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The growth effect of EU funds – the role of institutional quality

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Abstract:
This paper investigates the growth impact of the EU's Structural, Cohesion and Pre-accession Funds. We look at a large sample of 27 EU countries and the UK, over a period of 1989 and 2020, essentially covering the full history of these funds. We show that the growth effect of the funds is conditional on institutional quality: the funds contribute to economic growth only in countries with strong institutions: low corruption, strong rule of law, effective governments, and strong regulatory quality.
Our research have important messages for the expected economic impact of the Next Generation EU (NGEU) and the Recovery and Resilience Facility (RRF). On the one hand, our findings highlight the risk that countries with weaker institutions – that also receive more funds - may use such funds less efficiently or wisely. On the other hand, countries that receive more RRF funds are also expected to introduce more structural reforms, some of which have the potential to improve institutional quality and thereby improve the effectiveness of the RRF and EU funds in general.

JEL codes: O11, O43, O47

Keywords: economic growth, Structural, Cohesion funds, institutions

Non-technical summary

Structural, Cohesion, and Pre-accession funds provided by the EU, to which we will generally refer as EU funds in the whole study, aim to encourage convergence across the EU member states, and represent important sources of the government's finances. In this paper, we analyse the impact of EU funds on the economic growth of the EU member states in the period of 1989-2020. During the last three decades, some EU member states have experienced a rapid convergence with the average per capita GDP of more developed economies in the EU. In this context, we aim to understand the role of the EU funds behind the growth performance of the EU countries, and in particular, if institutional quality plays a role in how effective EU funds are.

We start from a common specification used in the empirical growth literature, i.e., we explain per capita GDP growth as a function of the level of per capita GDP (to capture unconditional convergence, i.e. the observation that less developed countries tend to grow faster), and production factors such as the employment rate, investment rate and human capital. We extend this specification first with the EU funds, and then a measure of institutional quality. We carry out several robustness checks to confirm the results of the main specification.

The results show that the growth effect of EU funds is conditional on institutional quality. Countries characterised by *strong* institutions benefit more from the EU funds, and the impact on per capita GDP seems to persist in the long run, too. On the contrary, member states lacking *good* institutions are likely to inefficiently use the EU funds, and these do not generate growth. For example, as shown in the literature, both their public and private sectors may tend to substitute their own spending with funds from the European Union, rather than complementing them, withdrawing additional potential resources. Also, governments may design projects that meet the criteria set by the EU, but that are not necessarily effective in stimulating growth, and this would allow them to keep their lagging regions eligible for EU funding again. Furthermore, in countries with weak governance, leaders are more likely to prioritize the personal interest in the use of the funding over the public interest.

Overall, European and national policymakers need to be mindful of these findings when designing the EU cohesion policy and guarantee a transparent and fair use of the resources to avoid any waste of economic resources and maintain and reinforce the credibility of the European Union institutions in the international community. This means strengthening governance, suppressing corruption, and promoting reforms of the judiciary system. In this respect, the results are also very relevant in light of the high expectations on the growth impact of the Next Generation EU (NGEU) and the Resilience and Recovery Facility (RRF). On the one hand, our findings highlight the risk that countries with weaker institutions – that also receive more RRF funds - may use such funds less efficiently or wisely. On the other hand, countries that receive more RRF funds are also expected to introduce more structural reforms, some of which have the potential to improve institutional quality and thereby improve the effectiveness of the RRF and EU funds in general.

1. Introduction

The Structural, Cohesion, and Pre-accession funds of the European Union (EU) are potentially important tools to promote economic growth and enhance convergence within the EU.[1] After about 30 years into the history of EU funds, the Next Generation EU (NGEU) was set up in 2020, with the aim to mitigate the economic consequences of the Covid-19 pandemic, and to foster the digital and green transition of the EU. Given the scale of the EU funds, the time elapsed since their onset, and the importance of NGEU, it is worth studying if EU funds indeed contribute to the economic growth of EU member states. An additional important aspect is to see if the growth impact depends on certain factors that countries can influence, such as the quality of institutions and governance.

With the history and future of EU funds in mind, this paper seeks to answer two interrelated questions:

(1) What is the growth effect of the EU funds? Have EU funds achieved their aim and contributed to the economic convergence of the EU member states?

(2) Is the effect conditional on some factor that the economic policy can influence? From a normative point of view, the question is whether EU members can improve the effectiveness of the funds, the absorption capacity of a country and escape the well-known traps related to the emergence of external resources, such as rent-seeking behaviour or crowding out effects.

Our paper contributes to the literature on the effectiveness of EU funds in three ways. First, we make use of the largest possible dataset, comprising also those member states which joined the EU in the last two decades, and their experiences with and without EU support. Second, we thoroughly examine the conditional effectiveness hypothesis, i.e. the idea that foreign funds only foster economic growth if the recipient country fulfils certain criteria related to the quality of institutions. While the concept is not new in the literature, the novelty lies in using a quite comprehensive indicator that captures the governance quality more effectively. Finally, we do not only focus on the contemporaneous impact of EU funds on growth, but we aim to measure the persistence of such effect over time using local projection methods, which is not common in the existing studies (at least that we know about). The paper is structured as follows. In the next section, we review the related literature on the effect of EU transfers. Our review suggests that the literature is rather inconclusive, and different methods result in diverging results. In Section 3, we then give a short overview of the descriptive statistical findings and how simple metrics support our hypotheses. In Section 4, we describe the methodological background of our econometric model, explaining why we start our exercise with growth regression and how we could include different variables and measure different convergence estimates. Our main findings are described in Section 5. In the last chapter, we summarize our main conclusion.

[1]Just to provide context, the average annual transfers received are larger than the average aid received by countries under the Marshall Plan (Regling, 2020). This significantly underscores the scale of the funds, especially when considering that EU transfers have been flowing to member countries for the past three decades, whereas the Marshall Plan lasted only for a few years.

2. Literature review

The literature investigating the effectiveness of EU funds is quite extensive. This can be collocated in a broader stream of literature investigating the causal effect of aid on economic performance, which includes studies mainly on less developed economies.
The literature focuses more on the growth impact of structural and cohesion funds, and less on the PHARE, ISPA, SAPARD and CARDS funding programs. This seems reasonable as the range of countries affected by the latter category of funds and the period of their implementation are narrower compared to the still existing structural and cohesion funds.

Regarding the effect of PHARE, ISPA, SAPARD and CARDS funding programs, some studies like Tiner (2003) and Bradley et al (2005) concluded that such funds required more coordination and community support to be effective on the long-term national interest of regional development. Concerning the literature investigating the effect of structural and cohesion funds, there is no common agreement on the size and sign of the impact, and one reason behind these mixed results relies on the heterogeneity of methodology followed. In this regard, Ederveen et al. (2002) identified three main methods employed in the literature: cases studies, model simulations and econometric techniques.

Cases studies mostly refer to qualitative evaluations of single (regional) projects. However, they rarely provide quantitative estimates of the growth impact of the projects. For example, Tiner (2003) presents a qualitative assessment of the ISPA program on the Hungarian transport infrastructure. Quantitative evaluations are only provided by model simulations and econometric techniques, with the difference that the former assesses the potential, ex-ante impact of funds, and the latter studies their actual, ex-post effect. As a result, these two methodologies tend to reach different conclusions, and the "impact elasticities"[2] of model simulations turn out to be significantly higher than those of econometric studies. In fact, model simulations assume that funds are used efficiently, disregarding any management failure, and that all spending directly augment productive resources. Examples of ex-ante evaluations are provided by Piculescu et al. (2017), who used the QUEST model to estimate the effect of some structural funds, and Varga and in t'Veld (2011), who employed a microfounded dynamic general equilibrium model to assess the cohesion policy funds[3].
On the other hand, as Ederveen et al. (2002) highlighted, econometric studies implicitly consider possible sources of inefficiency, which may undermine the effectiveness of EU funding and thus, reduce or even annihilate their potential impact and the absorbing capacities of each country. For example, the government may support poorer regions less to continue to meet the development criteria for applying

[2] The "impact elasticity" is a common measure introduced by Ederveen et al. (2002) to evaluate transfers of various magnitude and duration. It is defined as the additional cumulated economic growth per unit of cohesion support (calculated in percentage of GDP/GNI).
[3] However, both papers stressed that positive effects of funds take time to materialize, and that Total Factor Productivity (TFP) improves only in the medium-long term (even when the funding period is over). On the contrary, negative effects are likely to take place only in the short run, affecting the demand side and causing inflationary pressures, but proved to be rather modest in Piculescu et al. (2017).

for EU transfers (kind of moral hazard); or they may allocate funds not with the aim of financing projects that stimulate convergence but rather just to seek funding allocation ("rent-seeking" behaviour). Another instance of inefficiency would be the consequent change in investment plans by both the public and private actors, who decrease their investments in growth-enhancing projects given the EU transfers. In this case, EU funds may substitute planned public and private investments, leading to a "crowding out" effect. In this context then, both model simulations and econometric approaches can be seen as complementary to each other and should be both considered when analysing funding programs.

Our paper is an econometric analysis, and thus, we will focus on this stream of literature. In particular, Ederveen et al. (2002) classified econometric studies into those investigating the direct effect of funds on economic growth and those measuring the indirect effect of funds on convergence among member states. The starting point of studies focusing on convergence among member states is the β-convergence hypothesis, i.e., less developed countries grow faster over time, which is in line with the neoclassical growth theory. The results on how β-convergence is supported by EU funds are mixed and inconclusive: some studies report a positive, some an insignificant, and few even a negative effect. For example, both Beugelsdijk and Eijffinger (2005) and Hruza et al. (2019) estimated a positive effect of structural funds on convergence among EU member states, and between the regions of the Czech Republic, respectively. On the contrary, both Boldrin and Canova (2001) and Falk and Sinabell (2008) found a neutral effect of funds on convergence. Additionally, Ederveen et al. (2006) as well as Dall'Erba and Le Gallo (2008) found that the impact of funds on growth are rather small, rarely significant, and can even be negative.

Tomova et al. (2013) drew attention to the obstacles to reach conclusive econometric results on the macroeconomic effectiveness of EU funds, namely, the shorter time series for the new member states in the sample, the relatively small amounts of EU funds compared with national expenditures, the presence of endogeneity issues and thus, the difficulties to identify the impact of funds and disentangle it from other macro-economic measures and other noise. In this regard, in fact, many econometric methods have been employed, not only the more traditional ones, but Hruza et al. (2019) reported also the use of modern non-parametric econometric techniques, such as regression discontinuity design (i.e., using the eligibility requirement as threshold) or propensity score matching, by a few papers.

Tomova et al. (2013) also recognized the importance of the sample considered, which changed between studies both in terms of spatial and time dimensions. Some papers focus on a range of countries or regions or rather a single region or country - e.g., Hruza et al. (2019) focusing on the Czech Republic, and Eggert et al. (2007) on Germany. The impact of EU funds might also differ according to the programming period considered, as Puigcerver-Penalver (2007) found out. After having estimated a positive effect of the structural funds on the economic growth of member states, she concluded that the programming period 1989-1993 was more effective than the period of 1994-2000. Similarly, Rodriguez-Pose and Novak (2013) found a significant improvement in the returns of investment from Structural Funds between the second and third programming periods. As the authors argued, the reasons of such

differences may be due, on one hand, to the progressive learning process between one period and the other, e.g., in terms of implementation capacity of local administrations and definition of expenditure priorities. On the other hand, the enlargement of the EU created more disparities at the possible expenses of the effectiveness of the funds.

The impact of the funds also seems to depend on the target of support considered, as Rodríguez-Pose and Fratesi (2004) and Rodriguez-Pose and Novak (2013) pointed out. The former, who studied the same period as Puigcerver-Penalver (2007), concluded that EU funds are ineffective on infrastructure and business support, while effective on investment in education and human capital in the medium term, and on agriculture in the short-term. Moreover, Rodriguez-Pose and Novak (2013) argued that their conclusions on the higher returns of investment of the third programming period might be due to the gradual shift from direct support of firms and transport infrastructure, found to be less effective by Rodríguez-Pose and Fratesi (2004), towards other forms of infrastructure and human resources.

Furthermore, Mohl and Hagen (2008) identified other limitations in the existing studies: some papers did not distinguish between payments and commitments of the funding programs or used inappropriate econometric approaches. Also, they suggested to perform the analysis not only with a one year lag of funds but also with longer time lags, and indeed, they found that funds are effective only after time lags of two and three years. Additionally, Mohl and Hagen (2008) pointed out that, in case of EU funds, some papers did not investigate in detail the impact of different objectives defined by the European Commission, as they did. In fact, they concluded that EU funds foster growth, only in the case of Objective 1 transfers, which primary focus on convergence of the lagging regions. This result is confirmed by Bouayad-Agha et al. (2013), also finding that the total of structural funds are not effective. Moreover, Marzinotto (2012) points out that results may change across papers according to the choice of the control variables and controlling for all factors affecting GDP is a challenge, also given that some of them may be correlated with each other. Failing to control for the multiple factors impacting GDP would generate biased estimates of the effect of the EU funds.

Some studies investigating the presence of conditional effects of EU funds on various macroeconomic and political factors, e.g., the country of reference, openness, a relatively advanced industrial structure and R&D intensity, fiscal decentralization, a high-quality institutional environment and stable macroeconomic environment (Marzinotto 2012). In fact, considering the role of the governance quality of a country may explain the possible sources of inefficiency pointed out by Ederveen et al. (2002), e.g., moral hazard and rent seeking, as countries with weak institutions are more likely to experience these behaviours. This discussion can be collocated in a much broader stream of the literature that generally recognizes the importance of good institutions on the economic outcomes (North (1990), Knack and Keefer (1995), Acemoglu et al. (2001), Chong and Calderón (2003), Rodrik (2007)), especially of the economic institutions, such as the structure of property rights and the competitiveness of markets (Acemoglu et al. (2004), Knack and Keefer (1995)). Also, later growth theories shed light on the

importance of institutional factors and agree that part of the cross-country differences can be explained by institutional factors (European Competitiveness Report, 2001). In the literature investigating the effectiveness of EU funds, studies like Beugelsdijk and Eijffinger (2005) did not find significant differences between the effects of funds in less and more corrupted countries. On the contrary, many papers support the conditional effectiveness of funds. In this stream of literature, a milestone study is provided by Burnside and Dollar (2000), who assessed the effectiveness of aid on growth in less developed countries. They found that aid is effective conditional on the presence of good policies, which have been proxied by an index considering trade openness, the inflation rate and budget surplus. Based on this idea, Ederveen et al. (2006) proxied the quality of institutions through the institutional quality index from Sachs and Warner (1995) and using alternative measures for institutional quality for robustness checks, such as inflation and government savings, social trust measure and the corruption perception index, trade openness and a comprehensive index for the quality of governance. The results show that the growth effect of EU funds itself is not significant and even negative, but once the quality of institutions is considered, structural funds become effective in economies with "good" institutions. Similarly, Ederveen et al. (2002) studied the conditional effect of some EU funds, using the trade openness as a measure of governance as this latter might discipline governments and thus, the effectiveness of funds. They confirm that it is the combination of cohesion support and openness that works and funds do not seem to be effective unless recipient Member States have sufficiently open economies. On the other hand, other papers found that structural funds are effective on the economic development and convergence of member states, and this effect simply increases when good governance is present. This is the case of Tomova et al. (2013), who considered the role of sound national fiscal and macroeconomic policies, proxied respectively by levels of government debt and deficit, and levels of net foreign liabilities. Another example is given by Rodriguez-Pose and Novak (2013), who controlled for corruption. Another interesting insight on the conditional effectiveness of funds is provided by Bähr (2008), who analysed the effect of the differing degree of tax decentralization[4] on the effectiveness of EU funds. He found that only when the subnational autonomy is considered, funds are unambiguously effective.

A final classification in the literature can be done according to the granularity of the analysis, i.e., whether it is conducted at the regional or country level. Among the above-mentioned studies, those that employed a regional analysis are Boldrin and Canova (2001), Rodríguez-Pose and Fratesi (2004), Puigcerver-Penalver (2007), Mohl and Hagen (2008), Dall'erba and Le Gallo (2008), Rodriguez-Pose and Novak (2013), Hruza et al. (2019). Mohl and Hagen (2008) and Dall'Erba and Le Gallo (2008) are particularly relevant in this stream of literature, as they took care of the endogeneity issues resulting from spatial correlation and reverse causality between funds and regional growth, using an instrumental variable (IV) approach. Examples of country-level analysis are given by Ederveen et al. (2002, 2006),

[4] Tax decentralization refers to the amount of tax revenue the sub-central governments control to the tax revenue of consolidated general government.

Beugelsdijk and Eijffinger (2005), Bähr (2008), Tomova et al. (2013). Using country-level observations has various advantages, compared to regional analyses, as Ederveen et al. (2006) stressed. First, it is less sensitive to spillover effects, which need to be considered at the subnational level. Second, the regional allocation of funds might be sensitive to crowding out, namely, that national governments would change their support to regions according to the allocation of EU funds, whereas the country-level analysis is insensitive to this. Third, a country-level analysis allows to control for variables that are not available at the regional level, reducing potential measurement errors and omitted variables bias. Fourth, this level of granularity might reduce the endogeneity bias that the analysis would suffer at the regional level. In fact, in the case of EU funds, these are allocated to regions in a non-random way, namely, according to their initial economic conditions: poorer regions will receive more funds compared to richer ones. Since all countries do have regions that are relatively poorer than others, this endogeneity issue should be less present when the observations are at the country-level.

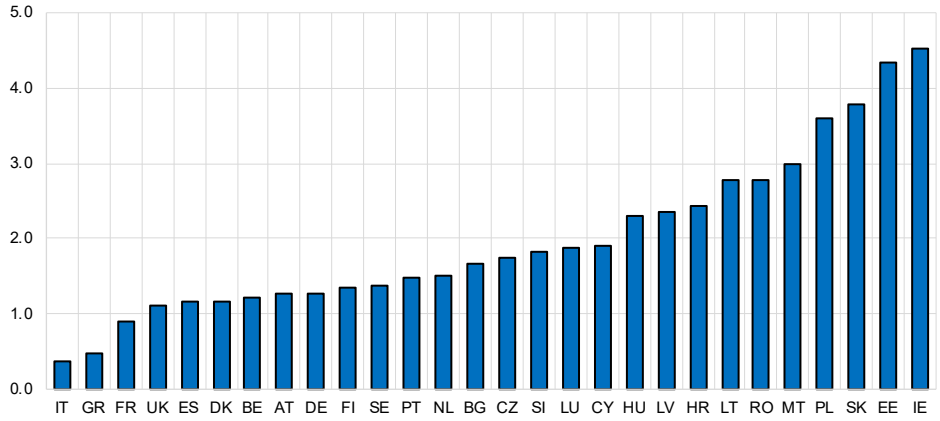
Our paper contributes to the literature on the conditionality of the effectiveness of EU funds on the economic growth of EU member states. Compared to the existing literature, we use an extended dataset, comprising also those member states which joined the EU during the last two decades. Moreover, we thoroughly examine the conditional effectiveness hypothesis, i.e., the idea that foreign funds only foster economic growth if the recipient country fulfils certain criteria related to the quality of institutions. To do so, we use a comprehensive dataset that aims to measure different sides of the governance, such as corruption and government effectiveness. Finally, we also look at the longer-term impact by applying the local projections method.

3. Description of the data

This section provides a detailed description of the data employed in the analysis. The empirical analysis is based on annual data, covering the 27 current EU countries, plus the United Kingdom. The key variables of interest are GDP per capita, the relevant set of EU funds, an aggregate measure of quality of institutions, and the standard production factors (human and physical capital and the employment rate).

To estimate the effectiveness of funds on economic performance, we investigate the variation in the growth of real GDP per capita. Specifically, we use data provided by AMECO at 2015 reference levels expressed in Purchasing Power Standards (PPS). Chart 1 displays the annual growth of real GDP per capita across the countries in our sample. It is worth noticing that most of the countries joining the EU after 2000 are the ones growing the most and they are also the ones with the lowest GDP per capita levels in the EU. This is in line with the beta-convergence theory, i.e., less developed EU countries would converge to the income level of more developed countries.

Chart 1: Average per capita growth in EU countries
(annual percentage change)



Source: AMECO
Note: annual growth rates are averaged over 1989-2020 for IT, GR, FR, UK, ES, DK, BE, AT, DE, FI, SE, PT, NL, MT, BG LU, CY, IE; 1991-2020 for CZ, LV, LT, RO, PL and SI; 1992-2020 for HU; 1993-2020 for SK; 1994-2020 for EE and 1996-2020 for HR.

The classification of the funds in the EU budget went through several modifications over the decades, but the funds of our interest can be properly identified in each period: these are the Structural Funds (SF), the Cohesion Funds (CF), and the Pre-Accession Assistance Funds (IPA). All three groups of funds finance the EU's Cohesion Policy, which aims to reduce regional disparities and enhance economic, social, and territorial cohesion. Structural funds are the largest group of funding, and they were the first to be introduced in the EU budget for the programming period 1989-1993, initially amounting to EUR 64 billion and setting five goals, e.g., promoting the development and structural adjustment of lagging regions, combating long-term unemployment and facilitating integration into working life. However, over time, there has been a continuous change in the number, and to a lesser extent, in the purpose of the objectives of the Structural Funds. In 1993, the Maastricht Treaty introduced the Cohesion Fund to support the economic growth of countries whose per capita Gross National Income (GNI) is below 90% of the EU average. The Pre-Accession Funds have been allocated to countries standing before the EU accession. In our sample these were the countries that joined the EU in 2004 and 2007, i.e., Poland, Czech Republic, Hungary, Estonia, Lithuania, Latvia, Slovenia, Slovakia, Bulgaria, Romania and Croatia[5]. They were formally introduced in 2007, replacing previous programs such as the PHARE, ISPA, SAPARD and CARDS.

Since the programming period of 1994-1999, the amount of both the Structural and Cohesion Funds has considerably increased, also given the large extension of the European Union. For example, in

[5] Today, the main beneficiaries of such funds are Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, Serbia and Turkey.

2014-2020, the EU funds financing the Cohesion Policy amounted to EUR 351 billion, while IPA funds to EUR 12.8 billion.

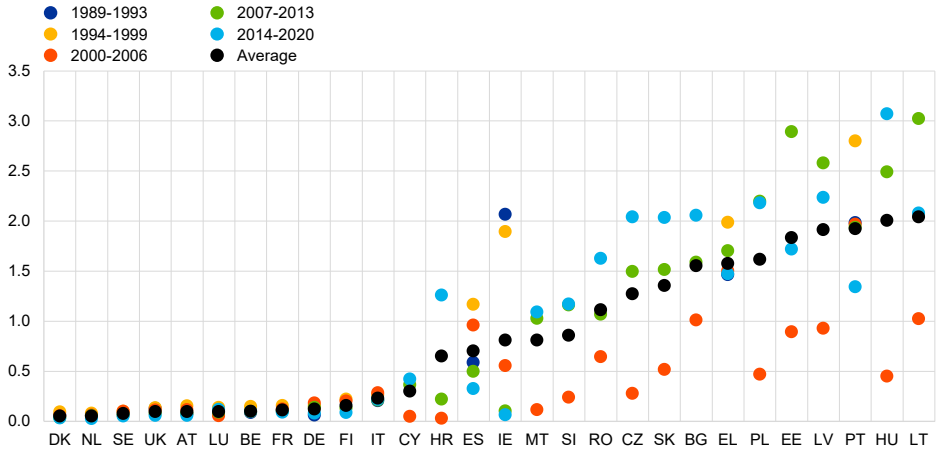
The data on the amount of EU funding stem from the ’EU spending and revenue - Data 2000-2022’, published by the European Commission on the EU budget website and prolonged by the historical data from the same webpage, which contains the structural fund values prior to 2000 (EU, 2023). We used the entries “Structural Actions” and “Pre-accession Strategy” in the 1989-1999 budgets, “Structural Actions”, and “Pre-accession Strategy” in the 2000-2006 budget, the “Structural Funds”, “Cohesion Fund”, and “Instrument for Pre-accession (IPA)” in the 2007-2013 budget, while the “Economic, social and territorial cohesion” and “Instrument for Pre-accession (IPA)” in the 2014-2020 budget.

We expect that among the total expenditure, only the aforementioned funds have some growth effects, as other shares of the EU funds aim to support different purposes (e.g., to cultivate rural areas). However, it is worth to mention that these subsectors of growth enhancing funds represent 35-40% of the total expenditure side of the budget.

We look at the EU funds inflows as a share of Gross National Income (GNI). Chart 2 shows the EU funds received by each country as a percentage of GNI in different programming periods. On average, Lithuania received the highest amount, averaging above 2% of GNI annually between 1989 and 2020, followed by Hungary, Portugal, Latvia and Estonia. Overall, we can observe that almost all member states that joined the EU from 2000 are in the group of the largest beneficiaries of the EU funds, except for Portugal and Greece. These are also the countries that lag in terms of economic development compared to the most developed economies in the European Union, and therefore, the allocation of funds shown in Chart 2 is consistent with the primary purpose of the EU funds, which aim indeed is to reduce regional disparities and promote economic, social and territorial cohesion.

In our main specification, we consider the gross amount of funds, and not the net, i.e. the amount from the funds is not adjusted with the countries’ contribution to the EU budget. The reason is that the contribution to the budget is roughly constant both across countries and over time, around 0.8% of GNI, and therefore there is an almost perfect correlation (99.2%, to be precise) between the gross and net funds expressed in percentage of GNI. However, we only found the contributions to the EU budget starting from 2000, hence using the net funds in our main specification would limit our sample size. Nevertheless, we included the net funds in one of our robustness checks in Section 5.3.

Chart 2: Average EU fund inflows as % of GNI by countries and programming periods
(percent)



Source: AMECO, European Commission

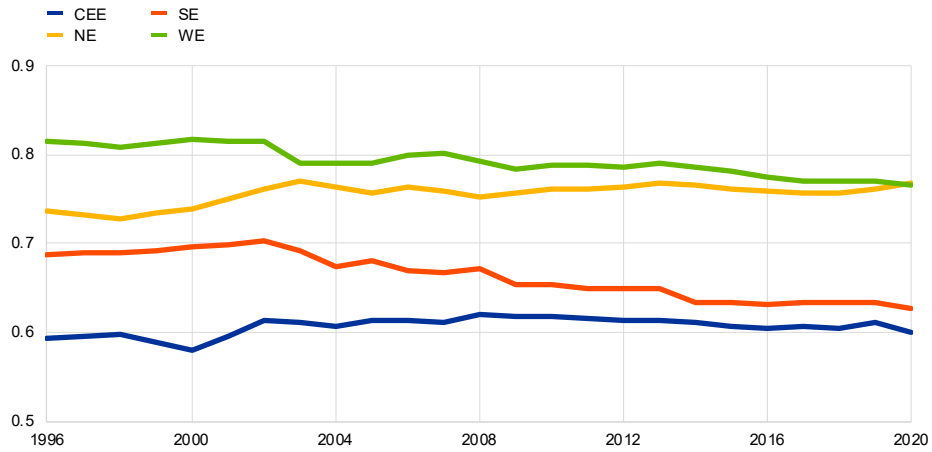
In this paper, we investigate if the growth effect of the funds depends on the quality of institutions, and governance more precisely. To proxy the quality of governance, we use the Worldwide Governance Indicators (WGI) published annually by the World Bank and available for the period between 1995 and 2021[6] for more than 200 countries worldwide[7]. Defining governance is a demanding task, as it includes different aspects; according to the WGI, governance is "the traditions and institutions by which authority in a country is exercised" (World Bank, 2024), and it is measured using the views and subjective perceptions on governance of survey respondents and public, private, and NGO sector experts worldwide. The full database includes six governance indicators: *Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law* and *Control of Corruption*. In line with the observations made by Masuch et al. (2016), we consider in our analysis the unweighted average of the latter four variables, as they capture the quality of economic and administrative institutions, whilst the first two indicators are related to the political setting, e.g., the electoral process, the state of democracy. Specifically, *Government Effectiveness* and *Regulatory Quality* measure "the capacity of the government to effectively formulate and implement sound policies"; while *Rule of Law* and *Control of Corruption* capture "the respect of citizens and the state for the institutions that govern economic and social interactions among them" (World Bank, 2024). This is also consistent with the findings of studies like Knack and Keefer (1995) and Acemoglu et al. (2004) that recognize the relevant role of economic institutions on prosperity in comparison with other institutions.

[6] Data for the years 1995, 1997, 1999 and 2001 are missing, hence we linearly interpolate between the neighboring years to obtain those observations. Moreover, we extended the dataset to 1989, assuming unchanged institutional quality between 1989 and 1996. We decided for this approach after studying the data provided by the Freedom House, which assesses the condition of political rights and civil liberties, and shows fairly stable scores of the EU countries in this period.
[7] We chose this dataset, because this has some advantages compared to other popular data sources used in the literature such as the Freedom House or Polity5 by Center for Systemic Peace. First, it measures a very broad definition of governance; secondly, it is less sensitive to extreme outliers in the data. Finally, it provides information on the uncertainty in the measurement of such aggregate indicators of governance through the computed std errors and confidence intervals, which is not a common feature among similar indicators.

The aggregated governance measure is standardized such that it ranges between 0 and 1, which are respectively the worst and best governance values[8].

To illustrate the trend movements behind institutional quality over time and by country, we divide the EU countries into different regions, according to the classification proposed by EuroVoc (2024), i.e., Central and Eastern Europe, Northern Europe, Southern Europe, and Western Europe.[9] Chart 3 shows the evolution of the governance quality indicator over time across the regions previously defined.

Chart 3: Quality of institutions in Europe
(percent)



Source: World Bank.

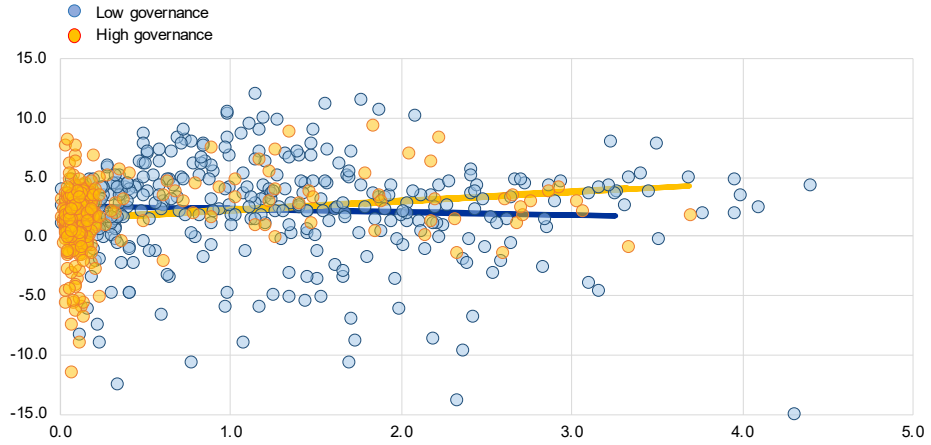
It is worth noting that in Western and Southern Europe, institutional quality has been deteriorating between 1996 and 2020, while it has broadly stagnated in Central and Eastern Europe and in Northern Europe. For our analysis it is also worth observing that overall, the cross-country variability of the aggregate governance indicator is considerably larger than the time variation: the standard deviation across countries is three times as much as across time.

Chart 4 shows the relationship between the EU funds and per capita growth. It demonstrates a difference in the correlation between growth and EU funds based on the governance quality of the countries. While this simple correlation does not clarify the pattern between the three variables, it does indicate that governance is important to be considered when investigating the effect of EU transfers.

[8] They originally range between -2.5 (the lowest and worse value) to 2.5 (the highest and best value). We standardized them to have them varying between 0 and 1.

[9] Western Europe groups Austria, Belgium, Germany, France, Ireland, Luxembourg, Netherlands, United Kingdom; Central and Eastern Europe refers to Bulgaria, Czech Republic, Croatia, Hungary, Poland, Romania, Slovakia, Slovenia; Southern Europe is meant as Cyprus, Greece, Spain, Italy, Malta, Portugal; Northern Europe is represented by Denmark, Estonia, Finland, Latvia, Lithuania, Sweden.

Chart 4: Average growth and EU fund by institutional quality
(percent)



Source: World Bank, EU Commission, AMECO and authors' calculation. Notes: Average annual funds as % GNI are plotted on the x-axis and average annual growth rate of per capita GDP on y-axis. We divide the sample into two parts, i.e., those with low governance and high governance according to the threshold of the sample's mean, i.e., 0.72. The two lines are the regression lines of the corresponding sample.

To explain the growth of GDP per capita according to the neoclassical model, as it will be described in Chapter 4, we require data on the standard production factors: employment rate, human capital and investment. We consider the change of the employment rate (number of employed people as a % of total population, between 15 and 64 years old), provided by Eurostat. Human capital is defined as the share of population between 25 and 64 years old that hold either an upper secondary, post-secondary non-tertiary or tertiary education. Such data are provided by Eurostat (for data after 2004) and the Barro-Lee dataset (for data before 2004)[10]. The investment ratio is gross fixed capital formation, defined in percent of GDP, from the World Bank.

[10] Eurostat is the main source, while the Barro-Lee dataset integrates for its missing data. Specifically, the Barro-Lee dataset supplies data on educational attainment in five-year intervals from 1950 to 2015. Given that Eurostat covers annual data from 2004 onwards, we select the data on percentage of the population 25-64 years old that completed the secondary (*lsc*) and tertiary education (*lhc*) for the years 1985, 1990, 1995, and 2000, and sum these two variables up to proxy the human capital provided by Eurostat. Also, we linearly interpolate the missing data for the lacking years.

4. Methodology

This section describes the methodology we use, starting from a basic unconditional convergence type of regression.

4.1. Growth regression

Our starting point is the unconditional convergence setup of Barro and Sala-i-Martin (1992), which shows that countries/regions with lower initial per capita income tend to grow faster, to catch up with higher-income countries. We apply this idea to a panel of EU countries between 1989 and 2020.

Equation 1

$$g_{i,t} = \propto_0 + \propto_1 log\left(y_{i,t-1}\right) + w_t + \varepsilon_{i,t} \qquad (1)$$

where $g_{i,t}$ is the growth of GDP per capita, $y_{i,t-1}$ is the lagged level of GDP per capita, both expressed in Purchasing Power Standards (PPS) in country *i* and year *t* and *t-1*, respectively, and w_t is a set of dummies acting as period (time) fixed effects. The reason to exclude cross-section fixed effects is explained below.

We then extend this basic specification with other determinants of growth, in the vein of Mankiw-Romer-Weil (1992):

Equation 2

$$g_{i,t} = \propto_0 + \propto_1 log\left(y_{i,t-1}\right) + \propto_2 inv_{i,t} + \propto_3 d(emp_{i,t}) + \propto_4 hk_{i,t} + w_t + \varepsilon_{i,t} \qquad (2)$$

where $inv_{i,t}$ is the investment ratio (gross fixed capital formation over real GDP); $emp_{i,t}$ is the employment ratio (number of employed over the working age population); and $hk_{i,t}$ is human capital, proxied by the share of population with at least secondary level education.

To study the growth effect of EU funds, our baseline specification extends *Equation 2* with the EU transfers. Here, we assume, in line with some papers in the literature, that the EU funds in year *t* affect growth already in that same year; nevertheless, we also estimate the longer-term effects of the funds, as presented later.

Equation 3

$$g_{i,t} = \propto_0 + \propto_1 log\left(y_{i,t-1}\right) + \propto_2 inv_{i,t} + \propto_3 d(emp_{i,t}) + \propto_4 hk_{i,t} + \propto_5 funds_{i,t} + w_t + \varepsilon_{i,t} \qquad (3)$$

Introducing the role of EU transfers in the growth model is not that straightforward, as some issues concerning the nature of EU transfers need to be considered. In fact, these are primarily coming in the form of investments, which are at the same time one of the production factors. Moreover, a country

might not spend all the amount devoted for a specific programming period by the end of that period, as project applications can be submitted until the end of a period and thus, they may be undertaken and paid out in the next period. In fact, the so-called N+2 rule holds for programming periods 1989-1993, 1994-1999, 2000-2006, 2007-2013 and N+3 holds for period 2014-2020, meaning programmes are required (or, are allowed) to spend funds by the end of the second year (or third year in case of N+3 rule) following the year in which they are allocated. Because of these regulations, EU transfers may translate into growth later, due to delays in investment project initiation and materialization, and thus accounting for the timing of the effect and receivers' absorption capacity could pose additional challenges. Given that we cannot account for these overlapping periods, we consider only the actual payments, and these are relevant to estimate the absorption rate of each country.

To examine the conditional effectiveness of the funds to the institutional quality, we add the interaction term into *Equation 3* as well as the institutional quality measure alone, in line with later growth theories: *Equation 4*

$$g_{i,t} = \propto_0 + \propto_1 \log(y_{i,t-1}) + \propto_2 inv_{i,t} + \propto_3 d(emp_{i,t}) + \propto_4 hk_{i,t} + \propto_5 funds_{i,t} + \propto_6 funds_{i,t} \times institution_{i,t} + \propto_7 institution_{i,t} + w_t + \varepsilon_{i,t} \quad (4)$$

where $institution_{i,t}$ is one of the institutional measures. By default, this is the non-weighted average of the four indicators introduced in Section 3.4. To understand which institution matters the most, we also study *Equation 4* for each of the four indicators individually. It is important to stress that these indicators vary relatively little over time and vary more across countries. Therefore, one can look at them as quasi-cross-section fixed effects – it means it would be redundant to add explicit cross-country fixed effects in the regression[11].

The impact of the EU funds on per capita growth is given by α_5 and α_6 as it follows:

$$growth\ effect_{i,t} = \widehat{\propto_5} + \widehat{\propto_6} * institution_{i,t}$$

Therefore, to see the growth effect, one has to plug in values for *institution* that are of interest for the researcher. Most often, the sample mean, median, and the minimum and maximum value are considered. We will actually plug in the values of each EU member state, to arrive at a chart that shows the growth impact as a function of institutional quality.

4.2. Possible endogeneity issues

[11] The same approach is followed e.g., in Masuch et al (2016).

Two possible sources of endogeneity might influence the estimated results in *equation (4)*: between GDP per capita and the quality of institutions, and between GDP per capita and EU funds. Specifically, they both refer to reverse causality.

The first type of endogeneity is related to the possible reverse causality between growth and institutions, as the degree of economic prosperity can be argued to affect the quality of the institutions[12]. In the literature, a large range of studies such as e.g. Chong and Calderón (2000) analyzed the nature of such relationship, recognizing their bi-directional sides and the importance of its correct treatment. Failing in addressing such issue results in a biased estimated impact of governance on growth. The literature generally treats this type of endogeneity with the use of instrumental variables (IV). For instance, one of the earliest papers, Mauro (1995) studies the role of corruption in economic growth, using ethnolinguistic fractionalization as an instrument, arguing that it is highly correlated with corruption and other institutional variables, but it is exogenous both to economic variables and to institutional efficiency. Another example is provided by Acemoglu et al. (2001), who employed the settler mortality in the eighteenth and nineteenth centuries as instruments, arguing that colonial powers were not prone to establish good institutions in colonies where a permanent European presence was unlikely to take root. In our paper we decide to follow the approach of La Porta et al (1999) and Masuch et al. (2016) and use the instrument "legal origin" [13] in the first stage of a Two-Stages Least Squares (TSLS) regression. We also add the distance to equator to proxy the role of geography in institutional development, as applied for instance in Rodrik (2004)[14]. As in Masuch et al. (2016), since we have an interaction term in *Equation 4*, we estimate two instrumental equations in the first step:

Equation 5

$$institution_{i,t} = \upsilon_0 + \upsilon_1 log\left(y_{i,t-1}\right) + \upsilon_2 inv_{i,t} + \upsilon_3 emp_{i,t} + \upsilon_4 hk_{i,t} + \upsilon_5 funds_{i,t} + \upsilon_6 LO_i + \upsilon_7 LO_i \times funds_{i,t} + \upsilon_8 distance_i + \upsilon_7 distance_i \times funds_{i,t} + \rho_t + \zeta_{i,t} \quad (5)$$

Equation 6

$$funds_{it} \times institution_{i,t} = \delta_0 + \delta_1 log\left(y_{i,t-1}\right) + \delta_2 inv_{i,t} + \delta_3 d(emp_{i,t}) + \delta_4 hk_{it} + \delta_5 funds_{i,t} + \delta_6 LO_i + \delta_7 LO_i \times funds_{it} + \upsilon_8 distance_i + \upsilon_7 distance_i \times funds_{i,t} + \phi_t + \mu_{it} \quad (6)$$

[12] However, the literature does not find agreement on the sign of this impact: on one hand, studies like Acemoglu et al. (2008) and Boix (2003) suggest that higher levels of economic growth are associated to democratization; on the other hand, Przeworski et al. (2000) stressed that economic development does not necessarily lead to democracy and dictatorship can survive in a country that becomes sufficiently wealthy. Also, Kaufmann and Kraay (2002) found negative feedback from income to governance, meaning that improvements in institutional quality is unlikely to occur merely because of economic development.

[13] La Porta et al. (1999) groups the countries based on their legal origin as follows: English (CY, IE, UK), French (MT, BE, ES, FR, GR, IT, LU NL, PT), German (AT, DE), Soviet (EE, LT, LV, SI, SK, BG, CZ, HR, HU, PL, RO) and Scandinavian (FI, DK, SE).

[14] The authors show that "once institutions are controlled for, conventional measures of geography have at best weak direct effects on incomes, although they have a strong indirect effect by influencing the quality of institutions."

Where LO_i is the matrix of the 5 types of legal origin variables for the 28 countries, and $distance_i$ is the distance of country *i*'s capital from the equator.

In the second stage, we plug in the fitted values of $institution_{i,t}$ of *Equation 5* and $funds_{i,t}$ *x* $institution_{i,t}$ of *Equation 6* into *Equation 4*:

Equation 7

$$g_{i,t} = \propto_0 + \propto_1 log\left(y_{i,t-1}\right) + \propto_2 inv_{i,t} + \propto_3 emp_{i,t} + \propto_4 hk_{i,t} + \propto_5 funds_{i,t} + \propto_6 \overline{funds_{i,t} \times institution_{i,t}} + \propto_7 \overline{institution_{i,t}} + w_t + \varepsilon_{i,t} \quad (7)$$

The second type of endogeneity is perhaps less clearly present, and stems from the fact that countries that receive higher funds are likely to grow more, but at the same time, the funds allocation depends on the economic condition of the country. Member states, whose GDP is below some specific threshold, receive more EU funds. Therefore, the estimated impact of EU transfers results to be downward biased, and a robust approach to measure its unbiased effect needs to be defined. There is little literature proposing any solution to this specific problem and this also mainly concerns region-level studies – e.g., Mohl and Hagen (2008) employs a two-step GMM estimation method, while Dall'Erba and Le Gallo (2008) use the distance by road to Brussels and the travel time from the most populated town of each region to Brussels as instrument, claiming that the spatial distribution of structural funds follows a center-periphery distribution. In our case, the endogeneity might emerge if both the distribution of EU funds, and the growth in per capita GDP are, at least partially, caused by a variable that we omit from the regression. Such a variable would be the level of per capita GDP – this is however included in our baseline specification. Nevertheless, to be on the safe side, we also construct a new dependent variable, based on the convergence theory of Barro and Sala-i-Martin (1992), with the aim to directly capture the potential additional convergence effect that the funds could result in, which does not depend on the inherent convergence of the country. Practically, we predict the per capita GDP of each country, based on an estimated β-convergence parameter, and obtain the deviation between this predicted per capita GDP and the observed per capita GDP. We argue that the distribution of EU funds is based on this underlying, predicted convergence path, and any deviation from this path is explained by the variables used in *Equation 4.* In particular, first, we estimate the pace of β-convergence, based on the experience of old EU member states, between 1960 and 1988, i.e. before the start of our sample, using the regression of Barro and Sala-i-Martin (1992):

Equation 8

$$growth_i = \beta_0 + \beta_1 initGDP_i + \epsilon_i \quad (8)$$

The estimation of *equation (8)* gives a statistically significant annual 2.9% as the speed of convergence, somewhat higher than the 2% documented in the early convergence literature. Then, we predict the log of per capita GDP that each member state would have had if they had followed the convergence pattern defined in *Equation 8*:

$$e\_y_{i,t+1} = y_{i,t} + \widehat{\beta_0} + \widehat{\beta_1} y_{i,t-1}$$

Then, we compute the difference between the actual and predicted log of real GDP per capita, which represents the unexplained convergence of each member state *i* in time *t* in {t_0,2020}, where t_0 is the year the country stared to receive funding from the Structural, Cohesion or Pre-Accession funds:

$$ue\_y_{i,t} = y_{i,t} - e\_y_{i,t}$$

In our alternative specification of *Equation 4*, we consider the change in the new unexplained per capita GDP as the main dependent variable, and drop the level of per capita GDP from the explanatory variables:

Equation 9

$$d(ue_{y_{i,t}}) = \propto_0 + \propto_1 inv_{i,t} + \propto_2 d(emp_{i,t}) + \propto_3 hk_{i,t} + \propto_4 funds_{i,t} + \propto_5 funds_{i,t} \times institution_{i,t} + \propto_6 institution_{i,t} + w_t + \varepsilon_{i,t} \quad (9)$$

Finally, to treat both types of endogeneity simultaneously, we repeat the TSLS estimation also with the unexplained per capita GDP as the dependent variable, i.e., based on *Equation 9*.

We have the view that the first type of endogeneity, the possible reverse causality between growth and institutions, is more of a concern, and the second type of endogeneity, the omitted variable bias, is likely to be small or negligible. Hence, our baseline specification will be the one estimated with TSLS, where per capita GDP growth is the explained variable, i.e. *Equation 7*.

4.3. Long-term impacts

The approach introduced in Sections 4.1 and 4.2 focus on the contemporaneous impact of EU funds. However, it is also important to study the long-term effect. Therefore, we apply the local projection method (LPM) as proposed by Jordà (2005). The LPM allows to compute impulse responses without specification and estimation of the underlying multivariate dynamic system. Using *equations (4)* through *(9)*, we estimate the impact of EU funds on *future* growth. Some selected fitted values of the governance indicator are used to observe impulse responses and confidence intervals; these are the lowest, average, and highest values of governance, across countries, on average over 1989-2020.
The OLS versions of the LPM look like *Equation 10* and *Equation 11* below. The IV versions combine *Equations (5)* to *(6)* with *Equations (10)* and *(11)*.

Equation 10

$$g_{i,t+k} = \propto_0 + \propto_1 log\left(y_{i,t-1}\right) + \propto_2 inv_{i,t} + \propto_3 emp_{i,t} + \propto_4 hk_{i,t} + \propto_5 funds_{i,t} + \propto_6 \overline{funds_{i,t} \times institution_{i,t}} + \propto_7 \overline{institution_{i,t}} + w_t + \varepsilon_{i,t+k} \quad (10)$$

Equation 11

$$ue\_y_{i,t+k} = \propto_0 + \propto_1 inv_{i,t} + \propto_2 emp_{i,t} + \propto_3 hk_{i,t} + \propto_4 funds_{i,t} + \propto_5 \overline{funds_{i,t} \times institution_{i,t}} + \propto_5 \overline{institution_{i,t}} + w_t + \varepsilon_{i,t+k} \quad (11)$$

for *k = 0 to 5*.

The impulse responses are then computed by estimating equations (10) and (11) for each *k = 0 to 6*, and obtaining the estimated α_5 and α_4 parameters, respectively. The 90% confidence bands are built using the estimated standard errors of the α coefficients.

5. Empirical results

5.1. Econometric results

Table 1 reports the results of our model specifications defined in equations (1), (2), (3), (4) and (7) for the growth of GDP per capita as the main dependent variable. The statistical significance (p-values) is computed using heteroskedasticity-robust standard errors, clustered by cross-section. These standard errors are in general larger than those that are not robust, and it is more likely that they reject the statistical significance of the estimated variables. We run equations (1), (2) and (3) considering both country and time fixed effects. We run equation (4) without country fixed effects, as institutional quality acts as a quasi-fixed effect. Nevertheless, in Section 5.3., we do a robustness check with country fixed effects in equation (4). As expected by the convergence theory, the lag of GDP per capita negatively affects the growth of GDP per capita; and the investment rate, human capital and employment rate have a positive impact on the growth of GDP per capita, although our proxy for the quality of human capital remains statistically non-significant in our estimates. When we extend the basic unconditional convergence equation with the addition of the EU funds, we find that these seem to have a negative effect, statistically significant at 10% with robust standard errors: other variables being constant, on average, one percentage point higher EU funds as a share of GNI is associated with 0.255 percentage point *lower* per capita GDP growth. The addition of the institutional quality to the equation confirms the conditional effects of EU funds: the estimated coefficient of EU funds is negative, and the estimated coefficient of the interaction term between the EU funds and institutional quality is positive, and larger in absolute value than the coefficient of EU funds. This suggests that in countries with weak institutions the growth effect of EU funds is non-positive, and the effect increases with institutional quality. In the

OLS regression, none of the coefficients are statistically significant though when applying robust standard errors. This in itself does not tell however whether in countries with different levels of institutional quality the growth effect is statistically significant. We return to this below.

Our main specification is shown in the last column of Table 1. Here, the regression is estimated using the IV approach, as described in Section 4.2. First, in the first stages of the regression (*Equation 5* and *Equation 6* in Section 4.2), we test for the joint significance of our instruments. In *Equation 5*, the F-test gives a value of 4.03, and the instruments are statistically significant at 5%. In *Equation 6*, the value of the F-test is 7.39, and the instruments are statistically significant at 1%. Stock and Yogo (2002) provide detailed tables to evaluate the F-test in instrumental variables regressions. Based on their critical values, our instruments are jointly statistically significant in *Equation 5* only if the desired maximal bias of the IV estimator relative to the OLS estimator is relatively large (>0.3); while our instruments are jointly statistically significant in *Equation 6* at lower desired maximal bias (between 0.1 and 0.2).

In this IV specification, which controls for the possible endogeneity between growth and institutional quality, all variables are statistically significant at least at 5%, except institutional quality as a standalone variable. However, it is quite likely that the non-significance of that latter variable is due to multicollinearity, between lagged per capita GDP and the fitted value of institutional quality from the first stage of the IV regression – their correlation is 0.75.

Table 1: Estimation outputs for growth of GDP per capita as dependent variable

dependent variable: ***per capita GDP growth***	(1 - OLS)	(2 - OLS)	(3 - OLS)	(4 - OLS)	(4 - IV)
constant	12.532***	13.730***	13.048***	3.910*	4.537**
log(gdph)	-3.319***	-5.615***	-5.225***	-2.657**	-2.910***
change in employment rate		0.947***	0.966***	1.019***	1.020***
human capital		0.022	0.019	0.026**	0.027**
investment rate		0.191***	0.180***	0.140***	0.133***
EU funds			-0.252*	-2.020	-3.540**
EU funds x institutions				2.986	5.250**
institutions				1.757	2.085
Period fixed effects	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	no	no
number of observations	726	726	726	726	726
adjusted R-squared	0.025	0.319	0.322	0.396	0.340
Joint significance	-	-	-	0.016	0.001

*Note: ***: p<0.01, **: p<0.05, *: p<0.1. p-values are calculated with robust standard errors (cross-section clustering). The R-squared has to be understood as the fit of the regression without fixed effects. Column (4) – IV present results using all instruments and the F-statistics of first stage are 9.932 and p-value equal to 0.0016 and 12.525 and p-value equal to 0.004.*

Table 2 repeats the estimations presented in Table 1, but with the non-explained per capita GDP growth as a dependent variable. The results confirm the results shown in *Table 1*, with limited qualitative differences. In the IV specification, the signs of the effect of the variables in interest are correct, and the

absolute value of the coefficient of the interaction term is larger than the coefficient of the EU funds variable, confirming the above-discussed conditional impact of the funds. The coefficients of EU funds and the interaction term are however not statistically significant.

Table 2: Estimation outputs for non-predicted per capita growth as dependent variable

dependent variable: ***unexplained per capita GDP growth***	(1 - OLS)	(2 - OLS)	(3 - OLS)	(4 - OLS)	(4 - IV)
constant	0.542***	-4.940*	-3.957	-6.444***	-4.674**
change in employment rate		1.142***	1.181***	1.248***	1.256***
human capital		0.017	0.011	0.008	0.017*
investment rate		0.175***	0.164***	0.131**	0.113**
EU funds			-0.522***	-0.917	-5.214**
EU funds x institutions				0.876	7.249**
institutions				4.508*	1.889
Period fixed effects	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	no	no
number of observations	726	726	726	726	726
R-squared	0.000	0.234	0.243	0.274	0.269
Joint significance	-	-	-	0.961	0.100

*Note: ***: p<0.01, **: p<0.05, *: p<0.1. p-values are calculated with robust standard errors (cross-section clustering). The R-squared has to be understood as the fit of the regression without fixed effects. Column (4) for IV follows uniquely the approach of Masuch et al. (2016) and F-test of the first stages are 18.666 and 20.417.*

To be able to properly interpret the results, the estimated regressions have to be evaluated at different levels of institutional quality. We use the IV specification for this evaluation, and plug in the observed institutional quality of each country (the average of it over our sample, 1989-2020) into *Equation 7*, and re-estimate the regression. Chart 5 plots the estimated coefficient of the EU funds for each country against their institutional quality. Using robust standard errors, countries with the worst institutional quality seem to have a negative impact of EU funds on their per capita GDP growth. Countries that have average, or better institutional quality have a positive growth impact of the funds, which can be as large as 1 percentage point in countries with the best institutions. Chart 6 confirms these estimates when using the non-explained per capita growth as dependent variable, although with much larger uncertainty about the positive impact.

Chart 5: The growth effect of EU funds conditional on the quality of institutions
(per capita GDP growth as dependent variable)

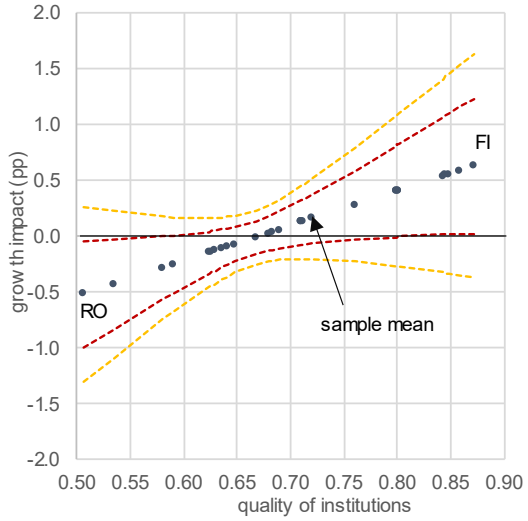
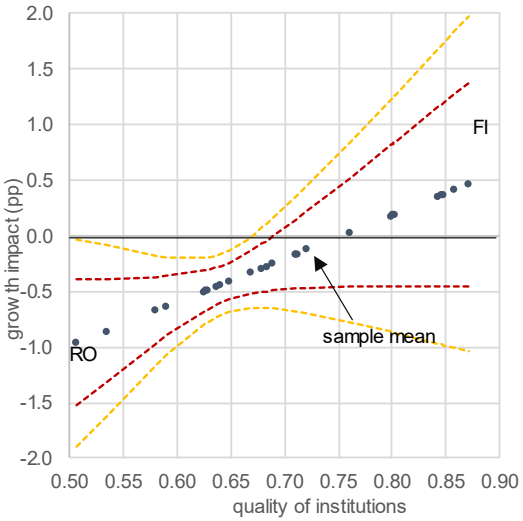


Chart 6: The growth effect of EU funds conditional on the quality of institutions
(non-explained per capita GDP growth as dependent variable)

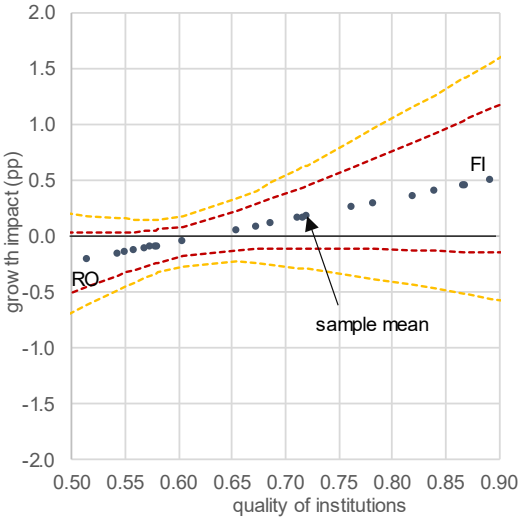


Note: red and yellow dashed lines represent 68% and 90% confidence intervals, respectively, using robust standard errors (cross-section clustering).

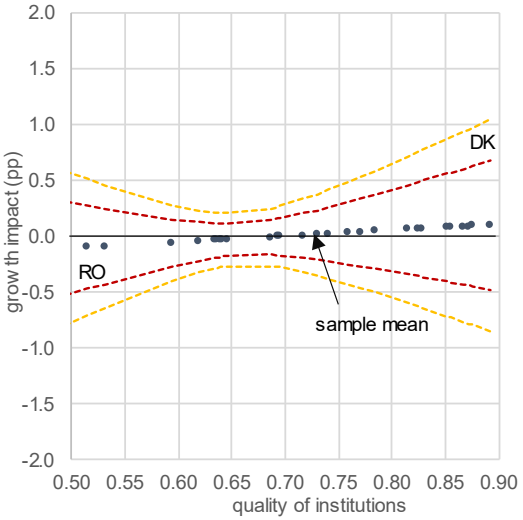
We also check if replacing our proxy for institutional quality, the non-weighted average of the four governance indicators, with the individual governance indicators, changes the results. In other words, we look at which of the governance indicators drives the results. Although the four indictors are highly correlated, this correlation is not perfect: for instance, the correlation between the regulatory environment and government effectiveness is 0.86. Therefore, one or more of the four indicators could be more informative. As Chart 7 indicates, the results change relatively little. If anything, the rule of law seems to matter somewhat less for the effectiveness of EU funds, while the control of corruption, government effectiveness and regulatory quality have similar importance.

Chart 7: The growth effect of EU funds conditional on the quality of institutions
(per capita GDP growth as dependent variable)

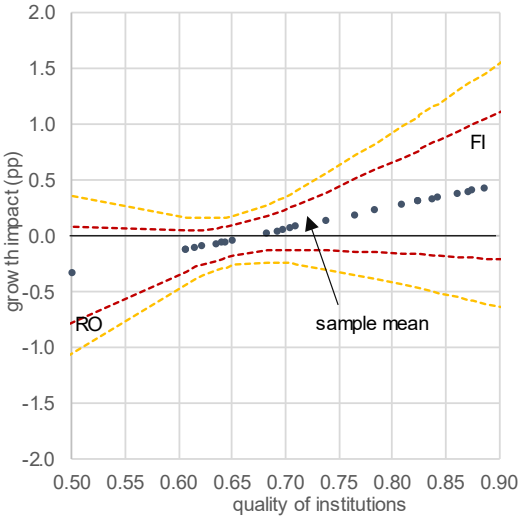
a) Institutional quality: Control of Corruption



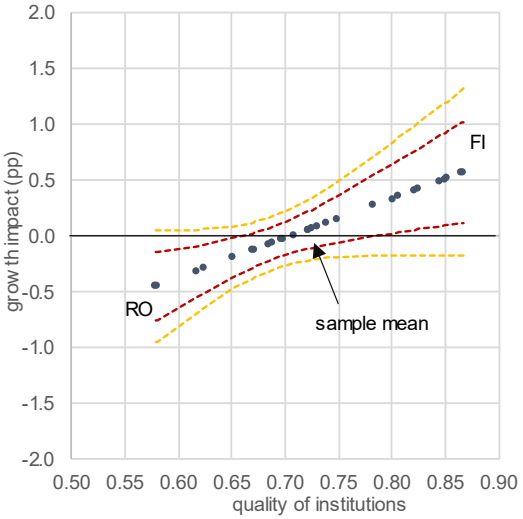
b) Institutional quality: Rule of Law



c) Institutional quality: Government Effectiveness



d) Institutional quality: Regulatory Quality



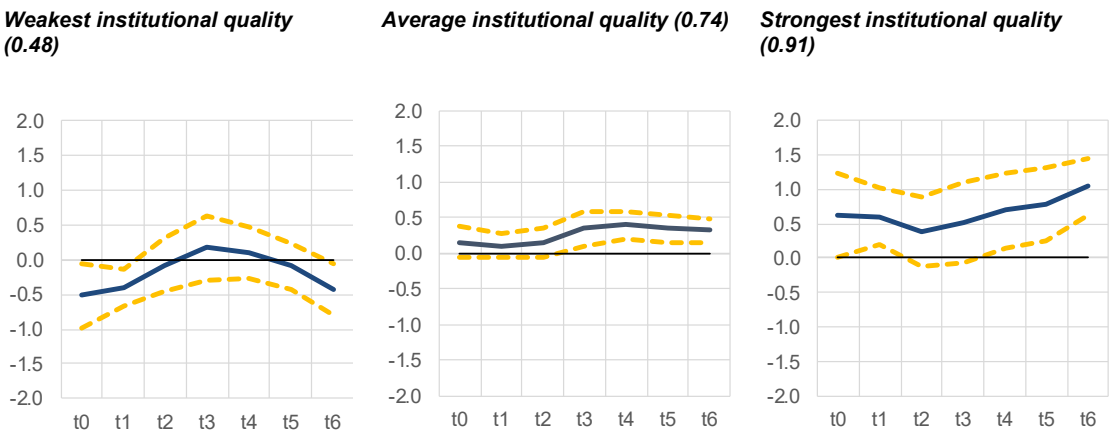
Note: Estimates based on the IV specification. Red and yellow dashed lines represent 68% and 90% confidence intervals, respectively, using robust standard errors (cross-section clustering).

5.2. Long-term impacts

We estimate the LPM models of *Equation 10*, i.e. the IV approach, and evaluate them with lowest, average, and highest institutional quality in our sample. The LPM shows that the contemporaneous impact shown in Section 5.1. persist over the longer term: the impact over 7 years (contemporaneous impact plus the impact 6-years ahead) is similar to the contemporaneous impact. Where institutions are

weak, there is no growth impact coming from the funds. In countries with average quality of institutions, the long-term impact is positive with 90% certainty: 1 percentage point additional EU fund enhances per capita growth by around 0.4-0.5 percentage point annually, over the assessed 7-year horizon. With very high institutional quality, the persistent growth impact is even higher (Chart 8).

Chart 8: Long-term growth effect of EU funds
(per capita GDP growth as dependent variable)



Note: yellow dashed lines represent a 90% confidence interval. Newey-West robust standard errors are used.

5.3. Further robustness checks

We conduct some further robustness checks on *Equation (7)*[15]; the results are summarized in *Table 3*. First, we check if replacing the standalone institutional quality indicator in *Equation 4* with country fixed effects changes the results (column (1)). Second, we check how changing the sample influences the results. We consider only the EU members who joined the EU before 1995, looking at a sample of 1989-2020 (column (2)), and 2000-2020 (column (3)); and we also consider a sample of all member states, with a time horizon of 2000-2020 (column (4)). Moreover, we take the entire sample but drop Ireland (column (5)) as well as Luxembourg (column (6)), two countries that might be considered as outliers, due to large transfers affecting their GDP levels and growth rates in certain years. We also check if the convergence of EU member states may be driven by foreign direct investment (FDI) as they received this additional source of funding in the same period considered (column (7)). Furthermore, we check for possible multicollinearity issues between the EU funds and the production factors such as employment and investment, as the former may affect the latter. To do that, we run a sort of first stage regression of EU funds on those production factors, finding that their collinearity is statistically significant only for the

[15] We do not make robustness checks on the change in the new unexplained per capita GDP to easily interpret the coefficients of the regression. Also, we report additional robustness checks in the appendix using alternative dependent variables. For example, we run the analysis on the growth of the GNI per capita to reduce the bias from the activity of multinationals (especially in case of IE and LU) and thus, we substitute the lag of the GDP per capita growth with the lag of GNI per capita as regressor.

labour factor[16]. Therefore, we compute the residuals of this regression output and use it to replace the change in employment in *Equation 7* (column (8)). Consistent with the labour factor specification, we run *Equation 7* with the human capital variable in first difference rather than in level (column (9)). Given that we have been using the gross EU funding as main regressor in our study and recalling the discussion in Section 3, we want to look at the impact of the net-out-of-payment EU funds and column (10) reports the results of such analysis. However, we need to keep in mind that the sample is now smaller due to the missing information on the contribution of each member state before 2000, and thus, this specification is especially comparable with the one in column (4). Column (11) considers the member states that have significant amount of EU funds, namely excluding the top ten countries in Chart 2, i.e., Denmark, the Netherlands, Sweden, the United Kingdom, Austria, Luxemburg, Belgium, France, Germany, Finland, and Italy. Column (12) checks the possible conditional effect of the EU funds while being part of the European Union, by adding a dummy for the EU membership to control for the pre- and post-accession periods. In other words, with such specification we are able to disentangle the influence of joining the EU and the receipt of the cohesion support. Finally, column (13) uses the gross funds per capita as alternative regressor to the ratio of the funds over GNI.

Although the significance of the estimated coefficients of interest changes somewhat in these alternative specifications, it remains that the sign of the EU funds coefficient is negative, and the sign of the interaction term is positive, and larger in absolute value, confirming that the growth effect of EU funds is conditional on institutional quality. Also, it is worth noticing that column (12) would suggest a positive influence of the EU membership on the economic performance of member states, despite being statistically insignificant; moreover, when institutions are not good, the impact of EU funds seems to be less negative only because the country is member of the EU, and once we control for the institutional quality, the conditional effect appears of smaller magnitude when the country is an EU member state. This would highlight the importance of the EU membership in their transition towards a wealthier economy and more stable institutional quality.

[16] You can find both first stage outputs in the Appendix.

Table 3: Robustness checks

dependent variable: per capita GDP growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
constant	-0.656	-1.776	-3.210	4.512	5.222**	8.570***	6.361**	5.627*	5.036**	-0.753	1.939	4.309*	5.970***
log(gdph)	-0.108**	-0.192	0.354	-2.137*	-2.930**	-5.163***	-3.83***	-2.847*	-3.504***	2.163**	-5.023***	-2.756***	-2.746***
change in employment rate	0.943***	0.851***	0.887***	1.002***	1.060***	0.924***	0.961***	0.968***	1.013***	1.166***	0.884***	0.985***	1.014
human capital	0.030	0.028***	0.099**	0.032**	0.024*	0.020*	0.030**	0.038***	0.085	0.024**	0.025*	0.030**	0.029***
investment rate	0.153***	0.120***	0.088	0.148***	0.110*	0.154***	0.122***	0.105***	0.159***	0.165***	0.157*	0.119***	0.120***
EU funds	-1.135	-8.145***	-18.292**	-3.430	-1.086	-4.329	-6.084	-8.555*	-2.077	-2.396	0.614	-9.703*	-0.044***
EU funds x institutions	0.979	12.197***	29.155**	5.005	1.540	6.204	9.008	13.028*	3.088	3.682	-1.547	20.473**	0.065***
institutions	-	-1.159	-8.764	-2.637	2.014	6.541*	3.733	0.591	5.618	4.936	15.719***	1.149	-0.360
FDI	-	-	-	-	-	-	0.003	-	-	-	-	-	-
EU membership	-	-	-	-	-	-	-	-	-	-	-	0.497	-
EU membership x EU funds	-	-	-	-	-	-	-	-	-	-	-	2.664	-
EU membership x EU funds x institutions	-	-	-	-	-	-	-	-	-	-	-	-9.933	-
(EU funds)^2													
Period fixed effects	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	no	no	No	no	no	no	no	no	no	no	no	no
number of observations	726	384	252	579	694	694	713	726	726	520	424	726	726
R-squared	0.857	0.318	0.279	0.405	0.451	0.425	0.41	0.377	0.384	0.415	0.422	0.418	0..409
Joint significance		0.000	0.025	0.639	0.664	0.190	0.157	0.053	0.361	0.416	0.262	0.101	0.000

*Notes: ***: p<0.01, **: p<0.05, *: p<0.1. p-values are calculated with robust standard errors (cross-section clustering). Instruments are not the same in all these specifications as their joint significance (assessed with the F-test) changes across the sample considered in each specification. Only column (5) uses the baseline instruments, i.e. the legal dummies of EN, DE, FR and SC, and the distance to equator. Columns (1) and (6) have as instruments the legal dummies of EN, DE, FR, and SC; while column (4) have as instruments the legal dummies of EN, DE, FR and SV. Distance to equator is the only instrument in case of specification (2), (3), (7), (8), (9), (10), (12). Column (11) reports the results from the fixed effects model without relying on any IV approach: this is due to the exclusion of the top ten countries in Chart 2, which implies dropping around 40% of observations and thus, reducing the variability of the instruments and therefore, their validity. In fact, the f-test confirms that none of the instruments or any of their combination suits such sample.*

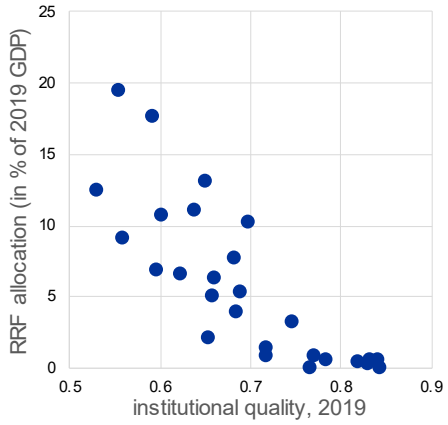
6. Discussion and conclusion

Based on our results, the experience with EU funds over 1989 to 2020 shows that only economic growth of countries with good quality of institutions benefit from these funds. In countries with weak institutions, EU funds fail to positively contribute to economic growth. There are multiple possible reasons why the funds are not effective in these countries:

- *Crowding out*: Governments of member states, as well as private sector are likely to withdraw their own funds from lagging regions once the government receive EU funds.
- *Rent seeking*: Regional governments design projects that meet the criteria set by the EU, but that are not necessarily effective in stimulating growth.
- *Moral hazard*: Regional governments are likely to invest the EU funding on low-productive projects with the final aim of keeping the region eligible for the EU funding.
- *Location*: A firm located in the targeted region or country does not necessarily undertake the plan financed by the EU funding, but companies from other regions or countries may. Therefore, a share of the value added from the project in one region/country may first benefit another one.
- *Principle of additionality*: A project needs to be also implemented by additional regional or national financing. However, only richer regions can have higher additional fundings, and thus the wealthiest regions are the ones that benefit the most from EU funds.

Our research has important messages for the expected economic impact of the Next Generation EU (NGEU) funds. The NGEU, and more precisely its main instrument, the Resilience and Recovery Facility (RRF), was set up in 2020, with aim "to mitigate the pandemic's economic and social impact" and to "make sure Member States are more resilient, more sustainable and better prepared for the challenges and opportunities of the green and digital transitions"[17]. It is interesting to note that more RRF funds are allocated to countries that have lower quality of institutions (Chart 9). On the one hand, this pattern highlights the risk that countries with weaker institutions – that also receive more RRF funds - may use such funds less efficiently or wisely. On the other hand, countries that receive more RRF funds are also expected to introduce more structural reforms, some of which have the potential to improve institutional quality and thereby improve the

Chart 9: Institutional quality and allocation of the Recovery and Resilience Funds
(annual percentage change)



Source: World Bank, European Commission

[17] https://next-generation-eu.europa.eu/recovery-and-resilience-facility_en

effectiveness of the RRF and EU funds in general. In this respect, it is encouraging that Zorell and Zwick (2024) show early tentative signs of improvements in institutional quality in some EU member states following the launch of NGEU.

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Annex

A.1. Data description

Variable	Description	Source
per capita GDP growth	First difference of the log of GDP per capita. This latter is measured in billions ECU/EUR, at 2015 reference levels expressed in Purchasing Power Standards (PPS),	AMECO
EU funds	The amount of funding under the EU budget entries “Structural Actions” and “Pre-accession Strategy” in the 1989-1999 budgets, "Structural Actions", and '"Pre-accession Strategy" in the 2000-2006 budget, the "Structural Funds", "Cohesion Fund", and "Instrument for Pre-accession (IPA)" in the 2007-2013 budget, while the “Economic, social and territorial cohesion" and "Instrument for Pre-accession (IPA)" in the 2014-2020 budget. Such entries are summed up and divided by GNI.	EU Commission, AMECO
change in employment rate	First difference of employment rate, as % of total population 15-74 years.	Eurostat
human capital	Population with upper secondary, post-secondary non-tertiary and tertiary education (levels 3-8), as % of total population from 25 to 64 years.	Eurostat (for data after 2004) integrated by Barro-Lee Dataset (for data before 2004).
investment rate	Gross fixed capital formation, as % of GDP.	World Bank
institutions	This is either the unweighted average of the Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption or the separate indicator. They have been standardized, ranging between 0 (worst quality) and 1 (best quality).	World Bank
FDI	Foreign direct investment, net inflows (% of GDP).	World Bank

Per capita GNI growth	First difference of the per capita GNI, expressed in Mrd EUR, at current price and divided by 1000 persons.	AMECO

A.2. First stage of the robustness check (8)

Dependent variable:	*change in employment rate*	*Investment rate*
Constant	0.245**	22.479***
EU funds	0.254*	-0.530
Period fixed effects	yes	yes
Country fixed effects	yes	yes
Number of observations	726	726
R-squared	0.010	0.010

*Note: ***: p<0.01, **: p<0.05, *: p<0.1. p-values are calculated with robust standard errors (cross-section clustering).*

A.3. Furter robustness checks on alternative dependent variables.

dependent variable:	**(7) - *per capita GNI growth***
constant	-1.245
log(gnih)	-0.147
change in employment rate	0.888***
human capital	0.045***
investment rate	0.126***
EU funds	-1.721
EU funds x institutions	3.096
institutions	-5.369
Period fixed effects	yes
Country fixed effects	no
number of observations	721
R-squared	0.25
Joint significance	0.140

*Notes: ***: p<0.01, **: p<0.05, *: p<0.1. p-values are calculated with robust standard errors (cross-section clustering). Instruments are the legal dummies and the distance to equator.*

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