance with the Best Available Techniques (BAT) requirements. The most important environmental activities are catalytic de-nitrification of flue gas (SCR) and the construction of a flue gas de-sulphurizer including a fabric filter. By reducing SO₂, solids and NO_x emissions from steam boilers, the TEKO II project will help to improve air quality in Košice.</p> <p><i>Specifics</i></p> <p>The project implements 2 BAT measures:</p> <ul style="list-style-type: none"> • Catalytic de-nitrification of ceramic catalytic converters (SCR) and active ammonia in PK4n. Catalytic converters reduce the amounts of nitrogen oxides, carbon monoxide, and unreacted hydrocarbons in emission. • De-sulphurization system built for boilers PK4n and PK4 b with a semi-dry method using active substance lime hydrate, which also reduces emissions of solids. Desulphurisation is a process that removes sulphur from a material. This reduces the release of harmful sulphur compounds into the environment, particularly sulphur dioxide (SO₂) which leads to acid rain. <p><i>Facts</i></p> <ul style="list-style-type: none"> • The project will achieve a reduction of particulate emissions from the boiler PK4n by 41%, SO₂ by 70% and NO_x by 50%. 	
<p>Externalities and transmission mechanisms</p> <p><i>The environmental benefits</i> of the power plant will be transmitted through <i>geographical linkages</i> as well as <i>biological connections</i>. The positive spillovers generated by the processes are a global improvement of air quality in nearby neighbouring countries. The borders of Hungary and Ukraine are 16 and 60 km away respectively and the increased air quality will have tangible health and environment benefits in these neighbouring countries.</p>	
<p>Website and contacts:</p> <p>http://www.teko.sk;</p> <p>TepláreňKošice, a. s., Teplárenská 3, 042 92 Košice</p> <p>info@teko.sk</p>	
<p>Sources:</p> <p>http://www.teko.sk;</p> <p>http://provyko.cz/en/clanky/denitrification-of-boiler-pk4n-in-the-heating-plant-kosice-a-s;</p>	

Project title	COUNTY WASTE MANAGEMENT CENTRE KAŠTIJUN - CROATIA
Context information	<p>Operational Programme: Environment Operational Programme</p> <p>Programming period: 2007 - 2013</p> <p>Beneficiaries: Kaštijund.o.o</p> <p>Financial value: EUR 35 mln</p> <p>EU resources: ERDF EUR 25 mln</p> <p>National resources: EUR 10 mln</p>
<p>Objectives and Background</p> <p>The Kaštijun Waste Management Centre, located in Kaštijun near Pula, is the Istrian county waste management centre. The centre prevents environmental pollution and enables maximum exploitation of valuable raw materials that can be salvaged by recycling through modern technology. Minimising waste will allow the closure of the uncontrolled dumpsites as well as limit uncontrolled waste leakage And help to reduced health risks for the population in the surrounding area.</p> <p>The project contributes to the reduction of greenhouse gas emissions, thanks to a decrease in, or proper collection of, methane and carbon dioxide emissions. Furthermore, the centre produces electricity and heat without using fossil fuels which leads to further emission savings. The system of waste management will apply the more advanced technology for the prevention of environmental pollution and the production of recycled materials to be reintroduced in the industrial supply chain.</p> <p><i>Specifics</i></p> <p>Structures built</p> <ul style="list-style-type: none"> • Entry/exit zone infrastructures • Waste processing plant (MBT) with an annual capacity of 90.000 tons of unsorted municipal solid waste to include a de-dusting system and a bio-filter. • Temporary storage zone. • Landfill zone. • Biogas collecting and processing zone • Wastewater collecting and processing zone. <p>Activities taking place at the Centre</p> <ul style="list-style-type: none"> • Processing of sorted or unsorted Municipal Solid Waste (MSW) • The redistribution of recycled materials. • Energy production (SRF). • Effective disposal of treated waste. <p><i>Facts</i></p> <ul style="list-style-type: none"> • Waste management services will cover a total of 41 local government areas • Istria is the first Croatian county to apply EU standards in waste management with the opening of this facility. 	

Main transmission mechanisms and externalities

The environmental and economic spillover benefits will be transmitted through proximity mechanisms:

- Air pollution can travel long distances and crosses national borders, affecting people far away from its source. Better quality tanks for the collection of methane will affect regions further away and indeed have the strongest impact on the closest neighbouring countries – Italy and Slovenia.
- The cleaner environment will make the region more attractive, potentially affecting the region's tourism sector. Furthermore, a cleaner environment in the region also leads to healthier life- and work conditions.

Website and contacts:

<https://www.kastijun.hr/>

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E-mail: info@kastijun.hr

Sources:

http://ec.europa.eu/regional_policy/en/projects/croatia/waste-management-centre-to-reduce-landfilled-waste-in-croatia;

http://www.exstructa.hr/portfolio_page/construction-of-county-waste-management-centre-mariscina-rijeka-and-construction-of-county-waste-management-centre-kastijun-pula/;

Annex D - Bibliography of Chapter 1

- AAVV (2006) *An industrial policy for Europe? Context and concepts*, European Investment Bank, *EIB papers*, vol. 11, n.1
- Acemoglu, D., Aghion, P., and Zilibotti, F. (2002) *Distance to Frontier, Selection and Economic Growth*, NBER Working Paper No. 9066
- Aghion, P., Cohen, E. (2004) *Education et Croissance*, La Documentation Francaise, Paris
- Aghion, P., Howitt, P. (1992) *A Model of Growth Through Creative Destruction*, *Econometrica* 60/2
- Annett A. (2007) *Lessons from Successful Labor Market Reformers in Europe*, IMF Policy Discussion Paper
- Applica, Ismeri Europa (2008) *Ex post evaluation of cohesion policy programmes 2000-2006*, Working package 1, Task 4, Various national reports.
- Arrow, K.J. (1962) *The Economic Implication of Learning by Doing*, *The Review of Economic Studies*, Vol. 29, No. 3
- Baldwin R., Forslid R., Martin P., Ottaviano G. and Nicoud F.R. (2003) *Economic geography and public policy* Princeton University Press, Princeton (USA)
- Barrios S., Strobl E. (2006) *The dynamics of regional inequalities*, Economic papers n° 229, European Commission (Directorate-general for economic and financial affairs)
- Barro, R.J. (1990) *Government Spending in a Simple Model of Endogenous Growth*, *The Journal of Political Economy* 106/2
- Barro, R.J. (2001) *Human Capital and Growth*, *The American Economic Review*, Vol. 91, No. 2
- Becattini, G. (1978) *The Development of Light Industry in Tuscany: An Interpretation*, *Economic Notes* 2
- Beckerman, W. (1962) *Projecting Europe's Growth*, *The Economic Journal* 72
- Begg, J. and El-Agraa Ali M. (2004) *The economics of the single market*, in El-Agraa, Ali M. (ed.) (2004) *The European Union-Economics & Policies*, Prentice Hall, London
- Bohman, J., Reigh, W. (eds) (1997) *Deliberative democracy. Essays on reasoning and politics*, Mit Press, Cambridge (Mass.)
- Boldrin, M., Canova, F. (2001) *Inequality and Convergence in Europe's Regions: Reconsidering European Regional Policies*, *Economic Policy* 32
- Buelens C., Garnier G., Meiklejohn R., Johnson M. (2007) *The economic analysis of state aid: some open questions*, in *European Economy Economic papers* n° 286
- Camagni, R. (2007) *Towards a concept of territorial capital*, Paper presented at the 47th Congress of the European Regional Science Association, Paris
- Camagni, R., Maillat, D., Matteacioli, A., Perrin, C. (eds) (1999) *Le paradigme du Milieux Innovateur dans l'Economie Spatiale Contemporaine*, *Revue d'économie regionale et urbaine*, Numero special sur le milieux innovateur
- Castells-Quintana D. Royuela V., 2014, *Tracking positive and negative effects of inequality on long-run growth*, Institut de Recerca en Economia Aplicada Regional i Pública, Document de Treball 2014/01

-
- Castiglione, D., Van Deth, J. W., Wolleb, G. (eds) (2008) *Handbook of social capital*, Oxford, Oxford University Press.
 - Cecchini, P. (1988) *The European challenge 1992: the benefits of single market*, Wildwood House.
 - Cersosimo D., Nisticò, R. (2008) *Social Capital in Economics*, in Castiglione, D., Van Deth, J.W., Wolleb, G. (eds) *Handbook of social capital*, Oxford, Oxford University Press
 - Cohen, J. (1986) *An Epistemic Conception of Democracy*, in *Ethics*, 97
 - Coleman, J. (1988) *Social Capital in the Creation of Human Capital*, *American Journal of sociology* 94
 - Coleman, J. (1990) *Foundations of Social Theory*, Cambridge, M.A., Harvard University Press
 - Commission on Growth and Development (2008) *Growth Report- Strategies for sustained growth and inclusive development*, The International Bank for Reconstruction and Development/The World Bank
 - Crescenzi, R., Di Cataldo, M. Rodríguez-Pose, A. (2016) *Government quality and the economic returns of transport infrastructure investment in European regions*. *Journal of Regional Science*. ISSN 0022-4146
 - Dosi, G., Marengo, L., Fagiolo, G. (2005) *Learning in Evolutionary Environments*, in Dopfer, K. (ed.) *The Evolutionary Foundations of Economics*, Cambridge University Press, Cambridge
 - EIB (2006) *An industrial policy for Europe? Context and concepts*, Volume 11, n°1
 - El-Agraa, Ali M. (ed.) (2004) *The European Union-Economics & Policies*, Prentice Hall, London
 - Elster, J. (ed) (1998) *Deliberative Democracy*, Cambridge, Cambridge University Press
 - Emerson, M., Anjean, M, Catinat, M., Goybet, P., and Jaquemin, A. (1988) *The economics of 1992: The EC Commission's assessment of the economic effects of completing the internal market*, Oxford, Oxford University Press
 - European Commission (2000) *Real convergence and catching-up in the EU*, in *European Economy Review*
 - European Commission (2002) *Commission Recommendation for the 2002 Broad Guidelines of the Economic Policies of the Member States and the Community*, ECFIN/210/02
 - European Commission (2003) *Broad guidelines of the economic policies of the Member States and the Community (for the 2003–05 period)*
 - European Commission (2003) *Education, training and growth*, in *European Economy Review*
 - European Commission (2004) *Catching-up, growth and convergence of the new members states*, in *European Economy Review*
 - European Commission (2004) *Macroeconomic development in the Euro area*, in *European Economy Review*
 - European Commission (2003) *Public finance in EMU*, in *European Economy* n°3
 - Frick S., Rodríguez-Pose A., 2018, *Big or Small Cities? On city size and economic growth*, *Growth and Change* Vol. 49 No. 1 (March 2018), pp. 4–32

- Gennaioli N., La Porta R., Lopez-de-Silanes F., Shleifer A., (2011) *Human Capital and Regional Development* National Bureau of Economic Research, Working Paper 17158
- Giannetti, M., Guiso, L., Jappelli T., Padula, M. and Pagano, M. (2002) *Financial market integration, corporate financing and economic growth*, Economic Papers, n.179, European Commission, DG Economic and Financial Affairs, Bruxelles
- Granovetter, M. (1985) *Economic Action and Social Structure: The Problem of Embeddedness*, The American Journal of Sociology, Vol. 91, No. 3
- Grossman, G.M., Helpman, E. (1994) *Innovation and Growth in the Global Economy*, Cambridge MA, Mit Press
- Habermas, J. (1991) *The Theory of Communicative Action*, Oxford, Polity Press
- Hall, R.E., Jones, C.I. (1999) *Why Do Some Countries Produce So Much More Output per Worker than Others?*, Quarterly Journal of Economics, 114(1)
- Harrod, R.F. (1939) *An Essay in Dynamic Theory*, The Economic Journal 49
- Hervé, K. et al. (2007) *Globalisation and the Macroeconomic Policy Environment*, OECD Economics Department Working Papers, No. 552
- Iammarino S., Rodríguez-Pose A. Storper M., 2018, *Regional Inequality in Europe: Evidence, Theory and Policy Implications*, CEPR Discussion Paper No. DP12841
- Kaldor, N. (1961) *Capital Accumulation and Economic Growth*, in Lutz, F.A. (ed.) *The theory of capital*, Mac Millan, London
- Kaldor, N. (1970) *The Case of Regional Policies*, Scottish Journal of Political Economy, Vol.XVII, n.3
- Kaldor, N. (1981) *The Role of Increasing Returns, Technical Progress, and Cumulative Causation in the Theory of International Trade and Economic Growth*, *Economie Applique*, n.34
- KPMG and Prognos (2016), *Work Package 4: Support to large enterprises*, Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF). Study commissioned by DG Regio.
- Krishna, A. (2008) *Social Capital and Economic Development*, in Castiglione, D., Van Deth, J.W., Wolleb, G. (eds), *Handbook of social capital*, Oxford, Oxford University Press
- Krugman, P. (1991) *Geography and Trade*, MIT Press, Cambridge
- Krugman, P. (1991.b) *Increasing Return and Economic Geography*, *The Journal of Political Economy* 39/3
- Lagakos D., Moll B., Porzio T., Qian N., Schoellman T. (2012) *Experience Matters: Human Capital and Development Accounting*, National Bureau of Economic Research, Working Paper 18602
- Leftwich, A. (1993) *Governance, Democracy and Development in the Third World*, *Third world Quarterly*, Vol. 14 (3)
- Lewis, W.A. (1951) *The Theory of Economic Growth*, London, Allen&Unwin
- Lewis, W.A. (1954) *Economic Development with Unlimited Supply of Labour*, *The Manchester School* 22
- Lucas, R.E. (1988) *On the Mechanics of Economic Development*, *The Journal of Monetary Economics* 22/1

- Martin, C., Velazquez F.J, Funck B. (2001) *European integration and income convergence*, World Bank papers, WTP514
- Mayes, D., Kilponen, J. (2004) *Factor mobility*, in El-Agraa, Ali M. (ed.) *The European Union-Economics & Policies*, Prentice Hall, London
- Monfort, P., Piculescu, V., Rillaers, A., Stryczynski, K., Varga, J. (2016) *The impact of cohesion policy 2007-2013: model simulations with Quest III*, Final Report of Work Package 14a Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF)
- Myrdal, G. (1957) *Economic theory and underdeveloped regions*, London, Duckworth.
- Nelson, R.R., Phelps, E.S. (1966) *Investment in Humans, Technological Diffusion and Economic Growth*, American Economic Review, n.56, 1/2
- OECD (2001) *Territorial Outlook*, 2001. Paris: OECD.
- OECD (2005) *Building competitive regions: strategies and governance*
- OECD (2007) European Union, *Economic Survey*, Volume 2007, Issue 11
- OECD (2007) *Globalisation and Regional Economies: Can OECD Regions Compete in Global Industries?*, Reviews of regional innovation
- OECD (2005) *Building competitive regions. Strategies and governance*
- OECD, WTO and World Bank (2014) *Global Value Chains: Challenges, Opportunities, And Implications For Policy*, Report prepared for submission to the G20 Trade Ministers Meeting Sydney, Australia, 19 July 2014
- Ostrom, Elinor (1990). *Governing the commons: the evolution of institutions for collective action*. Cambridge New York: Cambridge University Press.
- Osborne, D and Gaebler, T. (1992) *Reinventing government*, Addison-Wesley Publ. Co.
- Ottaviano, G., Thisse, J.F. (2004) *Agglomeration and Economic Geography*, in Henderson J.V., Thisse J.F. (eds) *Handbook of regional and urban economics*, edition 1, Vol. 4, Elsevier
- Pelinescu E. (2016) *Human capital and Competitiveness in UE*, Internal Audit and risk management, Annual XI Nr.3(43), September 2016.
- Pfluger, M. (2004) *Book Reviews* in Journal of Economic Geography, 4
- Porter, M. (1990) *The Competitive Advantage of Nations*, Mac Millan, London
- Putnam, R.D., Leonardi, R., Nanetti, R.J. (1993) *Making Democracy Work*, Princeton, Princeton University Press
- Pyke, F., Becattini, G., Segemberger, W. (1990) *Industrial Districts and Inter-firm Cooperation in Italy*, International Institute for Labour Studies, Geneva
- Ramsey, F.P (1928) *A Mathematical Theory of Saving*, The Economic Journal 38
- Rhodes, R.A.W (1997) *Understanding Governance*, Buckingham and Philadelphia: Open University Press
- Rocha R., Ferraz C. and Soares R.R. (2015) *Human Capital Persistence and Development*, IZA DP No. 9101, June 2015
- Rodrik, D. (2000) *Institutions for High-quality Growth: What They are and How to Acquire Them*, National Bureau of Economic Research, W.P. 7540, Cambridge, MA

- Rodrik, D. (2003) *Institutions, Integration and Geography: in Search of the Deep Determinants of Economic Growth*, in Rodrik, D. (ed.) *In search of prosperity: analytic country studies on growth*, Princeton, Princeton University Press
- Rodrik, D. (2007) *Normalizing Industrial Policy*, Paper prepared for the commission on growth and development
- Romer, P.M. (1986) *Increasing Returns and Long-Run Growth*, *The Journal of Political Economy* 98/5
- Romer, P.M. (1990) *Endogenous Technological Change*, *The Journal of Political Economy* 98
- Rostow, W.W. (1960) *The Stages of Economic Growth*, Cambridge, Cambridge University Press
- Sabel C., Dorf M. C. (2006) *A Constitution of Democratic Experimentalism*, M. A. Harvard University Press
- Santos, I. (2008) *Is Structural Spending on Solid Foundations?*, Bruegel Policy Brief 2008/02, Brussels: Bruegel
- Sapir, A. (2003) *An Agenda for a Growing Europe*, European Commission
- Schumpeter, J. (1934) *The Theory of Economic Development*, Harvard University Press
- Sen, A. (1999) *Development as Freedom*, Oxford, Oxford University Press
- Senior Nello S. (2005) *The European Union- economics, policies and history*, McGraw Hill, Berkshire
- Seravalli, G. (2006) *Né facile né impossibile. Economia e politica dello sviluppo locale*, Donzelli Editore, Roma.
- Seravalli, G., and Landabaso, M. (2008) *Different theoretical approaches behind innovation policies*, mimeo.
- Shankar R., Shah A. (2001) *Bridging the economic divide within nations: A scorecard on the performance of regional development policies in reducing regional income disparities*, Policy research working paper 2727, World Bank
- Sierhej R., Rosenberg C.B. (2007) *Interpreting EU Funds Data for Macroeconomic Analysis in the New Member States*, IMF Working Paper No. 07/77
- Solow, R.M. (1956) *A Contribution to the Theory of Economic Growth*, *The Quarterly Journal of Economics* 70
- Solow, R.M. (1970) *Growth theory: an Exposition*, Oxford University Press, Oxford.
- Swan, T.W. (1956) *Economic Growth and Capital Accumulation*, *Economic Record*, 32
- Tabellini, G. (2003) *Principles of Policy Making in the European Union: an Economic Perspective*, CESIFO Economic Studies, vol. 49.

Annex E – Bibliography of Chapter 2

- Aghion P. and Schankerman M. (1999) *Competition, entry and the social returns to infrastructure in transition economies*, *Economics of transition*, 7(1), 79-101.
- Barca F. (2009) *An agenda for a reformed cohesion policy*, *Independent Report prepared at the request of Danuta Hübner*, Commissioner for Regional Policy.
- Bartkiewicz P., Matejczuk A., Kalinowski H., Oska M., Regulski A. and Zawistowski J. (2016) *How do EU-15 Member States Benefit from the Cohesion Policy in the V4?*, Report commissioned by Polish Ministry of Economic Development, executed by Imapp and Ibs.
- Becker S., Egger P., von Ehrlich P. (2010) *Going NUTS: The effect of EU Structural Funds on regional performance*, *Journal of Public Economics*, 94.
- Beer C., Belabed C.A., Breitenfellner A., Ragacs C. and B. Weber (2017) *Österreich und die europäische Integration*. OeNB Monetary Policy and the Economy, No. Q1/17.
- Beutel J. (2002) *The economic impact of objective 1 interventions for the period 2000 – 2006*, Final Report to the Directorate-General for Regional Policies EC
- Bondonio D. (2016) *The impact of varying per capita intensities of EU Funds on regional growth: Estimating dose response treatment effects through statistical matching. Propensity score matching - Final Technical Report*, Work Package 14d of Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), Directorate-General for Regional and Urban Policy, Brussels.
- Bradley J., and Untiedt G. (2008) *Do economic models tell us anything useful about Cohesion Policy impacts? A comparison of HERMIN, Quest and ECOMOD*, in Stierle-von Schütz U., M.H. Stierle, F.B. Jennings, A. Kuh *Regional Economic Policy in Europe – New Challenges for Theory, Empirics and Normative Interventions*. E.Elgar, Cheltenham UK.
- Bradley J., G. Untiedt and J. Zaleski (2009) *The Economic Return of Cohesion Expenditure for Member States*, DG Internal Policies Study, Table 11.
- Caruana-Galizia P. and Martí-Henneberg J. (2013) *European regional railways and real income, 1870–1910: a preliminary report*. *Scandinavian Economic History Review*, 61(2), 167-196.
- Coelho M. P. and M. L. Oliveira M. L. (2011) *Externalities and Public Provision of Education*, *International Journal of Latest Trends in Finance & Economic Sciences*, Vol-1 No. 3 September.
- Dall'erba S. and Le Gallo J. (2008) *Regional convergence and the impact of European structural funds 1989–1999: a spatial econometric analysis*, *Papers in Regional Science*, Vol. 82, No. 2, pp. 219–244.
- D’Antonio M., Colaizzo R. and Leonello G. (1988) *Mezzogiorno/centre-North: A two-region model for the Italian economy*, Volume 10, Issue 3, *Journal of Policy Modeling*.
- Davies S. (2017) *Does Cohesion Policy Work? Meta-Review of Research on the Effectiveness of Cohesion policy*, European Policy Research paper No.99.
- Donaldson D. (2017) *Railroads of the Raj: Estimating the impact of transportation infrastructure*, *American Economic Review*. Forthcoming.
- Esposti R. and Bussoletti S. (2008) *Impact of Objective 1 Funds on Regional Growth Convergence in the European Union: A Panel-data Approach*, *Regional Studies*, Vol. 42.2, pp. 159–173, March 2008.

- Estache A. and Fay M. (2007) *Current debates on infrastructure policy*. World Bank Policy Research Working Paper 4410, World Bank.
- European Commission - DG Regio (2004) *A New Partnership for Cohesion, Third report on economic and social cohesion*, February, p. XVII.
- European Commission - DG Regio and Joint Research Centre Seville (2016) *The impact of cohesion policy 2007-2013: model simulations with RHOMOLO - Summary of Simulation Results - Work Package 14b*, Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), Directorate-General for Regional and Urban Policy, Brussels.
- Gorzelak G., Hryniewicz J., Kozak M., Płoszaj A., Rok J., Smętkowski M. (2017) *Data review and mapping of Cohesion Policy implementation and performance*. Cohesify Research Paper 7.
- KPMG and Prognos (2016) *Support to large enterprises*, Final Report Work Package 4 of the 2007-2013 ERDF ex-post evaluation. Study commissioned by the EC - DG Regio.
- Laffont, J.J. (2008) *Externalities*, The New Palgrave Dictionary of Economics; 2nd ed.; pp. 192-4.
- Landesmann M. and Hanzl D. (2016) *Correcting external imbalances in the European economy*; Ch. 3 in: *Boosting European Competitiveness: The Role of CESEE Countries*; Edited by M. Belka, E. Nowotny, et al.; E. Elgar Publ.; pp. 14-38
- Levinson D. (2007) *Density and dispersion: the co-development of land use and rail in London*. *Journal of Economic Geography*, 8(1), 55-77.
- Lutz V.C. (1954) *Development problems in Southern Italy: the second Conference of the Cassa per il Mezzogiorno*, *PSL Quarterly Review*, Vol. 7, No 28,29;
- Metzler L.A. (1942) *The Transfer Problem Reconsidered*, *Journal of Political Economy*, Vol. 50, No. 3, pp. 397-414.
- Metzler L.A. (1950) *A Multiple-Region Theory of Income and Trade*, *Econometrica*, Vol. 18, No. 4, pp. 329-354.
- Metzler L.A. (1951) *A Multiple-Country Theory of Income Transfers*, *Journal of Political Economy*, Vol. 59, No. 1, pp. 14-29.
- Martin P. (1998a) *Can Regional Policies Affect Growth and Geography in Europe?*, *The World Economy* Volume 21, Issue 6, Pages 757-774.
- Martin P. (1998b) *Public Policies, Regional Inequalities and Growth*, *Journal of Public Economics*, 73, 85-105.
- Martin P. (2005) *The geography of inequalities in Europe*, *Swedish Economic Policy Review* 12, 83-108.
- Mohl P. and Hagen T. (2010) *Do EU structural funds promote regional growth? New evidence from various panel data approaches*, *Regional Science and Urban Economics* 40.
- Monfort P., Piculescu V., Rillaers A., Stryczynski K.*, Varga J. (2016) *The impact of cohesion policy 2007-2013: model simulations with Quest III, Final Report*. Work Package 14a Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), Directorate-General for Regional and Urban Policy, Brussels
- OECD (2009) *Regions Matter. Economic recovery, innovation and sustainable growth*. OECD.

- OECD (2012) *Promoting Growth in All Regions*, OECD.
- Orłowski M. W. (1996) *Droga do Europy. Makroekonomia wstepowania do Unii Europejskiej* (Road to Europe. Macroeconomics of integration into the European Union), GUS, Warszawa.
- Pellegrini G. and Cerqua A. (2016a) *Measuring the impact of Structural and Cohesion Funds using the Regression Discontinuity Design in EU15- Final Technical Report*, Work Package 14b – Task 1 of: Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), Directorate-General for Regional and Urban Policy, Brussels.
- Pellegrini G. and Cerqua A. (2016b) *Measuring the impact of Structural and Cohesion Funds using the Regression Discontinuity Design in EU27 - Final Technical Report*, Work Package 14c – Task 2 and 3 of: Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), Directorate-General for Regional and Urban Policy, Brussels.
- Pienkowski J. and Berkowitz P. (2015) *Econometric assessments of Cohesion Policy growth effects: How to make them more relevant for policy makers?*, European Commission, Regional Working Paper, Nr. 02/2015.
- Richter S. (2008) *Facing the Monster 'Juste Retour': On the Net Financial Position of Member States vis-à-vis the EU Budget and a Proposal for Reform*. ... Research Reports No. 348 p. 28-30.
- Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production", Review of International Economics.
- Timmer M. P., Los B., Stehrer R. and de Vries, G. J. (2016) *An Anatomy of the Global Trade Slowdown based on the WIOD 2016 Release*, GGDC research memorandum, Nr. 162, University of Groningen.
- Wiiw and Ismeri, (2015), *Geography of expenditure*. Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).
- Winter S. and Pfitzner A. (2013), *Externalities and subsidization of higher education*, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2013: Wettbewerbspolitik und Regulierung in einer globalen Wirtschaftsordnung - Session: Health and Education: Empirics, No. E07-V2M.

Annex F – Bibliography of Chapter 3

- Dunning, J. H. (2002). *Global Capitalism, FDI and competitiveness* (Vol. 2). Edward Elgar Publishing.
- EUROSTAT, various years, Input-Output tables of EU countries (<http://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/data/database>)
- Sutton, J., (1991), *Sunk Costs and Market Structure*, Cambridge, MA: MIT Press.

Annex G – Bibliography of Chapter 4

- Álvarez-Ayuso I. C., Condeço-Melhorado A. M., Gutiérrez J. & Zofío J. L. (2016) *Integrating Network Analysis with the Production Function Approach to Study the Spillover Effects of Transport Infrastructure*, *Regional Studies*, 50:6, 996-1015
- Archibugi D. & Iammarino S. (2002) *The globalization of technological innovation: definition and evidence*, *Review of International Political Economy* 9(1), 98–122
- Balland P., Boschma R. & Frenken K. (2015) *Proximity and Innovation: From Statics to Dynamics*, *Regional Studies*, 49:6, 907-920
- Blum U. (1998) *Positive Externalities and the Public Provision of Transportation Infrastructure: An Evolutionary Perspective*, *Journal of Transportation and Statistics*, 1(3), 81-88
- Boschma R. A. (2005) *Proximity and innovation. A critical assessment*, *Regional Studies*, 39(1), 61-74
- Brandsma A., Kanés, D., Monfort Ph. and A. Rillaers (2013) *RHOMOLO: A Dynamic Spatial General Equilibrium Model for Assessing the Impact of Cohesion Policy*, REGIO Working Paper 01/2013
- Breschi S. & Lissoni F. (2009) *Mobility of skilled workers and co-invention networks: an anatomy of localised knowledge flows*, *Journal of Economic Geography*, 9(4), 439-468
- Buckwalter D. W. (2003) *Highways and Regional Realignment in an Economic Frontier: The Case of Hungary*, *Eurasian Geography and Economics*, 44:2, 121-143
- Cantwell J. & Piscitello L. (2005) *Recent Location of Foreign owned Research and Development Activities by Large Multinational Corporations in the European Regions: The Role of Spillovers and Externalities*, *Regional Studies*, 39:1, 1-16
- Cappelli R. & Montobbio F. (2016) *European Integration and Knowledge Flows across European Regions*, *Regional Studies*, 50:4, 709-727
- Coelho M. P. and M. L. Oliveira M. L. (2011) *Externalities and Public Provision of Education*, *International Journal of Latest Trends in Finance & Economic Sciences*, Vol-1 No. 3 September
- DG REGIO and Joint Research Centre Seville (2016) *The impact of cohesion policy 2007-2013: model simulations with RHOMOLO. Summary of simulation results*, Luxembourg: Publications Office of the European Union, 2016
- European Commission (2017) *Boosting Growth and Cohesion in EU Border Regions*, Communication to the Council and the European Parliament, COM(2017) 534 final
- European Commission (2010) *Efficiency and effectiveness of public expenditure on tertiary education in the EU*, Occasional Paper n. 70, http://ec.europa.eu/economy_finance/publications
- European Union (2016) *Tracking climate expenditure. The common methodology for tracking and monitoring climate expenditure under the European Structural and Investment Funds (2014-2020)*,
- Gutiérrez J., Condeço-Melhorado A., López E. & Monzón A. (2011) *Evaluating the European added value of TEN-T projects: a methodological proposal based on spatial spillovers, accessibility and GIS*, *Journal of Transport Geography* 19, 840–850
- Hermannsson K., Lisenkova K., Lecca P., McGregor P. G., & Swales J. K.(2017) *The external benefits of higher education*, *Regional Studies*, 51:7, 1077-1088

- Hoekman B. (2015) *Subsidies and Spillovers in a Value Chain World: New Rules Required?*, RSCAS Policy Paper 2015/03
- Huggins R., Johnston A. & Stride C. (2012) *Knowledge networks and universities: Locational and organisational aspects of knowledge transfer interactions*, *Entrepreneurship & Regional Development*, 24:7-8, 475-502
- Lecca, P., Barbero, J., Christensen, M., Conte, A., Di Comite, F., Diaz-Lanchas, J., Diukanova, O., Mandras, G., Persyn, D. and Sakkas, S. (2018) RHOMOLO V3: A Spatial Modelling Framework, Publications Office of the European Union, Luxembourg
- Martín J. C., Gutiérrez J. & Román C. (2004) Data Envelopment Analysis (DEA) *Index to Measure the Accessibility Impacts of New Infrastructure Investments: The Case of the High-speed Train Corridor Madrid-Barcelona-French Border*, *Regional Studies*, 38:6, 697-712
- McAusland C. (2010) *Globalisation's Direct and Indirect Effects on the Environment*, in *OECD, Globalisation, Transport and the Environment*, OECD publishing, Paris
- McMahon W. W. (2004) *The Social and External Benefits of Education*, in *International Handbook on the Economics of Education*, G. Johnes and J. Johnes (Eds), Edward Elgar Publishing
- O'Carroll C., Harmon C. and Farrell L. (2006) *The economic and social impact of higher education*, Irish Universities Association, <http://hdl.handle.net/10197/672>
- OECD (1997) *Economic globalization and the environment*, OECD publishing, Paris
- OECD (2007) *Higher Education and Regions: Globally Competitive, Locally Engaged*, OECD publishing, Paris
- OECD (2009) *Regions Matter. Economic recovery, innovation and sustainable growth*, OECD publishing, Paris
- Paci R., Marrocu E. & Usai S. (2014) *The Complementary Effects of Proximity Dimensions on Knowledge Spillovers*, *Spatial Economic Analysis*, 9:1, 9-30
- Perkins R. and Neumayer E. (2009) *Transnational linkages and the spillover of environment-efficiency into developing countries*, *Global environmental change*, 19:3, 375-383
- Petersen M.S., Bröcker J., Enei R., Gohkale R., Granberg T., Hansen C.O., Hansen H.K., Jovanovic R., Korchenevych A., Larrea E., Leder P., Merten T., Pearman A., Rich J., Shires J., Ulied A. (2009) *Report on Scenario, Traffic Forecast and Analysis of Traffic on the TEN-T, taking into Consideration the External Dimension of the Union – Final Report*, Funded by DG TREN, Copenhagen, Denmark
- Quatraro F. & Usai S. (2017) *Are knowledge flows all alike? Evidence from European regions*, *Regional Studies*, 51:8
- Raunio M. & Kautonen M. (2014) *Transnationalizing innovation systems by transplanting innovation platforms*, *Innovation and Development*, 4:1, 145-160
- Schäffler J., Hecht V. & Moritz M. (2017) *Regional determinants of German FDI in the Czech Republic: new evidence on the role of border regions*, *Regional Studies*, 51:9, 1399-1411
- Shiftan Y., Ben-Akiva M., de Jong G, Hakkert S. & Simmonds D. (2002) *Evaluation of Externalities in Transport Projects*, *European Journal of Transport and Infrastructure Research* 2(3/4), 285-304

- Sianesi B. & Van Reenen J. (2003) *The Returns to Education: Macroeconomics*, journal of Economic Surveys, 17:2, 157–200
- Winter S. and Pfitzner A. (2013) *Externalities and subsidization of higher education*, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2013: Wettbewerbspolitik und Regulierung in einer globalen Wirtschaftsordnung - Session: Health and Education: Empirics, No. E07-V2M.

The study investigates the effects of Cohesion Policy (CP) which occur in a country other than the one in which CP resources were actually spent. The study estimates that macroeconomic spillovers significantly contribute to the impact of CP. Spillovers directed to EU countries represent around 9% of the total annual CP expenditure. Other spillovers to Non-EU countries are around 8% of the CP expenditure. Macro and micro spillovers together arrive at the 21% of the annual CP expenditure 67% of which is distributed among EU countries. Around 20% of the CP expenditure can trigger sectoral spillover effects in the environment, transport and higher education sectors. The analysis demonstrates that externalities reinforce EU growth and competitiveness without CP deserting its convergence objective.

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