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## Regional absorption capacity of EU funds

Ines Kersan-Škabić and Lela Tijanić

Faculty of Economics and Tourism “Dr. Mijo Mirković”, Juraj Dobrila University of Pula, Pula, Croatia

### ABSTRACT

Absorption of the financial resources allocated from the EU funds is a very important aspect of the European integration process, while there is a lack of empirical researches on the determinants of a country/region's abilities to efficiently absorb the money. This study investigates the influence of the chosen territorial economic preconditions important for successful absorption of EU funds over the last two Cohesion Policy programming periods, on the sample of convergence and developed NUTS 2 regions of the EU. The analysis is based on 86 regions that have GDP per capita less than 75% of the EU average (convergence regions) and 186 regions that have GDP per capita above 75% of the EU average (developed regions). By using panel data analysis, it is confirmed that the absorption of EU funds is conditionally affected by regional economic characteristics. The results of the study contribute to empirical researches on the determinants of regional absorption capacity in the EU and can be important in discussions surrounding Cohesion Policy planning and programming.

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## 1. Introduction

Cohesion policy is focused on creating the preconditions for the development of all European regions, but particularly ones that are lagging behind the average of the EU GDP per capita. It offers them instruments (funds) aimed to finance their development goals and activities which, on the one hand, arise from the Europe 2020 strategy but at the same time, cover numerous problematic areas in the development path of these regions (lack of adequate infrastructure, entrepreneurship, unemployment, etc.). Absorption is a very important aspect of the European integration process, especially for the new EU member states that anticipate receiving a huge amount of money from the EU budget and becoming net-beneficiaries of EU membership. The available funds seem to be a great opportunity for new member states, but this does not necessarily mean that countries and their regions/other subjects will be able to fully exploit them. Their success depends on the ‘absorption capacity’.

When we talk about the utilisation of EU funds there are a few interesting issues: (1) the influence of received funds on the economic (regional) development (growth) of a particular

**CONTACT** Ines Kersan-Škabić  [ikersan@unipu.hr](mailto:ikersan@unipu.hr)

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region/country/group of countries; (2) the influence of EU funds on the convergence process among EU countries/NUTS 2 regions; and (3) the capacity of a particular region/group of regions/countries for the absorption of EU funds. Considering the fact that the majority of papers on the subject address the first and second issue we found the third issue to be an unexploited area.

The aim of this article is to find out which indicators (economic, institutional, financial) can explain the absorption of funds in NUTS 2 regions in the EU. Our aim is not to repeat the case study on the country level because regions (NUTS 2) are subjects who participate in and can have benefits from the EU Cohesion Policy. We will first construct the conceptual framework of absorption capacity (based on the theory and availability of statistical data on the regional level) and then we will perform econometric panel data analysis to quantify the impact of the selected determinants on the EU funds absorption. The identification of the determinants that have a significant influence is important in regional absorption and can help to identify the best directions for the economic policymakers in achieving higher absorption rates.

The analysis will cover the period 2000–2013 and the absorptive capacity of both the Structural Funds and the Cohesion Fund. This article is organised as follows: the following section presents the literature review; the second section analyses the absorption of EU funds; the third section describes the data and methodology of our empirical analysis; the fourth section explains the results. The final section gives the concluding remarks in line with the main goal of this article.

## 2. Literature review

Regional policy of the EU is carried out through funds – European Structural and Investment Funds where the majority of activities are financed through the European Social Fund (ESF), the European Regional Development Fund (ERDF) and the Cohesion Fund. Although the EU member states have always had poorer regions, when the European Economic Community (EEC) was created the problem of their underdevelopment was considered a national issue. The ESF was established in 1958 (together with the establishment of the EEC) with the aim of providing financial help to member states in promoting employment (with no special regional concern). The ERDF, which is oriented to strengthening economic and social cohesion in the EU by reducing imbalances between its regions, was established in 1975. Since then, and especially after the EEC enlargement to Greece, Spain and Portugal in the 1980s (poorer countries), regional policy has become an important area of common concern, where the funds represent the main instruments in regional policy implementation. The effectiveness of the absorption of funds is a permanent challenge for EU member states, thus the need has arisen to analyse absorption capacity in detail – its scope, determinants and effects.

In analysing the existing literature on absorption capacity of EU funds, we found that a majority of papers deal with the estimation of the influence of funds on regional growth (Becker, Egger & Von Ehrlich, 2008; Cappelen et al., 2003; Ederveen, de Groot & Nahuis, 2006; Mohl & Hagen, 2010; Pellegrini et al., 2013; Pérez, Dones & Llano, 2009; Puigcerver-Peñalver, 2007; Varga & Veld, 2011). Some papers are related to the convergence analysis (Bachtler & McMaster, 2007; Beugelsdijk & Eijffinger, 2005; Dall'erba & Le Gallo, 2008; Kyriacou & Roca-Sagalés, 2012), while there is a lack of empirical research on the

determinants of a country/region's abilities to efficiently absorb the money from the EU funds. Here a significant contribution is made by, for example, Bouvet and Dall'erba (2010), Iatu and Alupului (2011) and Tosun (2013). Other studies in this area are usually focused on case study or comparison analyses.

There are different approaches in analysing the determinants that can influence the amount of received grants. Looking from a national perspective it is logical to observe the macroeconomic aspect. Zaman and Georgescu (2014) make a connection between the amount of grants received and a poor macroeconomic performance as a consequence of the global economic crisis (and low absorption of EU funds). But absorption takes place at the regional and local level where microeconomic aspects also have an important role.

It can be highlighted that especially new EU member states are faced on one hand with the possibility of receiving large amounts of money from the EU budget and on the other hand with numerous constraints on being able to get this available money. These constraints are difficult to identify and resolve in the short- and medium-term because they include having a specially educated workforce who understand the principles of EU cohesion policy and who also have specific knowledge about project management (how to write, implement, and report a project). There is also significant financial constraint, EU projects should be co-financed from national/regional/local resources and usually the local units do not have money reserved for these purposes. Zaman and Cristea (2011, p. 71) identified many obstacles in the absorption of EU funds in Romania such as multiple difficulties in the case of operations for identification of land for the location of certain large investment objectives, the legislative modifications allowing expropriations for road infrastructure projects of national interest being made with delay and triggering confusion.

There is also the inevitable role of institutions. Mihailescu (2012) gives a general comparative analysis of the corruption in the area of European financing and emphasises the reasons for Romania's unsatisfactory handling of EU funds in comparison with Poland. Braşoveanu, Silvestru, Pavel, and Onica (2011) recognised that the institutions for the management of EU funds are important. Furthermore, they describe the evolution of regional development policy, the financial allocations, the impact of EU funds within Cohesion Policy, legal and institutional framework in Romania. Markovič Hribernik, Kirbiš, and Vek (2008) made comparisons among the institutional environments in Ireland, Estonia and Slovenia (as the countries most successful in absorbing EU funds in the 2000–2006 programming period). They detected different management approaches to the EU funds: in Ireland decentralised with several managing authorities, and in Estonia and Slovenia more centralised at the national level. They do not come to a conclusion which approach is better – both can be effective and lead to high absorption results. Gruševaja and Pusch (2011) conducted a study on the effectiveness of Structural Funds in the countries of the first Central and Eastern European enlargement round in 2004 (on the regional level). The novelty of their research is the fact that they include (besides growth of income per capita, income per capita of the subsequent period, the investment rate, growth of human capital), three institutional variables: corruption (Corruption Perception Index [CPI]), the variable that has the value one in the case of accordance of a NUTS 2 region with a regional administration unit in the Central and Eastern European countries (CEECs) and equalisation variable – the role of strategies in effectiveness of Structural Funds. They found that CPI has a positive influence on Structural Funds (indicating that low corruption leads to higher growth/income effects of

Structural Funds flows in the regions). The regional administration variable and equalisation variable do not contribute to larger effects of Structural Funds according to their study.

Bachtler and McMaster (2007) examined the assumption that EU Structural Funds lead to stronger regionalisation ('stronger regions') in the EU8 member states through the building of regional structures and competences which are necessary to absorb funds. Although the regions have increased their role in managing their development (to bring the strategies, etc.) the authors warn that the limitations and barriers to regional participation in the funds currently outweigh the opportunities. The degree of sub-national involvement depends on constitutional arrangements, the institutional structures of individual countries, and the size of the country.

Fratesi and Perucca (2014) provide evidence on the relationship between structural characteristics (accessibility, public goods, stock of private capital, social capital, human capital, urban/rural typology, regional workforce) of the recipient regions of funds and the impact of the EU financial support on economic growth in CEECs NUTS 3 regions. Regions more endowed with territorial capital are more able to take advantage of the support of structural funds (Fratesi & Perucca, 2014, p. 187). Synthesis of the studies that have identified factors of the funds absorption degree in EU countries can be found in Achim and Borlea (2015). They also investigate the determinants of the absorption performance of European funds in the programming period 2007–2013 among the 28 Member States and have shown that good public governance has a positive impact on the absorption. Here it can be concluded that according to previous studies different regional economic characteristics have proved to be important in the absorption of EU funds. Another question that has to be addressed in more detail before performing empirical analysis is the determination of the terms 'absorption' and 'absorptive capacity' of the EU funds.

### 3. Absorption capacity

'The concept of absorptive capacity, whose foundations were originally designed in the context of firm theory, can be extended to more complex institutions, such as countries and regions' (Caragliu & Nijkamp, 2008, p. 1). Cace et al. (2009) discuss different interpretations of the term 'absorptive capacity', both in Europe and worldwide. Absorption is addressed in relation to EU enlargements, where the authors describe 'absorption capacity as the degree to which a county is capable to spend, actually and efficiently, the financial resources allocated from the Structural Funds' (Cace et al., 2009, p. 15). They also present integrative perspective of absorption capacity of the structural funds which confirms the complexity of the determinants that can have an influence on absorption.

Šumpíková, Pavel, and Klazar (2003), Zaman and Georgescu (2009) identified three approaches to analyse absorption capacity:

- (a) Macroeconomic absorption capacity – measured in GDP; current Cohesion Policy rules limit the transfer of EU funds to a maximum of 3.8% of the respective country's GDP.
- (b) Financial absorption capacity – ability to co-finance programmes and projects from structural funds.
- (c) Administrative capacity – ability and qualifications of central and local authorities to prepare programmes and projects, to report, coordinate and implement them.

Some authors identify two sides of absorption capacity: the supply side (the institutional system, created by the respective state to administrate the funds) and the demand side (from beneficiaries which are targeted to use the funds (Zaman & Georgescu, 2009)). The importance of heterogeneous territorial characteristics in the analysis of the relationship between EU regional policy and economic results is highlighted in Crescenzi and Giua (2014). They determined that regional socio-economic conditions are a positive conditioning factor for regional policy impacts, where demographics, productive structure and the labour market as well as regional innovative capacity and infrastructural endowment were included. The relationship between EU regional policy funding and regional growth is stronger for areas with more favourable socio-economic conditions (Crescenzi & Giua, 2014, p. 23), which confirms a potential paradox of the EU Cohesion Policy. This confirms that regional endowment is important in the implementation of regional policy and in the absorptive capacity analysis.

Mihailescu (2012) highlighted the importance of the decentralisation process that has led to a reform of public administration, the main beneficiary of the European funds. He connects the successfulness of absorption of EU funds with the level of local responsibility and authority because these levels are closest to the real needs. According to a report created by the Head of Public Administration department of the University of Warsaw (Grose, 2007), centralisation means inefficiency, inequity and corruption. It also states that economic inefficiency has many aspects: the budget funds, instead of being spent where generated, are first sent to the centre, then thoroughly processed by the bureaucratic apparatus and return to the territory through the principles arbitrary, on political merit. Grose (2007) also warns that an excessive centralisation of the Regional Operational Programmes (ROP) management system could lead to more cases of corruption. On the other hand, Coman and Coman (2010) cite the Irish example with the statement that a successful investment policy based on the absorption of EU funds is that which acknowledges that the prioritisation of strategic investment is government's responsibility, and not that of regional or local authorities.

The differences on the estimated impact of Cohesion Policy (confirmed in European Commission – Directorate-General for Regional & Urban Policy, 2014) between EU member states can be connected with differences between absorption rates across EU member states, which can be seen below in Table 1.

Table 1 confirms significant differences in absorption rates of the EU funds in and between EU new and old member states and between programming periods. There is no well developed conceptual framework of indicators of absorption and here it can also be seen that the results differ regarding the indicators used in measuring the absorption and also regarding the available funds.

As can be seen from the literature overview these significant differences across EU countries and regions in absorption capacity depend on numerous factors, regional internal characteristics highlighted above whose influence will be empirically investigated in the next section. It is assumed that heterogeneous territorial characteristics can have significant influence on absorption of the EU funds and that these factors will differ between less developed regions, which have GDP per capita below 75% of the EU average and the rest of the EU regions that have GDP per capita above 75% of the EU average. Those regions that have GDP per capita above 75% of the EU average are divided into transition and developed regions in programming period 2014–2020 and we have decided to use the term developed regions in order to differentiate this group of regions from less developed ones. Regions

**Table 1.** Indicators of absorption capacity of the ERDF, ESF and Cohesion funds (programming periods 2000–2006, 2007–2013).

Member States	ERDF				ESF				Cohesion Fund				
	Committed/ Decided (%)	Paid/Commit- ted (%)	Paid/Decided (%)	Committed/ Decided (%)	Committed/ Decided (%)	Paid/Commit- ted (%)	Paid/Decided (%)	Committed/ Decided (%)	Committed/ Decided (%)	Paid/Commit- ted (%)	Paid/Decided (%)	Committed/ Decided (%)	Paid/Commit- ted (%)
					2000–2006								
Austria	99.08	100.00	99.08	98.62	96.18	94.86	94.86						
Belgium	99.08	98.29	97.38	97.26	98.94	96.23	96.23						
Bulgaria													
Czech Republic	100.00	98.50	98.50	99.68	99.95	99.63	99.63	100.79	98.38	83.96	84.62	100.79	83.96
Cyprus	100.00	100.00	100.00	99.99	100.00	99.99	99.99	100.00	98.38	97.24	95.66	100.00	97.24
Denmark	94.18	100.00	94.18	91.66	99.99	91.65	91.65	100.00	100.00	100.00	100.00	100.00	100.00
Estonia	99.76	99.80	99.56	98.28	100.00	98.28	98.28	98.56	98.56	94.08	92.73	98.56	94.08
France	98.62	99.72	98.34	94.52	99.57	94.11	94.11						
Finland	99.92	100.00	99.92	96.33	100.00	96.33	96.33						
Greece	99.91	98.90	98.81	100.00	99.68	99.68	99.68	94.92	94.92	87.69	83.24	94.92	87.69
Germany	98.27	98.39	96.69	96.50	98.91	95.45	95.45						
Hungary	100.00	100.00	100.00	97.34	99.71	97.05	97.05	99.60	99.60	81.88	81.55	99.60	81.88
Ireland	99.97	94.42	94.40	99.86	100.00	99.86	99.86	98.93	98.93	94.60	93.59	98.93	94.60
Italy	99.81	97.67	97.49	97.93	94.05	92.10	92.10						
Luxembourg	100.00	100.00	100.00	82.68	100.00	82.68	82.68						
Lithuania	100.00	100.00	100.00	99.74	100.00	99.74	99.74	99.88	99.88	89.07	88.96	99.88	89.07
Latvia	100.00	100.00	100.00	100.00	100.00	100.00	100.00	94.76	94.76	95.92	90.90	94.76	95.92
Malta	100.00	100.00	100.00	99.62	100.00	99.62	99.62	100.00	100.00	89.33	89.33	100.00	89.33
Netherlands	98.31	100.00	98.31	99.22	98.86	98.10	98.10						
Portugal	99.93	100.00	99.93	94.94	105.02	99.70	99.70	97.21	97.21	91.56	89.00	97.21	91.56
Poland	99.98	99.76	99.74	99.93	99.86	99.79	99.79	101.86	101.86	88.45	90.10	101.86	88.45
Romania								99.59	99.59	87.88	87.52	99.59	87.88
Spain	99.95	99.64	99.59	99.18	95.58	94.80	94.80	96.88	96.88	98.40	95.33	96.88	98.40
Sweden	96.13	100.00	96.13	94.49	99.95	94.44	94.44						
Slovenia	100.00	100.00	100.00	97.76	100.00	97.76	97.76	99.93	99.93	96.54	96.47	99.93	96.54
Slovakia	99.82	98.27	98.10	99.99	95.80	95.80	95.80	99.64	99.64	89.78	89.46	99.64	89.78
United Kingdom	99.00	96.20	95.24	94.73	99.96	94.69	94.69						
					2007–2013								
Austria	100.00	49.15	49.15	100.00	85.38	85.38	85.38						
Belgium	99.93	50.56	50.52	100.00	65.61	65.61	65.61						
Bulgaria	100.00	50.41	50.41	100.00	54.73	54.73	54.73	100.00	100.00	42.08	42.08	100.00	42.08
Czech Republic	100.00	47.62	47.62	100.00	49.95	49.95	49.95	100.00	100.00	50.43	50.43	100.00	50.43

Croatia	100.00	22.99	22.99	31.27	47.41	47.41	100.00	21.05	21.05
Cyprus	100.00	58.22	58.22	100.00	58.03	58.03	100.00	48.35	48.35
Denmark	100.00	50.79	50.79	100.00	87.82	87.82	100.00	74.01	74.01
Estonia	100.00	78.98	78.98	100.00	78.54	78.54	100.00		
Finland	100.00	57.82	57.82	100.00	54.90	54.90	100.00		
France	99.96	57.34	57.32	100.00	70.40	70.40	100.00		
Germany	100.00	68.09	68.09	100.00	59.35	59.35	100.00	74.20	74.20
Greece	100.00	71.11	71.11	100.00	55.92	55.88	100.00	51.05	51.05
Hungary	99.91	64.44	64.39	99.94	69.98	69.98			
Ireland	100.00	65.39	65.39	100.00	58.66	58.66			
Italy	99.84	45.11	45.04	100.00	95.00	95.00	100.00	59.37	59.37
Latvia	100.00	62.21	62.21	100.00	78.64	78.64	100.00	59.37	59.37
Lithuania	99.19	80.13	79.48	100.00	58.37	58.37			
Luxembourg	100.00	68.24	68.24	100.00	43.19	43.19	100.00	52.07	52.07
Malta	100.00	47.90	47.90	100.00	57.33	57.33			
Netherlands	100.00	65.94	65.94	100.00	70.32	70.32	100.00	57.95	57.95
Poland	100.00	71.21	71.21	100.00	82.97	82.97	100.00	69.84	69.84
Portugal	100.00	77.65	77.65	100.00	40.35	40.35	99.54	35.31	35.15
Romania	98.61	36.90	36.39	100.00	46.95	46.89	100.00	37.47	37.47
Slovakia	100.00	55.07	55.07	99.88	68.94	68.94	100.00	38.20	38.20
Slovenia	100.00	76.48	76.48	100.00	61.02	61.02	100.00	71.48	71.48
Spain	100.00	60.59	60.59	99.98	59.37	59.37			
Sweden	100.00	75.58	75.58	100.00	62.24	62.24			
United Kingdom	100.00	51.50	51.50	100.00					

Source: Authors according to: European Commission - Directorate-General for Regional and Urban Policy – Regional Policy – InfoRegio, 2015.



whose GDP per capita was below 75% of the EU average were called convergence regions in previous programming periods and due to the time period of our analysis we will use this term for the regions that are less developed.

#### 4. Methodology, units of analysis and data

To the best of our knowledge, a unique model to analyse the determinants of EU funds absorption has not been developed in previous researches. In measuring the influence of the funds committed to Cohesion Policy different tools and methodologies can be used: theory-based evaluation, econometric and macroeconomic models (López-Rodríguez & Faíña, 2014). Bachtler et al. (2000) synthesise methodologies used in the evaluation of the effectiveness of European Structural Funds where a top-down (macro level) approach (e.g., sophisticated models such as PARADISE and HERMIN) and a bottom-up (micro level) approach are identified in regional economic policy evaluation. Even though they explain the limitations and biases, the authors note that direct econometric estimation should calculate the impact of policy with the greatest degree of accuracy if the data are available. The European Commission (DG Regio) has used QUEST and HERMIN models for the evaluation of the cohesion policy at the level of EU Member States, while the RHOMOLO models developed by the DG REGIO and Joint Research Centre-Institute for Prospective Technological Studies produces results at the level of EU NUTS 2 regions (López-Rodríguez & Faíña, 2014).

In view of the main research question, units and time period of analysis, we have chosen to use econometric panel data analysis as appropriate in measuring the influence that the chosen determinants of the EU absorption capacity have on the regional absorption in the EU.

The analysis in this article is based on 272 NUTS 2 regions, 86 regions that have GDP per capita less than 75% of the EU average (convergence regions) and 186 regions that have GDP per capita above 75% of the EU average (developed regions), that is belonging to EU 28 member countries regarding the availability of statistical data and the area in which the EU funds are absorbed. Modelling was applied over the 2000–2013 period, which is over EU-Budget and Cohesion policy programming periods 2000–2006 and 2007–2013, due to the fact that new member states, EU 12<sup>1</sup> entered the EU in 2004, 2007 and Croatia in 2013.

We have decided to use the indicators payments per capita and payments/commitments as indicators of the regional absorptive capacity, relying on the work of Mohl and Hagen (2010) who warn of possible biased estimation results if the structural funds commitments are used instead of payments and also on the work of Tosun (2013) that uses percentage of ERDF allocations paid in comparative analysis on the absorption of Regional Funds. Input variables included in our modelling are: indicators of absorption capacity (payments per capita and payments/commitments related to the programming period 2000–2006, 2007–2013), size of the regions, infrastructure, labour force characteristics, dummy variables for institutions and fiscal decentralisation, differences between programming periods and gross fixed capital formation.

Separate analysis is done for the period 2000–2011 because of the availability of data on gross fixed capital formation and on indicators necessary to create a dummy variable for fiscal decentralisation. This separate analysis is also motivated by the need to test the robustness of the conclusions. Regarding changes in Cohesion Policy between programming

periods (European Commission – Directorate-General for Regional & Urban Policy, 2014) it is expected that significant differences between programming periods 2000–2006 and 2007–2013 will be determined so a dummy variable that refers to the programming period 2007–2013 is included in modelling.

The possible connection between government effectiveness and absorption of Cohesion Policy funding is recognised in European Commission – Directorate-General for Regional and Urban Policy (2014), also in Ederveen, de Groot, and Nahuis (2006) and Tosun (2013). In order to include institutions as important determinants of absorptive capacity in our analysis, data on European Quality of Government Index (Charron, Dijkstra, & Lapuente, 2014a) is used. This index focuses on perceptions and experiences with public sector corruption. Since these data are available for 2010 and 2013, it was not possible to include the data for the time period 2000–2013, so we have created a dummy variable that refers to regions in which the index has higher (positive) values. In line with Charron, Dijkstra, and Lapuente (2014b) this can be interpreted as meaning that these are the regions with a better quality of governance, understood as low corruption, impartial public services and rule of law. In order to test the conclusions on the influence of quality of governance we have created another dummy variable that refers to countries that have higher values ( $> 1$ ) according to one of the indicators used for measuring quality of governance by the World Bank (Kaufmann, Kraay, & Mastruzzi, 2014) that refers to Control of Corruption. We were also aware of the possibility of creating dummy variables according to Government Effectiveness given in the same database, but we determined that the results do not differ on the country level when creating dummy variables. This dummy variable is included in a separate regression due to possible problems of multicollinearity between institutional indicators (e.g., pillar control of corruption is also included in European Quality of Governance Index, together with pillars that refer to rule of law, government effectiveness, voice and accountability) used in our study.

Another dummy variable that was created due to insufficient data on the observed regional level is the dummy variable that refers to fiscal decentralisation. This aspect is important in regional absorptive capacity and it is used in studies that deal with the allocation of structural funds, e.g., in Kyriacou and Roca-Sagalés (2012). We have created dummy variables using the data for the share of local government expenditure in total general government expenditure (as explained in Table 2). Due to the fact that these data were not available in 2013 at the time the analysis was performed, we have used this variable in models that refer to the 2000–2011 time period.

Based on the given explanation, the theoretical framework for the determinants of absorption capacity can be formulated through function as follows:

$$ABS_{it} = f(AREA_{it}, INFR_{it}, UNEMP_{it}, EDUC_{it}, EQI_t, CORR_t, PROG_t, GFCE_{it}, FISC_i) \quad (1)$$

*ABS* refers to proxies of absorptive capacity (*PAY/COMM*, *PAYp.c.*) explained in Table 2. Separate analysis is conducted on the sample of the convergence regions and other regions and on two time periods, so  $i = 1, \dots, 86$ , refers to one of the NUTS 2 regions in models in which convergence regions are included, while  $i = 1, \dots, 186$ , refers to one of the NUTS 2 regions in models in which developed regions are included.  $t = 1, \dots, 11$ , refers to the years 2000–2011 in models (1)–(4) and  $t = 1, \dots, 13$ , refers to the years 2000–2013 in models (5)–(8) explained below. The rest of the variables and data sources are presented in Table 2.

**Table 2.** Variables and data sources used in the estimation.

Variable - code	Description	Data source
<i>Models over 2000–2013</i>		
PAY/COMM	Indicator of the absorptive capacity (ABS): payments/commitments related to programmes of period 2000–2011 in models (1) and (3) and 2000–2013 in models (5) and (7)	Data have been provided for by the European Commission – Directorate-General for Regional and Urban Policy (2015). Database: estimated structural and cohesion policy commitments and payments by year (2000–2014) and NUTS 2 region, programming periods 2000–2006 and 2007–2013, accessed in February 2015
PAYp.c.	Indicator of the absorptive capacity (ABS): payments per capita related to programmes of period 2000–2011 in models (2) and (4) and 2000–2013 in models (6) and (8)	Data have been provided for by the European Commission – Directorate-General for Regional and Urban Policy (2015). Database: estimated structural and cohesion policy commitments and payments by year (2000–2014) and NUTS 2 region, programming periods 2000–2006 and 2007–2013, accessed in February 2015
AREA	Total area in km <sup>2</sup>	European Commission – Eurostat (2015b)
INFR	Indicator of infrastructure – motorways in km per 1000 km <sup>2</sup>	European Commission – Eurostat (2015b)
UNEMP	Unemployment rate (in %)	European Commission – Eurostat (2015b)
EDUC	Share of employed with upper secondary and post-secondary non tertiary education + share of employed with tertiary education in total employment (in %)	European Commission – Eurostat (2015b)
EQI	Dummy variable. The variable takes the value 1 for regions in which European Quality of Governance Index is positive	Charron, Dijkstra, and Lapuente (2014a)
CORR	Dummy variable. The variable takes the value 1 for countries in which index Control of Corruption is higher than 1.	The Worldwide Governance Indicators, Kaufmann, Kraay, and Mastruzzi (2014)
PROG	Dummy for programming period 2007–2011, in models (1)–(4), and 2007–2013, in models (5)–(8). Dummy = 1 for time period 2007–2011 in models (1)–(4) and for time period 2007–2013 in models (5)–(8).	Authors
<i>Additional variables in models over 2000–2011</i>		
GFCF	Real gross fixed capital formation (in mil. EUR) per capita	European Commission – Eurostat (2015a), European Commission – Eurostat (2015b)
FISC	Dummy variable for fiscal decentralisation, variable takes the value 1 for countries in which indicator of fiscal decentralisation is higher than this indicator on EU level. Indicator of fiscal decentralisation is calculated as the share of local government expenditure in total general government expenditure (in %).	European Commission – Eurostat (2015a)

Source: Authors' compilation.

Based on relation (1) and previous works, general econometric specification (detailed extended or reduced in models (1)–(8) according to the chosen period of the analysis and data availability of the included variables as explained in the text) is the following:

$$ABS_{it} = \beta_0 + \beta_1 ABS_{i,t-1} + \beta_2 AREA_{it} + \beta_3 INFR_{it} + \beta_4 UNEMP_{it} + \beta_5 EDUC_{it} + \beta_6 EQI_i + \beta_7 CORR_i + \beta_8 PROG_t + \alpha_i + \varepsilon_{it} \quad (2)$$

As can be seen a lagged dependent variable is included in the dynamic specification.  $\alpha_i$  refers to time-invariant, individual-specific effect that is not included in the regression,  $\varepsilon_{it}$  represents the error term of the specification. Other variables, and symbols  $i$ ,  $t$  are described below specification (1) and in Table 2. Where necessary, variables are entered into the model in logarithmic form.

Before performing dynamic panel data analysis, static panel data estimators were applied, but due to the determined problems of serial autocorrelation, heteroscedasticity, possible endogeneity and reverse causality we decided to use and present the results of the estimation by using the two step system Generalised Method of Moments (GMM) estimator (more about the properties of this estimator can be found in Blundell and Bond [1998] and Roodman [2009], and application is given in Mohl and Hagen [2010]). The models estimated with this estimator satisfy econometric tests and are shown in the next section, where further economic interpretation is given.

## 5. Estimation results on the determinants conditioning the regional absorption capacity in the EU

Estimation results for the developed regions are presented in Table 3, and estimation results for the convergence regions are presented in Table 4. The econometric diagnostic statistics (based on: Roodman, 2009; Mohl & Hagen, 2010) is satisfied (the Sargan test does not reject the over-identification restriction, the absence of first order serial correlation is rejected while the absence of second order serial correlation is not rejected, the number of instrument is lower than the number of groups).

In Table 3 it can be seen that in most of the models which refer to developed regions, unemployment has a positive and significant influence on the absorptive capacity, in models that refer to the 2000–2013 time period, infrastructure has a significant, but negative influence on the absorptive capacity. Education has a positive and significant influence in most of the models, while this variable has a negative influence in the models regarding the 2000–2011 time period, in which payments per capita are used as proxy of the absorptive capacity. It is possible that this negative influence relies on the influence of the regions that did not succeed in developing human capital potential for absorption (e.g., regions with middle income levels), or it could also be connected with methodological constraints. Gross fixed capital formation has a positive and significant influence, fiscal decentralisation has a positive and significant influence (but this conclusion is not robust in models with a different dependent variable), while dummy for programming periods has confirmed significant differences between the last two programming periods in absorptive capacity. Dummy variables that refer to institutional quality did not prove to have significant influence.

Developed regions have recognised unemployment as an important determinant for absorption. It can be assumed that they use the funds to deal with one of the most important economic problems in European countries. Conclusions can also be interpreted in line with



**Table 3.** Estimation results by using dynamic panel system GMM estimator in two-step for developed regions.

Dependent variable	2000–2011				2000–2013			
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
	PAY/COMM	PAY/p.c.	PAY/COMM	PAY/p.c.	PAY/COMM	PAY/p.c.	PAY/COMM	PAY/p.c.
Constant	-5.3130 (0.010)**	-4.2183 (0.014)**	-5.3232 (0.010)**	-4.0500 (0.017)**	5.7702 (0.473)	12.7670 (0.051)***	7.4059 (0.368)	12.8682 (0.058)***
Lag PAY/COMM	0.4536 (0.000)*		0.4516 (0.000)*		0.4000 (0.000)*		0.3957 (0.000)*	
Lag PAY/p.c.		0.5442 (0.000)*		0.5461 (0.000)*		0.1935 (0.002)*		0.1963 (0.002)*
AREA	-0.0641 (0.388)	-0.0760 (0.376)	-0.0643 (0.392)	-0.0709 (0.434)	-0.4700 (0.509)	-0.6995 (0.274)	-0.6097 (0.399)	-0.7336 (0.276)
UNE/MP	0.0318 (0.102)	0.0446 (0.039)**	0.0333 (0.086)***	0.0474 (0.026)**	0.0924 (0.000)*	0.1105 (0.001)*	0.1079 (0.000)*	0.1137 (0.001)*
INFR	-0.0422 (0.611)	-0.0730 (0.489)	-0.0416 (0.617)	-0.0650 (0.562)	-1.5578 (0.012)**	-2.3770 (0.000)*	-1.6748 (0.009)*	-2.3650 (0.000)*
EDUC	0.0122 (0.015)**	-0.0165 (0.001)*	0.0114 (0.018)**	-0.0184 (0.000)*	0.0867 (0.000)*	0.0464 (0.004)*	0.0831 (0.000)*	0.0463 (0.003)*
EQI	-0.0636 (0.463)	-0.1089 (0.368)			-0.7745 (0.277)	-0.3742 (0.534)		
CORR	0.0057 (0.882)	-0.0645 (0.062)***	-0.0139 (0.856)	-0.0258 (0.845)			0.5760 (0.370)	-0.2120 (0.692)
PROG	0.8497 (0.000)*	0.8999 (0.000)*	0.0096 (0.801)	-0.0508 (0.143)	-0.1591 (0.053)***	-0.0769 (0.363)	-1.5260 (0.059)***	-0.0793 (0.336)
GFCF	0.1634 (0.018)**	-0.0316 (0.734)	0.8527 (0.000)*	0.8762 (0.000)*				
FISC			0.1630 (0.018)**	-0.0281 (0.759)				
Model diagnostics								
Number of observations	1300	1300	1306	1306	1722	1716	1730	1724
Number of groups	161	161	162	162	167	167	168	168
Number of instruments	147	148	148	148	13	13	13	13
Wald test	894.85	724.23	890.75	716.79	486.74	120.59	470.71	118.97
Prob > chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sargan/Hansen J statistics	155.12	153.01	156.16	154.86	7.44	5.61	6.80	5.70
Prob > chi <sup>2</sup>	0.138	0.181	0.138	0.155	0.190	0.346	0.236	0.337
Arellano-Bond test for AR	-5.92	-6.21	-5.92	-6.16	-7.46	-6.50	-7.46	-6.51
(1) in first differences								
Prob > chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Arellano-Bond test for AR	0.04	1.52	0.05	1.52	-0.10	0.95	-0.07	0.98
(2) in first differences								
Prob > chi <sup>2</sup>	0.967	0.129	0.962	0.129	0.190	0.344	0.948	0.327

Notes: Full name and description of variables are shown in Table 2. Standard errors are corrected using the approach by Windmeijer (2005). *p* values are shown in parentheses.

Number of groups = number of cross-section units.

\*Significant at 1%; \*\*Significant at 5%; \*\*\*Significant at 10%;

Estimations are done with order xtabond2 (Roodman, 2009).

Source: Authors' calculation.

**Table 4.** Estimation results by using dynamic panel system GMM estimator in two-step for convergence regions.

Dependent variable	2000–2011				2000–2013			
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
	PAY/COMM	PAYp.c.	PAY/COMM	PAYp.c.	PAY/COMM	PAYp.c.	PAY/COMM	PAYp.c.
Constant	-0.6072 (0.924)	-14.9187 (0.101)	-3.7328 (0.407)	-13.4916 (0.112)	-15.5305 (0.044)**	-18.1884 (0.034)**	-15.21178 (0.043)**	-21.008 (0.040)**
Lag PAY/COMM	0.1302 (0.013)**		0.1080 (0.052)**		-0.0555 (0.248)		-0.0595 (0.285)	
Lag PAYp.c.		0.4740 (0.000)*		0.4863 (0.000)*		0.5300 (0.000)*		0.5564 (0.000)*
AREA	0.5884 (0.373)	0.8881 (0.209)	0.7672 (0.095)**	0.7646 (0.262)	1.4969 (0.008)*	1.4467 (0.058)**	1.4230 (0.014)**	1.6824 (0.084)**
UNEMP	-0.0433 (0.017)**	0.0033 (0.883)	-0.0459 (0.020)**	0.0003 (0.990)	-0.0229 (0.283)	-0.0117 (0.462)	-0.0237 (0.344)	-0.0157 (0.362)
INFR	0.3892 (0.007)*	0.7857 (0.003)*	0.4220 (0.005)*	0.7189 (0.006)*	-0.0229 (0.283)	0.8815 (0.001)*	0.65257 (0.023)**	1.001 (0.001)**
EDUC	0.0191 (0.133)	0.0593 (0.011)**	0.0375 (0.054)**	0.0629 (0.007)*	0.0494 (0.046)**	0.0558 (0.002)*	0.0542 (0.086)**	0.0593 (0.000)**
EQI	0.6636 (0.043)**	-0.1754 (0.733)			-0.1840 (0.618)	-0.4601 (0.406)		
CORR			1.0556 (0.018)**	0.5365 (0.355)			0.1797 (0.810)	-0.5309 (0.530)
PROG	-0.0839 (0.358)	0.1747 (0.176)	-0.1676 (0.245)	0.1710 (0.196)	0.0442 (0.839)	0.0629 (0.666)	0.0286 (0.898)	0.0255 (0.873)
GFCF	-0.4890 (0.140)	0.2457 (0.633)	-0.524 (0.113)	0.1673 (0.759)				
FISC	0.2996 (0.087)**	0.4315 (0.183)	0.3979 (0.026)**	0.5878 (0.043)**				
<b>Model diagnostics</b>								
Number of observations	460	460	460	460	574	594	574	594
Number of groups	55	55	55	55	59	59	59	59
Number of instruments	46	51	41	51	24	54	24	49
Wald test	88.39	197.15	61.43	202.50	215.29	318.40	240.81	334.93
Prob > chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sargan/Hansen J statistics	37.34	50.11	34.64	50.18	2.02	52.29	2.11	50.41
Prob > chi <sup>2</sup>	0.407	0.156	0.298	0.154	0.847	0.243	0.834	0.149
Arellano-Bond test for AR (1) in first differences	-2.19	-3.10	-2.10	-3.15	-2.08	-3.58	-1.99	-3.58
Prob > chi <sup>2</sup>	0.028	0.002	0.036	0.002	0.038	0.000	0.047	0.000
Arellano-Bond test for AR (2) in first differences	-1.26	1.19	-1.28	1.09	-0.92	1.61	-0.97	1.47
Prob > chi <sup>2</sup>	0.208	0.233	0.201	0.274	0.359	0.107	0.333	0.142

Notes: Full name and description of variables are shown in Table 2. Standard errors are corrected using the approach by Windmeijer (2005). *p* values are shown in parentheses. Number of groups = number of cross-section units. \*Significant at 1%; \*\*Significant at 5%; \*\*\*Significant at 10%. Estimations are done with order xtabond2 (Roodman, 2009). Source: Authors' calculation.

the conclusions given in European Commission – Directorate-General for Regional and Urban Policy (2014) which finds that investments in human capital are more important than in infrastructure in countries and regions which have a higher level of development. These regions are focused on more diversified determinants in relation to the absorption of EU funds, not only on the strengthening of infrastructure.

Models for convergence regions in Table 4 present a different picture thus confirming the importance of regional diversity. Unemployment has a negative influence, even though this conclusion is not robust, infrastructure has a positive and significant influence on the absorptive capacity, in most of the models education has a significant and positive influence, dummy variables that refer to European quality of governance and Control of Corruption have shown that in less developed regions in 2000–2011 these determinants have had significant influence (this is also found by Gruševaja & Pusch, 2011 and Mihailescu, 2012). Indicators of fiscal decentralisation show a positive and significant influence which is in accordance with Bachtler and McMaster (2007).

We agree with Crescezi and Giua (2014, p. 31) that the reinforcement of the socio-economic environment is an important precondition for the success of regional policy. These determinants may be the reason why the conclusions about the impact of regional policy are conflicting because these significant determinants are not included in the observations when measuring the influence of EU funds on different economic categories. Lopez-Rodriguez and Faina (2014) explain that regional labour markets serve as important adjustment channels to macro-economic shocks. This in part confirms the conclusion of Tosun (2013) which refers to the importance of fiscal decentralisation and in the sample of convergence regions the importance of government capacity (limited with data availability). Education is again determined to be an important determinant of the absorptive capacity which needs further analysis on the micro level and from the perspective of management systems of EU funds implementation. Interventions tailored to the needs of specific regions are also highlighted in the challenges to be faced by Cohesion Policy given in Farole, Rodríguez-Pose, and Storper (2011).

## 6. Concluding remarks and implications

Regional absorption capacity in the EU depends on territorial economic preconditions for successful absorption of EU funds. The analysis has shown that the following determinants are crucial for explaining the absorption capacity: labour force characteristics (educational level and unemployment rates), decentralisation, investments, institutional framework and infrastructure development. The results have confirmed that the chosen determinants of EU absorption are conditionally effective, that they differ between convergence regions and developed regions. The significant differences in determinants across the regions according to their level of development lead to a conclusion that it is necessary to observe these groups of regions in a separate way which is also defined in the regulation of the EU funds. In addition, less robust conclusions are determined about the differences between programming periods.

Labour force characteristics represent an inevitable determinant of successful absorption of EU funds. It can be seen that education level of the workforce represents important variable for successful absorption of EU funds in all NUTS 2 regions, so it is necessary to remove the macro- and micro-level constraints, especially in the EU new member states,

which refer to labour force capacity to realise the projects financed through EU funds. Institutional framework (proxy with good governance and control of corruption) is an important determinant of the absorptive capacity in the convergence regions but needs to be further investigated. Public investments should not be excluded from the observation (regarding significant influence in developed regions), even though EU funds represent the opportunity especially at the time when public investments decline.

The proven importance of fiscal decentralisation for the successful absorption (in convergence regions) highlights the need to give these regions, their sub-national authorities, higher responsibilities (together with obligations) in managing their development. Infrastructure exerts a different influence in the sample of convergence regions and the rest of the regions. Even it still presents significant determinant for convergence regions, it will be necessary to move towards more integrated determinants (economic, financial and institutional) which is complex task for regional policy actors. Permanent attempts in new programming period 2014–2020 to direct investments according to the national/regional specific goals is one of the possibilities how to move the funds towards the determinants that are significant for the observed regions in their better absorption.

The conclusions of this analysis can be of importance in cohesion policy needs-based programming as well as in planning better absorption of EU funds in European regions. The results of the study also contribute to the discussions surrounding Cohesion Policy in regards to which factor the policy should be aimed at tackling ('first and second nature determinants of development', as described in European Commission – Regional and Urban Policy, 2014). If we look at these characteristics in more detail we can see that in line with Camagni (2008), Fratesi and Perucca (2014) it can be observed as territorial capital.

The results of this study can also be compared with the results of the effectiveness of EU funds absorption and transmission channels of EU funds in European regions, regarding national and regional priorities given in strategic documents. These significant determinants of the regional absorptive capacity can be included in measuring the saturation point in estimating the influence of the Structural and Cohesion Fund on regional economic growth and development.

With this study we have tried to empirically determine the possible significant influence of the regional absorption capacity determinants in the EU. Much more research should be done on the influence of the EU absorption determinants chosen in this study with higher regional data availability (e.g., with time series on institutional quality or fiscal decentralisation at NUTS 2 level).

## Note

1. EU 12=Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovenia, Slovak Republic.

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