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# Feasibility study for the overall impact evaluation of the European Social Fund

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# 1 Introduction

The European Social Fund (ESF) is one of the main Structural and Investment Funds (ESI Funds) which aim to provide support and to create more and better jobs and a socially inclusive society. The aim of this report is to assess the feasibility of an evaluation of the causal effects of the ESF on key objectives (growth and productivity, employment, poverty and inequality, and human capital accumulation) in the EU regions that benefited of the financial assistance in the programming periods 1994-99, 2000-06 and 2007-13.

Many studies have been undertaken to analyze the effects of ESI funds. Several ones have been coordinated by DG-REGIO and they mostly consider the effect of ESI funds on GDP, GDP growth and employment (See Pellegrini et al. for a complete review). Nevertheless, most of these studies focuses on the effect of the ESI funds overall, i.e. aggregating ESF with other available Funds, mostly ERDF and Cohesion Fund.

The objective of this report is to understand under which conditions it is possible to disentangle the effect of ESF from that of other funds, on outcomes that are explicitly targeted as key ESF policy objectives. The word "outcome" comprises any output variables targeted by the ESF, which can be used to identify the part of the results that can be credibly imputed to the fund netting out the contribution of either EU policies or other external factors.<sup>1</sup> These outcome variables should better capture the true impact of the funds. Using counterfactual impact evaluation, it is possible to establish a cause-effect link between the fund and the outcomes.

The report tries to answer three main questions: first, what are the most suitable data on ESF spending to be used (treatment definition); second, which are the most appropriate counterfactual impact evaluation methods that can be applied given the way ESF is allocated and given the data availability (method choice); third, which are the most credible outcomes variable to focus on to estimate the impact of ESF (Outcome definition).

Our main findings point to two possible sources of data on ESF that could be used, each of them with some limitations and caveats; one reliable method to be applied, given the features of ESF and the data availability; as well as a small set of outcome variables to be considered, in the field of human capital accumulation and employment.

The report is structured as follow: Section 2 provides a short review of the literature investigating the effect of EU transfer; Section 3 presents the main features of the ESF, focusing on the rules governing the allocation of the funds to the targeted regions and the main actions that can be supported with the fund. Section 4 presents the available data on ESF transfers, and Section 5 the main methods used in the literature to evaluate the effect of EU transfers and the assessment of their feasibility for estimating the effect of ESF only. Section 6 reports a list of possible empirical approaches that could be applied, together with the associated assumptions needed to identify the effect of ESF. Section 7 focuses on outcomes variables and proposes some concrete studies that could be undertaken, and Section 8 provides some possible empirical strategies and considerations on the possible way forward.

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<sup>1</sup> Outcome variables may hence correspond to output, result, impact or other indicators in the classification adopted by the ESF and by other ESIF funds.

## **2 Review of overall impact evaluation of European Structural and Investment Funds.**

The literature on *ex post* evaluation of EU funds is extensive. It comprises studies employing very rigorous counterfactual impact evaluation methods, as well as studies using more qualitative methodologies. The scope of these studies is both at aggregate level and at the single interventions level. The aim of this section is to list what has been done so far in this field employing rigorous methodologies. This can serve as a starting point to assess what is feasible or not in the evaluation of the overall impact of the ESF only.

Although there are many existing studies evaluating the effect of the EU funds, most of them concentrate their analyses on evaluating the joint effect of the EU transfers (ESF, ERDF or CF) mainly on GDP growth rates, assessing thus the “aggregate” impact of the EU budget, rather than ESF-specific impacts. The majority of these papers finds positive effect of the funds on different outcomes, with varying magnitude possibly due to the different datasets and methodology used.

Next, this report contains a classification of the main existing papers, focusing on the main outcomes and the main treatment variables they investigate. Following the Counterfactual Impact Evaluation literature, in the following “outcome variable” is used to indicate any output, results or impact indicator that is targeted or affected by European Funds interventions. Moreover, here “policy treatment variable” indicates the variables used to measure the ESI fund policy interventions.

### **Outcome variable**

The existing literature analyses the effect of ESI Funds predominantly on growth rate of GDP per capita, or growth rate of GDP per worker, see for example Dall’Erba-Le Gallo (2008), Becker et al. (2012), Rodriguez-Pose and Garcilazo (2015), Bondonio (2016), Pellegrini-Cerqua (2016) etc. One exception is Becker et al. (2013) that also looks at the effect on investment per capita. Other exceptions are Ferrara et al. (2016) who study impacts on innovation and transports.

### **Policy treatment variable**

Current studies mostly shed light on the aggregate impact of the joint ESI transfers. This is because data availability and the funds allocation mechanism make it difficult to analyse the effects of transfers separately, as explained in detail below.

DG Regio provides access to several data sets; however, yearly and harmonized data on total payments of EU funds by region are not always present, even at NUTS 2 level.

As a result, many studies have employed a dummy indicator for Objective 1 eligibility to study the effects of EU funds (see for example Becker et al. 2010 and 2013), or have used the total amount of transfers per programming period (Becker et al 2012). One exception to this trend is the recent work by Pellegrini & Cerqua (2013) which exploits a detailed dataset on total transfers per year by the EU Structural and Cohesion Funds at NUTS 2 level from 1994 to 2013, covering three programming waves.<sup>2</sup>

What emerges as bottom line from the literature review is that no study so far has tried to disentangle the effect of one particular fund, such as the ESF, from the aggregate effect of all ESI Funds. Moreover, the outcomes considered in the literature are mostly related to GDP.

The rest of the report describes more in details the rules governing the ESF, its relation to the other funds, and which methods proposed in the literature could be used to attempt to disentangle the effect of EFS transfer, under sets of specific assumption.

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<sup>2</sup> For a comprehensive literature review, see Pienkowski and Berkowitz (2015) and Figure 1 in Appendix.

## 3 The Structure of European Social Fund

### 3.1 Objectives and allocation criteria

The purpose of this section is to highlight the main features of the European Social Fund, focusing on its allocation criteria and the actions it finances, taking into account the different programming periods and the role played also by the other funds.

These observations serve as a base to properly discuss the alternative strategies for the estimation of the overall ESF impact. Two aspects are important in this discussion:

- first, how the different funds are allocated to the targeted regions
- second, which main actions are financed by each fund; this allows to focus on the primary outcomes that could have been affected mostly by the ESF.

The European Social Fund (ESF) is part of the European Structural and Investment Funds, which aims to provide "*support to create more and better jobs and a socially inclusive society*". In different programming periods, between 1989 and 2020, the ESF played a major role in financing actions mostly targeting at reducing unemployment, improving human capital and supporting the vulnerable groups in order to reduce social exclusion.

The size of the ESF is however relatively small compared to the overall funds received by Member States from all EU funding schemes, which include much larger sources of funding, such as the European Regional and Development Fund (ERDF) or the Cohesion Fund. On average the ESF amount is around the 10 % of the total EU budget, and 20% of all ESIF and 26% of the total between ESF, ERDF and CF.

The ESF, together with the other funds, are managed in programming periods lasting 7 years, which are planned by Member States, their managing authorities at NUTS2 level and the European Commission.

In order to have a more detailed idea how the ESF interplays with the other funds to reach the objective set by the EU, 4 main programming periods are considered: 1994-1999; 2000-2006; 2007-2013 and 2014-2020 and the main features of each period are summarized in Figure 2.

For each programming period, some main objectives for the ESF funds were stated. Moreover, one can observe that each region states some of these objectives and had some financial instruments available to reach them.

As it can be seen in the Figure, the structure of the programming period has changed a lot over time: in the first programming period there were many detailed objectives explicitly mentioned, while in the last programming period there is one main objective that basically groups all the relevant objectives under the "*Investment for growth and jobs*" heading.

Nevertheless, the different programming periods share some common features: the funds are allocated in larger amounts to NUTS 2 regions which are lagging behind, identified as regions where GDP per capita is below the 75% of the average EU GDP per capita, while a relatively small amount is allocated to the remaining regions.

Two features emerge in relation to the criteria used to allocate ESF – and the other funds – and their targets:

1. Different funds are used to reach the same objective (so for example ERDF, ESF and Cohesion Fund can be spent in all programming periods for *objective1 \convergence\investment for growth and jobs* objective);
2. The same funds (ESF and ERDF) are used under almost all of the objectives, both the ones directed to the least developed regions and the ones directed to the more developed ones. (So while for example the Cohesion Fund is exclusively

allocated to poor countries, the ESF and the ERDF can be used basically in all the European regions).

In particular, it is worthwhile noticing that in most programming periods, ESF and ERDF are used under the same overarching objective and thus are allocated using the same criteria. In other words, the ESF and ERDF are allocated using the same criteria, and they are used to reach the same overarching objectives.

This poses a quite serious problem, i.e. how to find a suitable strategy to identify and isolate the causal effect of ESF only and disentangle this effect from the effect of the other funds, the ERDF in particular.

### **3.2 ESF Activities**

Identifying which activities are financed by ESF and the corresponding outcomes plausibly affected by those actions, is an important step to properly identify the causal effect of the ESF.

In particular it would be advantageous to be able to select outcomes which are not likely to be affected by other funds, at least in principle. Table 1 – in the annex - reports the scope and the actions that could be financed by ESF in the different programming periods (up to 2013), as reported in the relevant regulations.<sup>3</sup> The right hand side columns show some indicators\data set that could be used to measure the relevant outcomes, which will be discussed more in details in Section 5.

Another issue is that, according to the need of a country, the money can be spent in one or another activity and targeting different groups: for example the “vulnerable group” includes migrants, individuals with disability, and minorities, but each member state can decide to target a specific group according to the context faced in that particular moment.

The main aims\actions of the ESF in the different programming periods are listed below.

#### **1994-1999**

- Occupational integration of unemployed persons exposed to long-term employment;
- Occupational integration of young people in search of employment;
- Integration of persons exposed to exclusion from the labour market;
- Promotion of equal opportunities on the labour market;
- Adaptation of workers to industrial change;
- Stability and growth in employment;
- Strengthening human potential in research, science and technology;
- Strengthening education and training systems

#### **2000-2006**

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<sup>3</sup> The regulations laying down the principles of the ESF fund are: for 2014-2020: 1304/2013; for 2007-2013: 1083/2006 and 1081/2006; for 2000-2006: 1260/1999 and 1784/1999; for 1994-1999: 2084/93.

- Assistance for persons: education and vocational training, aid for employment, higher education in science and research, new sources of employment.
- Assistance for structures and systems: improving education and training systems, modernizing employment services, developing systems to anticipate qualification needs.
- Accompanying measures: raising awareness, services, etc.

### **2007-2013**

- adaptability of workers, enterprises and entrepreneurs
- improving of the access to employment and sustainable inclusion in the labour market
- social inclusion of disadvantaged people and fighting discrimination in the workplace
- development of the human capital
- partnerships and agreements to promote the reforms in the fields of employment and inclusion in the workplace
- strengthening institutional capacity and the efficiency of public administrations and public services at national, regional and local level

### **2014-2020**

- promoting sustainable and quality employment and supporting labour mobility;
- promoting social inclusion, combating poverty and discrimination;
- investing in education, training and vocational training for skills and lifelong learning;
- enhancing the institutional capacity of public authorities and stakeholders and efficient public administration.

From this list, one clearly deduces that the focus of ESF has always been on promoting employment, fostering human capital and supporting vulnerable groups. Thus, when trying to estimate the impact of ESF, one could focus on outcomes related to these priorities.

Nevertheless, also other funds – and the ERDF in particular, share some of these themes. For example, one of the ERDF's priorities is to support small and medium enterprises, which also foster employment. This poses the problem of how to isolate the causal effect of the ESF, as some outcomes can be also directly (or indirectly) affected by the other ESI funds, as well as by other MS national funding to similar policies

Outcomes like growth, job creation (except support for the creation of enterprises or self-employment) and productivity should not be considered when trying to evaluate the impact of ESF, both because they are not explicitly targeted by ESF financed actions, and because they are most likely affected by the other EU transfers.



## 4 Data sources on ESF spending and their availability

Ideally, for each programming period (or even better, for each year), it is necessary to have spending for each relevant statistical unit, such as regions at NUTS 2 level, and by priority\theme, this could be for example spending in human capital, in employment. Data on ESF spending would in fact measure the intensity of the treatment.

Nevertheless, the data availability is fairly different from an ideal situation. The two main sources of data that could be used in the study are discussed in the following subsections.

### 4.1 Publicly available data on ESF committed amount + SFC information

#### 4.1.1 Data sources

The main sources of data on ESF spending are the SFC (System for Fund management in the European Community: <https://ec.europa.eu/sfc/en/2014>), containing data for the programming periods 2007-2013 and 2014-2020; and the databases provided by DG-REGIO in its website ([http://ec.europa.eu/regional\\_policy/it/policy/evaluations/data-for-research/](http://ec.europa.eu/regional_policy/it/policy/evaluations/data-for-research/)).

One of the main issues is that the information contained in this data is about "committed funds" rather than actual spending. In the following, the expression "ESF expenditure" or "ESF spending" should be interpreted as "ESF committed funds" or "ESF funds transferred to the ESF Managing Authorities".

#### 4.1.2 Data granularity by geography and priority

The table below summarizes data publicly available on ESF expenditure. Using these data, each programming period could be considered as the time unit of observation, rather than single years.

One of the main drawbacks of this data is that the information provided is not coherent between different programming periods: for example for the programming period 2000-2006, it is possible to recover ESF spending by year by NUTS2 region, but not by priority theme. On the other hand, for the programming period 2007-2013, ESF spending is provided by priority theme, but data are not disaggregated by NUTS2 regions

This is because most of the time the ESF is considered as a "national programme" and the Member States report the overall national spending in the different priorities. This rule has some exceptions; here is a list of possible cases:

- (a) Italy and Spain are countries which give information at the NUTS 2 level;
- (b) Estonia, Lithuania, Luxemburg, Latvia are countries with only one NUTS 2 region;
- (c) Germany and the United Kingdom are countries with information at NUTS 1 level.

Program ming period	ESF spending at NUTS 2 level	Spending by priority	
1994-1999	-	-	-
2000-2006	YES (for most of the	? by Structural funds in	<a href="http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/funds_comm">http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/funds_comm</a>

	countries)	general, not possible to distinguish ESF from other	<a href="#">itment_2000_2006.xls</a>  <a href="http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2006/expenditure_final_annex2.xls">http://ec.europa.eu/regional_policy/sources/docgener/evaluation/pdf/expost2006/expenditure_final_annex2.xls</a>
2007-2013	YES\NO (available only for some countries)	YES (yes by 6 priority)	<a href="http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/funds_obj_year_2007_2013.xls">http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/funds_obj_year_2007_2013.xls</a>  + SFC information
2014-2020	YES By category of region	YES	<a href="http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/esif_finance_2014-2020.xlsx">http://ec.europa.eu/regional_policy/sources/docgener/evaluation/data/esif_finance_2014-2020.xlsx</a>  + SFC info

## 4.2 DG-REGIO financial data 1989-2013

### 4.2.1 Data sources

In addition, as described by Pellegrini and Cerqua (2016), DG-REGIO has provided a complete dataset on EU Structural and Cohesion Funds payments to Member States, broken down by programming period (1994-1999, 2000-2006, 2007-2013) and region per year.

It contains information on EU payments by operational programme per year and covers all the main funds, including the Cohesion Fund, the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Agricultural Guidance and Guarantee Fund (EAGGF); the Financial Instrument for Fisheries Guidance (FIG).

The main strength of this data set is that it refers to actual payments (not allocations).

### 4.2.2 Data granularity by geography and priority

While it contains information about payments at NUTS 2 level for all the programming period, this dataset has two severe drawbacks:

1. It does not contain information about spending by theme\priority;
2. The dataset is composed mainly by "estimated data".

As stated by the document presenting this data, "the ESF data have been estimated with simple procedures and are thus of lower reliability"<sup>4</sup>.

<sup>4</sup>[http://bookshop.europa.eu/en/establishment-of-consolidated-financial-data-1989-2013-pbKN0417070/downloads/KN-04-17-070-3A-N/KN04170703AN\\_002.pdf;pgid=GSPefJMEtXBSR0dT6jbGakZD0000QXLyL8xQ;sid=hcl2WtMmlB52Woo-W2Do\\_bEDJwoKCnHI-Zk=?FileName=KN04170703AN\\_002.pdf&SKU=KN04170703AN\\_PDF&CatalogueNumber=KN-04-17-070-3A-N](http://bookshop.europa.eu/en/establishment-of-consolidated-financial-data-1989-2013-pbKN0417070/downloads/KN-04-17-070-3A-N/KN04170703AN_002.pdf;pgid=GSPefJMEtXBSR0dT6jbGakZD0000QXLyL8xQ;sid=hcl2WtMmlB52Woo-W2Do_bEDJwoKCnHI-Zk=?FileName=KN04170703AN_002.pdf&SKU=KN04170703AN_PDF&CatalogueNumber=KN-04-17-070-3A-N)

It appears that, when expenditure in one particular project could not be manually allocated to a NUTS 2 region, regional data have been downscaled from the national data. The procedure used by DG REGIO consists in taking the national expenditure and divide it by region according to available regional indicators, which in the case of ESF are weighed shares of unemployment and employment rate.

This implies that part of estimated ESF expenditure is perfectly correlated with variables regarding unemployment\employment, and thus suffers from an endogeneity bias. Moreover, it is not very reliable. Its reliability is also impossible to assess, as there is no information on the accuracy of the procedure adopted by DG REGIO.

Overall this data appears not to be strong alternative with respect to the ESF expenditure discussed in section 4.1.

### **4.3 Data on expenditure at national level**

It would also be important to consider also the transfers or funding that a region receives from their own member state to fulfil objectives targeted by ESF. Unfortunately this information is rarely available at the regional level. Information on expenditures on relevant issues is available at national level most of the time. In particular, there are data on expenditure coming from World Bank, OECD and UOE databases.

The data from World Bank (WB) has the drawback of having a short time window (2000-2014) while the OECD has different advantages: first, it ranges from 1980 to 2014 which provides a larger time span than WB. Second, it has precise information on social expenditure. Finally, it has harmonized to give the possibility of better cross country comparability. We present in the annex more details on these dataset.

## 5 Evaluation approaches

This section describes possible identification strategies to assess the effects of the European Social Funds on various economic outcomes in the EU-27 regions that have benefited from financial assistance during the last programming periods.

The main purpose is to summarize the different econometric approaches that are based on counterfactual policy evaluation, and to assess whether the available data and the policy setup allows to identify causal impacts of ESF transfers on a given set of economic and social outcomes.

The section is organized in the following way. First, common challenges and *desiderata* are reviewed. Next three alternative methodological approaches are discussed.

### 5.1 Common challenges

The most challenging issue in the overall ESF impact evaluation is that several objectives and the eligibility criteria of the **ESF are similar to other ESI funds**.

In general, the 'Structural programs' provide support and funding to the same regions, sometimes for similar objectives, and often following similar criteria for the allocation of funds and co-financing. This makes it very hard to disentangle the actual effect of the different programs.

Within the aggregate transfers, the ESF amounts represent a relatively small fraction of the total funds. Hence, if evaluating ESF in an aggregate together with the other funds, one could not claim that the main effect comes from ESF.

As a consequence, the existing literature has simplified the evaluation pooling together all EU transfers; this has the direct drawback that most of the studies cannot obtain very precise estimates when estimating the impacts of the funds on macro-economic indicators such as GDP, employment, etc.

An additional challenge is that the available variation in the data is across EU regions, among which one can expect substantial **heterogeneity** of the ESF impacts. Empirical approaches that can tackle this issue, exploiting the available data, are to be favored.

One final challenge lies with the fact that it would be desirable to estimate a dose-response function between the ESF transfers and the outcomes of interest. Dose-response functions are inherently **nonlinear**; approaches that would allow this feature of the relationship would have a comparative advantage.

A brief summary of the challenges related to the evaluation of ESF funds is hence the following:

1. Allocation rules of ESF cannot be sharply distinguished from the allocation rules of ERDF; the regions receiving one fund can also receive the other one, and often for similar objectives.
2. For some programming periods it is impossible to distinguish the money spent on different priorities (human capital, employment, etc.).
3. For some programming periods and some countries, it is not possible with the data at hand to distinguish how much money from ESF is spent in different NUTS 2 regions, since the operational programme financed by ESF is at the country level. So, there is a lack of information about spending at the level of the NUTS 2 regions, which would be relevant statistical units.
4. Even when we know in which priority the ESF money is spent, one single priority can be very broad and general and may differ between countries, and even between NUTS 2, according to local needs and priority. This makes the choice of a common proper outcome variable more difficult.

5. Methods allowing the estimation of heterogeneous effects or nonlinear effects would have a comparative advantage.

The next subsection describes the 3 methods that potentially can be applied to the evaluation framework

## 5.2 Fixed-Effects Panel, Difference-in-differences, Synthetic Control Methods

A first approach that can be used as a baseline for the evaluation of the impact of ESF transfers versus other EU funds is the *Panel Fixed-Effect Estimator*. Mohl and Hagen (2010) have applied this model to estimate the effects of EU Funds for the period 2000-2006.

The model assumes that a particular outcome variable, measured in year  $t$ , depends on the amount of the ESF transfer received in that year, on the amount of other European Funds and Member State transfers received in the same year, and on some time-varying characteristics of the region, also measured in year  $t$ .

The model also assumes that there are some characteristics or features of each region that are fixed over time and that can influence the outcome variable (*region fixed effects*) and that also some year characteristics can affect all the regions in the same way in a given year (*year or time fixed effect*). The model can be written as:

$$y_{rt} = \beta_0 + \beta_1 \text{ESF\_Transfer}_{rt} + \beta_2 \text{Other\_Transfer}_{rt} + \mu_r + \gamma_t + X'_{rt} \delta + \epsilon_{rt},$$

where  $r$ ,  $t$  are respectively region and time dimensions.  $y_{rt}$  is the outcome of interest, which is targeted by the ESF. The outcome of interest is measured at the NUTS 2 regional level, so it could be for example employment rate in region  $r$  in year  $t$ .  $\mu_r$  are *regional fixed effects* that control for the *time-invariant* characteristics of the region, that could be in this example structural features of a particular region affecting the employment rate.  $\gamma_t$  are the *time fixed effects*, that take into account the time variation in the outcome that does not depend on the EU funds, which could be for example the effect of the 2008 crisis on overall employment in Europe;  $X_{rt}$  contains (if available) a set of time-varying characteristics of the region which can have an effect on the employment rate. Eventually  $X_{rt}$  can contain (if available) also transfers received by the region by own member state. Finally  $\epsilon_{rt}$  is the vector of error terms.

The key assumption of the model is that the region fixed effect and the time fixed effect are able to capture all the relevant unobserved characteristics (that are implicitly contained in the error term) that can produce bias in the estimate of the EU funds' impact; example of these unobserved factors are as the efficiency level of the region, its capacity to use the program funds etc. A sufficient condition for the fixed effects to work in this way it that the unobserved characteristics are time-invariant. Similarly, it is important to take into account national interventions in the fields targeted by ESF. While it is quite hard to take into account of those policies in the models, the fixed effect framework captures region\ national differences which are fixed over time, partially targeting this issue.

This empirical strategy exploits variations in the intensity of ESF transfers across European regions, holding constant the transfers from other EU funds.

The empirical strategy assumes that the ESF affects the outcome without time-delay.

This assumption can be tested by changing the specification, replacing  $t$  in  $\text{ESF\_transfers}_{rt}$  and  $\text{Other\_transfers}_{rt}$  with  $t-j$  for some lag  $j$ .

Alternatively, the estimation could be based on data aggregated by programming periods rather than measured every year. In this case, the outcome variable should be measured in the last year of a programming period and the ESF variable should include the overall amount of transfers received in the 9 years.

This approach, however, would reduce the sample size substantially as one would work with one time observation rather than with seven.

Finding the proper time framework is a crucial issue. Indeed, while some outcome variables may respond immediately to a given intervention, other may take longer. Yet other outcome variables may reflect cumulative processes as well. Henceforth, it is necessary to evaluate and define the timing of measurement on a case by case basis, according to the specific outcome in question.

For instance, transfers may affect outcomes such as labour productivity only after a given time-lag. For example, training programmes for the unemployed finance by the ESF may affect labour productivity only after the training period is over and workers have returned to the labour market.

Therefore, one possibility would be to use measures of labour productivity one or two years after the end of each programming period, for instance in the specification by programming periods.

Similarly, the effects of expenditure in education may be better characterised by a cumulative process, which only completely shows off for cohorts which have been treated for several years. In such cases, it is advisable to measure test-scores as outcome variables at the end of the programming periods or even few years after; this should be juxtaposed with the cumulative investment in human capital. However, the delayed effects are correctly identified just if it is assumed that the funds have no immediate effects, but only delayed effect

One interesting aspect of the fixed-effect approach using yearly data is the fact that the one could test whether the common trend assumption holds in years prior to the intervention. Namely, one could rely on data from pre-intervention years to conduct a placebo exercise using the leads of the ESF transfers in the subsequent programming period and inspect whether it is associated with changes in a given outcome of interest over time. The specification of the placebo equation is the following

$$y_{r(t-k)} = \beta_0 + \beta_1 ESF\_Transfer_{rt} + \beta_2 Other\_Transfer_{rt} + \mu_r + \gamma_t + X'_{r(t-k)}\delta + \epsilon_{r(t-k)}$$

In other words, a panel containing observations only on few years prior to a given programming period (e.g. three years) could be estimated. Then, it would be possible to inspect whether the ESF transfer intensity is associated with a given outcome in the pre-intervention years, in the fixed-effects model.

More specifically, if the assumption holds, fixed effects estimated on the leads of the ESF transfers should not yield any statistically significant correlation with the given outcome of interest.

This approach could also benefit from the fact that the same EU regions change objective status across programming wave periods and from the fact that some countries only entered the European Union in the 2000's. While this obviously does not ensure exogeneity in the allocation of ESF funds, it does create some variability in the distribution of these funds. Nevertheless, in this case, pre-accession funds should be taken into account, if there is the assumption that they could have had any effect on the selected outcomes.

Finally, as a robustness exercise, the panel approach could be extended to incorporate the lags of the dependent variable as an additional control. Depending on the outcome in question and its degree of persistence, controlling for this lag could be relevant.

Namely, it would be possible to implement a dynamic linear model with fixed-effects. This model could be estimate with the Arellano-Bond GMM estimator. In this case, one would need to set the panel with yearly data in order to implement this approach, which requires at least three periods of observation.

As a further possibility in this approach, one also could envisage an analysis in triple differences by including the comparison between groups that are expected to be affected

by ESF and those groups that are not. For instance, a project supporting schools in the programming period 2000-2006 should only affect schooling age cohorts during this period, while older cohorts are not expected to be affected; hence this latter cohort could be used as control in the analysis.

However, such analysis would only be feasible with detailed data of the specific projects supported by the ESF. At aggregate level this approach is most likely unfeasible because the ESF supports a wide range of projects which reach participants of all ages. For instance, many of these projects support schools (younger cohorts), training programs (working age cohorts) and the employability of older workers. For these reasons, it may be hard to identify cohorts that are unlikely to be affected by the ESF transfers and that could serve as an adequate control group for an analysis in triple differences.

### **5.3 Regression Discontinuity Design**

As discussed in the literature review, recent studies have used fuzzy regression discontinuity designs to explore the 75% GDP threshold for Objective 1\convergence eligibility. As mentioned in Section 3 regions whose GDP is lower than the 75% of the EU average GDP are entitled to much more funding than regions whose GDP per capita is above the 75%. This approach exploits the fact that around the threshold of the 75% of the GDP being a region eligible for objective 1\convergence funding can be assumed as random.

In practice, regions whose GDP per capita is equal to the 75.1% of the EU average are not considered objective 1\convergence regions, and receives much less transfers than regions whose GDP per capita is equal to 74.9 % of the EU average. Those regions are quite similar (their GDP is almost the same), but one region is receiving a much larger amount of EU funding than the other one.

In this case fund allocation can be considered as good as “random” close to the threshold, and a simple comparison of the outcome in the two regions will provide evidence on the effect of the EU transfer. Such an approach is arguably the most credible in terms of internal validity, while the main pitfall is its limited external validity, i.e. the limited ability to extrapolate this impact to observations away from the threshold.

This method has been used extensively in the literature evaluating the aggregate effects of EU transfer: Becker et al. (2010) find that in programming periods 1989-2006, Objective 1 status increased per capita GDP by 1.6% on average, while employment effects were not statistically significant.

Similarly Pellegrini et al (2013) also estimate positive, but smaller, effects of Objective 1 funds ranging from 0.6% to 0.9% higher GDP per capita.

Becker et al (2013) formally extends the RD design to deal with heterogeneous effects, always focusing on the effect of EU transfer as a whole (ERDF, ESF and Cohesion Fund) and finding that only 30% of the Objective 1 recipient regions were positively affected by the funds.

Finally, Pellegrini and Cerqua (2016a;2016b) adapt the RDD approach by Becker et al (2013) to estimate responses according to treatment intensity, finding a positive effect on growth.

All the papers exploiting RDD consider as treatment variable either the dummy “being an objective 1 region” or receiving the EU transfers in general, without distinguishing between the different funds.

Indeed, the main challenge of employing RDDs to evaluate the single impact of ESF derives from the fact that the Objective 1\convergence cut-off determines not only ESF transfers, but also transfers from the ERDF (and Cohesion Fund).

Therefore, units just to the left of this threshold are not only potentially entitled to receive larger ESF transfers but also larger transfers from the ERDF and Cohesion Funds.

Considering that these resources fund projects which are not expected to affect mutually exclusively outcome, there arises a confoundness issue: it is quite difficult to say whether the effect found is due to the ESF or the ERDF.

For this reason, employing the RDD approach to study the single impact of the ESF is not advisable unless one is willing to impose additional, and possibly incredible, assumptions. An example of such an assumption is that there exist some outcomes which are exclusively affected by ESF and not? in any way affected by ERDF. While this is a possibility, it could be accepted only if supported by empirical tests.

It is also worth noting that, in theory, it would be possible to implement a difference in discontinuities analysis. Namely, one could estimate how the intensity in (1) ESF and (2) other funds transfers increases at the 75% GDP threshold for each programming period and then correlate these discontinuities, which should vary over time, to the estimated discontinuity for a given outcome.

The main problem with this approach in the programming periods specification is the fact that the GDP is not *time-invariant*, consequently the NUTS that are around the threshold point in the last programming period are not necessarily around the threshold in the previous programming period.

## 5.4 Matching Methods

Matching methods are used to create a control group by matching untreated individuals who exhibit the same observable characteristic as the policy beneficiaries. So, for each individual in the treated group one (or more) similar individual(s) is (are) identified in the untreated group.

This method is only valid under the identification assumption that selection of individuals into the treatment is only based on observable characteristics (called the Conditional Independence Assumption - CIA).

The CIA assumption is the more credible the more control variables (covariates) are available. The data available for the overall ESF evaluation appears to be not very rich in covariates; this would hence limit the applicability of this method to the present impact evaluation.

The method could be applied to data measured at the regional NUTS 2 level, as well as at individual level.

As mentioned before in Section 2, also for this method, the evaluation of European Funds transfers have been considered jointly in the literature (see for instance Becker et al. 2012; Bondonio 2016).

If applied to NUTS 2 regions, say, this method would overcome the issue related to the fact that EU Funds are allocated in a similar manner (ERDF vs ESF). In fact one could match European territories or individuals on the level of EU transfers received through channels other than the ESF. This would create control units that have the same level of *other funding*.

A baseline specification could be implemented with a standard Propensity Score matching based on dichotomous treatment identifying European regions with high and low amounts of ESF transfers.

Furthermore, an advantage of this approach relates to the fact that it can also easily accommodate an analysis on treatment intensity. Namely, one could employ the Generalised Propensity Score to estimate dose-response functions, as in by Becker et al. (2012).



The fundamental condition for this strategy to succeed is that all the relevant characteristics that affect the ability of regions to attract EU funds and that are related to the outcome(s) of interest are observed.

Although this is clearly a strong hypothesis, it is worth noting that the literature evaluating the impact of EU Funds, as a whole, does not find significant differences in results compared to the regression discontinuity approach, which is in principle, more reliable.

Therefore, the existent evidence on the evaluation of EU funds lends some support for the use of matching methods in this context.

This method has however some drawbacks. The assumption needed to use matching is that there are units with similar observed characteristics both in the treated and in the control group. This may be problematic as funds are allocated to regions mostly according to their GDP; hence GDP cannot be used as matching variable, otherwise one may find that there are no NUTS2 regions in the non-treated group which could be used as suitable comparison for the treated ones (lack of common support).

Therefore, one needs to find variables that are able to capture all the differences among NUTS2 regions that make the Conditional Independence Assumption credible. In addition, even if one could find such variables, relying only on NUTS2 data may yield a sample size that is not big enough, as highlighted by Bondonio (2016). As a matter of fact, their results are indeed mostly insignificant.

## 6 Data and methodology assumptions

The previous sections discussed the data availability on ESF spending and the methods used in the literature to estimate the overall effects of EU transfers. This section presents and summarizes the assumptions needed by these methods to identify the causal effect of interest, both in terms of data and in term of assumptions.

### 6.1 Data availability and assumptions

Both datasets presented in Section 4 could be used to measure the main treatment variable, i.e. the ESF transfers to regions at NUTS2 level. Here their characteristics are reviewed together with their limitations. In particular

- 1) DG-REGIO dataset. This data set allows using years as reference periods, instead of programming periods. This increases the number of observations. Some of the underlying limitations of the data are as follows:
  - a. it relies on the assumption that the estimated values of ESF expenditure by NUTS 2 and by year are reliable.
  - b. Even assuming reliability, one needs to verify to which degree the expenditure data deviates from the other indicators (unemployment \employment) used in the downscaling.
  - c. The detailed document on *Establishment of consolidated financial data 1989-2013*<sup>5</sup>, Table 2.1 on page 13 shows a poor coverage by financial period. Due to the lack of regional data, the expenditure was manually allocated according some criteria. For instance, it says that “*ESF: weighted shares of unemployment and unemployment rate*”
  - d. Table 2.2 in page 18 shows how more than the 50% of the total amount of the ESF funds are allocated among regions through this or some other imputation procedures.
  - e. As the data does not contain information about spending by priority, one has to assume that each euro spent by ESF (either for unemployment or for human capital development) has the same effect on the different outcome variables to be considered.
- 2) Data on committed payments. This data allows to use only the programming period as reference time period. Some additional underlying limitations of the data are the following.
  - a. One needs to assume that funds commitment is a good proxy of actual spending.
  - b. For the latest programming period (2007-2013) the dataset lack information about NUTS 2 level spending, which makes it impossible to rely on this dataset if one wish to use NUTS 2 as level of observations.
  - c. An alternative would be focusing only on the few member states that have NUTS 2 level disaggregation.
  - d. For the programming period 2000-2006 there is no information on spending by priority, thus one has to assume that each euro spent by ESF (either for unemployment or for human capital development) has the same effect on the different outcome variables to be considered.

Hence, the present alternative is either working with data with limited reliability (using the DG-REGIO dataset), or working with very few countries, using data on committed payments), which would limit the statistical power of the analysis.

<sup>5</sup> See the document available at the following link: <http://publications.europa.eu/en/publication-detail/-/publication/31c556d1-e394-11e6-ad7c-01aa75ed71a1/language-en/format-PDF>

A second take-away message is that there appears to be the need to plan for better collection of data on ESF for the remaining part of the present programming period, so as to allow better data to be available at the end of the 2014-2020 programming period.

## 6.2 Model assumptions

Similar criteria used to allocate the ESF and the ERDF make it difficult to disentangle the impact of a fund versus another one.

Moreover, as some outcomes are targeted by both funds, it is even harder to isolate the effect of one particular fund.

This hampers the use of approaches based on threshold estimates, namely the RDD approach discussed in Section 5.

In the case of ESF and ERDF funds, the eligibility selections overlap for both funds. This appears to prevent the application of an identification strategy of the causal effect of one of the two funds based on a particular threshold.

The approach relying on matching appears possibly viable. However, in order to apply it one would need more abundant data on controls than the one that appears available. Many controls are needed to make matching credible. Only access to individual data (not at regional level but at individual level) could make this approach fully viable.

The most credible solution for evaluating the separate impact of ESF from OTHER funds (such as ERDF) hence appears to be the Fixed Effect framework.

Also in this case, a number of limitations are likely to apply. Some of them are listed in the following.

1. The ESF and OTHER fund expenditure amounts may be strongly correlated, making it difficult to identify the impact of each separately. In the end this will need to be explored empirically.
2. The fixed effect model controls for time-invariant confounders, but not for time-varying ones. Its results will hence be conditional on the absence of time-varying confounders. One example of possible time-varying confounders are: changes in laws in a particular country that may confound the effect of a programme intervention, either ESF or OTHER funds. This limitation of this approach could be improved collecting more data (in the future) on national laws, for example.
3. As for any method and empirical approach, the last programming period 2007-2014 comprises the financial crisis. For the present purposes, one has to assume that the effect of the financial crisis is fully captured by time fixed effects. In particular this means that the financial crisis is assumed to affect all regions in the same way.
4. One needs to play with various specifications trying to capture the possible presence of delayed effect of funds. Moreover this delay may be different for ESF and for the other funds.

## 7 Feasibility

### 7.1 List of possible outcomes and data sources

A few outcome variables related to the field of education and unemployment, which could credibly have been affected by the ESF transfers, can be identified.

The research of suitable outcomes is limited also by the requirement that those outcome variables need to be available at NUTS 2 level, for all the 28 Member States, and over a relatively long time span (since the 90's).

As a consequence, the most credible dataset that can be used is the Labor Force Survey, which has these three characteristics and it contains information useful to build relevant outcome variables.

In particular relevant outcomes could be:

1. **Early leavers from education and trainings (ELET)** This refers to a person aged 18 to 24 who has completed at most lower secondary education and is not involved in further education or training; the indicator 'early leavers from education and training' is expressed as a percentage of the people aged 18 to 24 with such criteria out of the total population aged 18 to 24.
2. **Tertiary Education Attainment (TEA)**. This is the proportion of 30–34 year-olds with tertiary educational attainment
3. **Individuals not in employment or in education (NEET)**. This is the percentage of the population (of a given age group and sex) who is not employed and not involved in further education or training.
4. **Youth unemployment rate** The unemployment rate of individuals aged 15-24.
5. **Gender gap in employment**. The difference between male and female employment rates
6. **Third country national employability** The employment rate of third countries nationals. Although this outcome estimated at NUTS 2 regions may not be always reliable.
7. **Long-term unemployment rate** expresses the number of long-term unemployed (12 months and more) aged 15-74 as a percentage of the active population of the same age. The duration of unemployment is defined as the duration of a search for a job or as the period of time since the last job was held (if this period is shorter than the duration of the search for a job).

The Labour Force Survey was established in 1983 and now covers all the relevant Member States. Figure 2 reports how the LFS has been expanded in the new member states over time. It also contains information on the NUTS 2 categorization that changed over time.

The possibility of using other data sources has also been investigated. None of them satisfied the necessary conditions. Here are some example:

- **PISA data**<sup>6</sup>, to measure skill in mathematics and literacy of 15 years old pupils or to identify low achievers.
  - Drawback: Pisa data cover several European countries from 2000 onwards. The main issue is that data is collected at the national level and not at the NUTS2 level, thus is cannot be used in the analysis.
- **PIAAC data**<sup>7</sup>, to measure skills in numeracy and literacy of the population aged 16-65.

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<sup>6</sup> <http://www.oecd.org/pisa/>

- Drawback: PIAAC data is available at NUTS 2 level, but it is a cross section study, and there is only one point in time as the survey was undertaken in 2011 only.
- **EU-SILC<sup>8</sup> data**, to measure childcare availability, employment, income and social inclusion, and educational achievements.
  - Drawback: Data is collected at NUTS 1 level, and thus cannot be used to perform NUTS 2 level analysis.
- **SHARE data<sup>9</sup>**, to focus on active ageing and older workers.
  - Drawback: the first wave of this survey is in 2004, which would not allow having enough observations on the first programming periods. In addition, in the first waves not all European countries are covered.

## 7.2 Concrete Options

Combining the different ESF data options, the applicable methodologies and the relevant outcomes, CRIE's proposal for a study on the overall impact of ESF would be as follow:

1. **Methodology:** the preferred strategy is to employ a fixed effect model as explained in Sections 5 and 6.
2. **Data:** Combination of the different data sources on ESF and outcome could lead to focusing on 4 outcomes: ELET, NEET, youth unemployment and long term unemployment, measured using LFS data. As for ESF data, we propose to focus on DG-REGIO dataset , considering programming periods from 1994 to 2013.<sup>10</sup>
3. **Level of analysis:** while the preferred option would be to focus on NUTS2 level, data at country level could be eventually used if more suitable given the reliability of DG-REGIO data at NUTS2 level in some countries.

It is proposed that CRIE will perform the impact study by the end of 2017 on these four outcome variables. CRIE will inform DG EMPL by end September about the methodological approach (time framework and level of analysis) that will be applied to each outcome variable.

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<sup>7</sup> <http://www.oecd.org/skills/piaac/>

<sup>8</sup> <http://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions>

<sup>9</sup> <http://www.share-project.org/data-documentation/waves-overview.html>

<sup>10</sup> The time framework considered may vary according to the different outcomes and their availability in LFS back in time.

## **8 Way forward**

The main difficulties encountered in assessing the feasibility of the evaluation of ESF impact are given by the data availability.

Data limitation are both in the way the main treated variable is collected and stored, and in the possible dataset that could be used to obtain outcome variables to estimate the ESF impact.

As for the treated variable (ESF amount spent) a possible way forward could be to re-design the rule governing the monitoring system used by the Commission, i.e. mainly the SFC.

It should be required to better record (i.e. collect and enter) and store data in computerized form by the managing authority to improve the performance of the monitoring and then evaluation.

Data should be stored and made available at the same geographical level of aggregation, at least NUTS 2 level.

Even considering the more detailed data available at the moment, i.e. the dataset put together by DG-REGIO, it appears clear that the data collection suffers from lack of precision and accuracy.

If member states would have the obligation to report data on spending at a lower geographical level, e.g. NUTS 3, and by priority, this would facilitate the overall evaluations.

As for the outcome variables, it would be good to investigate if it was possible to retrieve information on NUTS 2 (or 3) also in datasets which do not provide this information in their public offerings, e.g. EU-SILC. This could enlarge the set of possible outcomes to be investigated.

Methodological limitations also emerge, most of all from the fact that allocation criteria of the ESF are not theoretically different from the ERDF one, which makes it very hard to find a credible identification strategy.

If different funds were allocated to different priorities or different regions, it would be easier to evaluate properly the effect of one fund without having the problem of trying to isolate it from the effects of other funds.

In addition, it would be worth to select specific outcomes for a specific fund so the problem of measuring the direct effect of a fund on a particular outcome would be minimized or alleviated.

Roughly speaking, it would reduce the possibility that money spent – coming from a fund – may have some indirect effect on the outcomes of the other fund

As a final remark, it is worth highlighting that looking at aggregate effect of ESF (or other funds) appears important to have overall estimates of the effect of EU transfers. However, it may be even more important to evaluate the single programmes financed by the ESF budget, to learn more about the mechanisms in place and what really works or not. This type of evaluation appears best suited to indicate how to design the next MFF.

In fact, the aggregate result of an overall evaluation of ESF will tell whether the fund contributed or not to improve a particular outcome, but it cannot tell which were the main concrete actions contributing to reach (or not) the results, and for whom.

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## Annexes

### Data on expenditures at national level.

We summarize the most relevant information along these lines:

1) Source: WORLD BANK

Link: <http://data.worldbank.org/indicator>

The variables that appear most target for the analysis are:

- Current education expenditure, primary (% of total expenditure in primary public schools) (2000-2014)
- Current education expenditure, secondary (% of total expenditure in secondary public schools) (2000-2014)
- Current education expenditure, tertiary (% of total expenditure in tertiary public schools) (2000-2014)
- Current education expenditure, total (% of total expenditure in public institutions) (2000-2014)
- Government expenditure per student, primary (% of GDP per capita) (2000-2014)
- Expenditure on primary as % of government expenditure on education (%) (1990-2014)
- Government expenditure per student, secondary (% of GDP per capita) (2000-2014)
- Expenditure on secondary as % of government expenditure on education (%) (1990-2014)
- Government expenditure per tertiary student as % of GDP per capita (%) (2000-2014)
- Expenditure on tertiary as % of government expenditure on education (%) (1990-2014)
- Expenditure on education as % of total government expenditure (%) (1990-2014)
- Government expenditure on education, total (% of GDP) (1990-2014)

2) Source: OECD

Link: [https://stats.oecd.org/Index.aspx?DataSetCode=SOEX\\_AGG#](https://stats.oecd.org/Index.aspx?DataSetCode=SOEX_AGG#)

Mostly Unbalanced panel

Here it is possible to gather different indicators about:

1. Social Expenditure – Aggregated data
2. Social Expenditure – Detailed data

Concerning the Social Expenditure - Aggregated data (1980-2014) (% GDP) – it is possible to distinguish between cash and in kind. We can also have information on these topics:

1. Old age
2. Survivors
3. Old age and Survivors
4. Incapacity related
5. Health

6. Family
7. Active labour market programmes
  - PES and Administration (1985-2013)
  - Training (1985-2013)
  - Job Rotation and Job Sharing (1985-2013)
  - Employment Incentives (1985-2013)
  - Supported Employment and Re-habitation (1985-2013)
  - Direct Job Creation (1985-2013)
  - Start up incentives (1985-2013)
8. Unemployment
  - Unemployment compensation / severance pay
  - Early retirement
9. Housing
10. Other social policy areas
  - Income maintenance
  - Other cash benefit
  - Social assistance
  - Other in-kind benefit
11. Total

Figure 1: Main studies on the effect of EU funds

Authors	Outcomes of Interest	Data Source	Data Level	Data Span	Main Method	Treatment Intensity	Heterogeneous Effects	Method Details	Spatial dimension?	Results
Becker, Egger, Ehrlich (2013)	GDP per capita growth and In of per capita investments	Regional Database compiled by Cambridge Econometrics / European Commission	NUTS2	1989–1993, 1994–1999, and 2000–2006	RDD	No	Yes	RDD HLAITE - Objective 1 Threshold	No	Only about 30 percent and 21 percent of the regions — those with sufficient human capital and good-enough institutions — are able to turn transfers into faster per capita income growth and per capita investment.
Becker, Egger, Ehrlich (2010)	GDP per capita growth and employment	Regional Database compiled by Cambridge Econometrics / European Commission	NUTS2 / NUTS3	1989–1993, 1994–1999, and 2000–2006	RDD	No	No	RDD - Objective 1	No	Positive per capita GDP growth effects of Objective 1 transfers, but no employment growth effects
Becker, Egger, Ehrlich (2012)	GDP per capita growth	European Spatial Planning Observation Network / European Commission	NUTS3	1994–1999, and 2000–2006	Matching	Yes	No	GPS	No	Positive growth effect, but in 36% of the recipient regions the transfer intensity exceeds the aggregate efficiency maximizing level and in 18% of the regions a reduction of transfers would not even reduce their growth.
Bondonio (2016)	GDP per capita growth	DG-Region / Eurostat / Cambridge Econometrics	NUTS2	1994–1999, 2000–2006, 2007–2013	Matching	Yes	No	Applies a variety of matching methods	No	EU funds for the 1995–2006 period spurred additional 0.8–1 p.p growth. If also pre-intervention average levels of the control variables are included in the estimation, the impact of the EUF on regional GDP growth is lower (0.3–0.5 pp) and the estimate is statistically not significant.
Dall'Erba, Le Gallo (2008)	GDP per capita growth	NewCronos Regio (Eurostat)	NUTS2	1989–1993, and 1994–1999	b-convergence model	No	No	Controls for Initial GDP Level and IV (lagged variables, distance to Brussels)	Yes	Significant convergence takes place, but the funds have no impact on it. Simulation experiments show how investments targeted to the peripheral regions never spill over to their neighbours.
Ferrara, McCann, Pellegrini, Stedler, Terribile (2016)	Innovation and transport infrastructure	Eurostat Regio statistics / European Commission	NUTS2	1995–2007	RDD	No	No	RDD - Objective 1	No	Cohesion Policy interventions had a positive effect on growth rate in patent applications (capturing the effect on research and innovation) and it increased the accessibility of transport infrastructure in recipient regions.
Gua (2017)	Employment rate	Industry and Services Census (Istat) / Italian Ministry of Interior	Municipalities	1988–1993 and 1994–1999	RDD	No	No	Spatial RD	Yes	EU Regional Policy produced a positive impact on employment levels, without any displacement of economic activities away from non-treated regions and a concentration of the impact in key economic sectors.
Mohl, Hagen (2010)	GDP per capita growth	European Commission	NUTS1 / NUTS2	2000–2006	Dynamic Panel	No	No	Controls for Initial GDP Level, Spatial Correlation and IV (lagged variables / GMM)	Yes	Objective 1 payments promote regional economic growth, whereas the total amount of Objectives 1, 2, and 3 do not have a positive and significant impact on the EU regions' growth rates.
Mohl, Hagen (2011)	Employment rate	Eurostat Regio statistics / OECD / European Commission	NUTS1	1995–2007	Dynamic Panel	No	Yes	Controls for Initial GDP Level, Spatial Correlation and IV (lagged variables / GMM)	Yes	Structural funds payments seem to be used as capital subsidies: they have a statistically positive impact on employment in regions with low share of low-skilled population, and a negative impact on employment in regions with high share of low-skilled population.
Pellegrini, Cerqua (2016)	GDP per capita growth	Eurostat and Cambridge Econometrics' Regional Databases, European Commission-DG REGIO	NUTS2	1994–1999, 2000–2006, 2007–2013	RDD	Yes	No	Applies a GPS around the RD threshold	No	Positive effects of SF transfers on regional growth. The estimated conditional intensity-growth function is non linear, mostly concave and with a marginal efficiency of transfers null after a certain point.
Pellegrini, Cerqua (2016)	GDP per capita growth	Eurostat / Cambridge Econometrics / European Commission-DG REGIO	NUTS2	1994–1999, 2000–2006, 2007–2011 - Expand data to New Member States	RDD	Yes	No	Applies a GPS around the RD threshold	No	Positive effects of EUF transfers on regional growth. Higher impact of EUF for the new member state regions, and lower impact during the crisis. Marginal impact on regional growth tends to be higher for regions that do not already receive a high intensity of EUF.
Pellegrini, Terribile, Tarola, Muccigrosso, Busillo (2013)	GDP per capita growth	Eurostat Regio statistics / European Commission	NUTS2	1994–1999, and 2000–2006	RDD	No	No	RDD - Objective 1	No	Positive impact of Regional Policy on economic growth of around 0.6 percentage points per year when measured with a non-parametric model, roughly 0.9 percentage points when using a parametric model.
Rodriguez-Pose, Garcilazo (2015)	GDP per capita growth	Quality of Government Institute / World Bank World Governance Indicators / OECD Regional Database.	NUTS1 / NUTS2	1996 - 2007	FE Panel	No	Yes	Controls for Initial GDP Level and IV (lagged variables / GMM as robustness)	No	EU investments make a difference for regional economic growth, but above a certain threshold of expenditure the quality of government becomes the basic factor determining why a region grows.

**Table 1: List of objectives and actions by programming period.**

**2007-2013**

Convergence and Regional competitiveness and employment objectives	POSSIBLE VARIABLES TO USE AS OUTCOMES
1. Increasing adaptability of workers, enterprises and entrepreneurs with a view to improving the anticipation and positive management of economic change, in particular by promoting:	
a. lifelong learning and investment in HC by enterprises;	
b. apprenticeships, training of low skilled and old workers	
c. entrepreneurship and innovation and business starts-ups	
d. more productive form of work organization: better health and safety at work	
2. Access to employment and the sustainable inclusion in the labor market of job seekers and inactive people preventing unemployment, in particular long-term and youth unemployment, encouraging active ageing and longer working lives, and increasing participation in the labour market, in particular by promoting:	
a. the modernisation and strengthening of labour market institutions	
b. tailored training, job search, outplacement and mobility, self-employment and business creation	
c. flexible measures to keep older workers in employment longer	-employability of older workers
d. measures to reconcile work and private life, such as facilitating access to childcare and care for dependent persons	- Childcare availability\ enrollment
e. improve access to employment, increase the sustainable participation and progress of women in employment and reduce gender based segregation in the labour market, including by addressing the root causes, direct and indirect, of gender pay gaps;	-Women participation to labour force
f. the participation of migrants in employment and thereby strengthen their social integration	-third country national employability (LFS?)
3. Reinforcing the social inclusion of disadvantaged people with a view to their sustainable integration in employment and combating all forms of discrimination in the labour market, in particular by promoting:	
a. re-entry into employment of: early school leavers, minorities, people with disabilities	Employability of ELET, NEET? (LFS)

and people providing care for dependent persons	- employability of disable
b. combating of discrimination	
4. Enhancing human capital, in particular by promoting:	
a. reforms in education and training systems in order to develop employability	
b. vocational education and training and the	Employability of VET
c. continual updating of the skills of training personnel	Participation to LLL
d. networking activities between higher education institutions, research and technological centres and enterprises;	
5. Promoting partnerships, pacts and initiatives through networking of relevant stakeholders, such as the social partners and non-governmental organisations, at the transnational, national, regional and local levels in order to mobilise for reforms in the field of employment and labour market inclusiveness.	
Convergence objective	
1. investment in human capital	
a. reforms in education and training systems	Pupils achievement
b. increased participation in education and training throughout the life-cycle	
c. reduction in early school leaving	ELET
d. and in gender-based segregation	
e. increased access to and quality of initial, vocational and tertiary education and training	TEA
f. development of human potential in research and innovation, notably through post-graduate studies and the training of researchers;	
2. Strengthening institutional capacity and the efficiency of public administrations and public services at national, regional and local level	

**2000-2006**

Scope:	POSSIBLE VARIABLES TO USE AS OUTCOMES
1. Developing and promoting active labour market policies:	
a. to combat and prevent unemployment,	Unemployment rate
b. to prevent both women and men from moving into long-term unemployment, to facilitate the reintegration of the long-term unemployed into the labour market,	Long term unemployment
c. and to support the occupational integration of young people and of persons returning to the labour market after a period of absence	Unemployment rate young NEET
2. equal opportunities for all in accessing the labour market, with particular emphasis on those exposed to social exclusion	
3. promoting and improving:	
a. training	
b. education	
c. counselling	
as part of lifelong learning policy to	
a. facilitate and improve access to, and integration into, the labour market,	
b. improve and maintain employability, and	
c. promote job mobility;	
4. promoting a skilled, trained and adaptable workforce, innovation and adaptability in work organisation, developing entrepreneurship and conditions facilitating job creation, and enhancing skills and boosting human potential in research, science and technology;	
5. women's access to and participation in the labour market, including their career development, their access to new job opportunities and to starting up of businesses, and to reduce vertical and horizontal segregation on the basis of sex in the labour market	-Women participation to labour force
Activities	
1. education and vocational training — including vocational training equivalent to compulsory schooling — apprenticeships pre-training, in particular:	
a. the provision and upgrading of basic skills,	ELET? PISA? PIAAC-ALL
b. rehabilitation in employment,	
c. measures to promote employability on the labour market,	Unemployment rate
d. guidance, counselling and continuing training	LLL
2. employment aids and aids for self-employment;	Self employment
3. in the fields of research, science and technology development:	
a. post-graduate training	

b. and the training of managers and technicians at research establishments and in enterprises;	
4. Development of new sources of employment, including in the social economy (Third System).	

### 1994-1999

Objective 3	POSSIBLE VARIABLES TO USE AS OUTCOMES
1. facilitate the occupational integration of unemployed persons exposed to long-term unemployment, in particular through:	Unemployment rate
a. vocational training, pre-training including upgrading of basic skills, guidance and counselling;	ELET? PISA? PIAAC-ALL
b. temporary employment aids;	
c. the development of appropriate training, employment and support structures, including the training of necessary staff, and the provision of care services for dependents.	
2. facilitate the occupational integration of young people in search of employment through operations as described in (a), including the possibility of up to two years' or more initial vocational training leading to a vocational qualification, and the possibility of vocational training equivalent to compulsory schooling, provided that by the end of that training the young people are old enough to join the labour market;	-proportion in VET? -youth employment?
3. promote integration of persons exposed to exclusion from the labour market through operations as described in (a);	
4. promote equal opportunities for men and women on the labour market especially in areas of work in which women are under-represented and particularly for women not possessing vocational qualifications or returning to the labour market after a period of absence through operations as described in (a) and through other accompanying operations;	-Women participation to labour force
<b>Objective 4</b>	
1. facilitate the adaptation of workers of either sex, especially those threatened with unemployment, to industrial change and to changes in production systems in particular through:	-Women participation to labour force
a. the anticipation of labour market trends and vocational qualification requirements,	
b. vocational training and retraining, guidance and counselling,	

c. assistance for the improvement and development of appropriate training systems.	
Objective 1, 2 and 5b:	
1. support employment growth and stability, in particular through:	
a. continuing training and through guidance and counselling for workers of either sex, especially those in small and medium-sized enterprises and those threatened with unemployment, and for persons who have lost their jobs,	
b. support for the development of appropriate training systems, including training of instructors, and through the improvement of employment services;	
2. boost human potential in research, science and technology, particularly through:	
a. post-graduate training and	
b. the training of managers and technicians of either sex at research establishments;	
Objective 1	
1. strengthen and improve education and training systems, particularly through:	
a. the training of teachers and instructors of either sex and administrative staff,	
b. by encouraging links between training centres or higher education establishments and enterprises and	
c. financing training within the national secondary or equivalent and higher education systems which has a clear link with the labour market, new technology or economic development;	VET?
2. contribute to development through the training of public officials where this is necessary for the implementation of development and structural adjustment policies	



**Figure 2: Structure and objectives of the different programming periods**

Objective	1994-1999 Financial Instrument/Targeted Units	2000-2006 Objectives	2000-2006 Financial Instrument/Targeted Units	2007-2013 Objectives	2007-2013 Financial Instrument/Targeted Units	2014-2020 Objectives	2014-2020 Financial Instrument/Targeted Units
Objective 1: promoting the development and structural adjustment of regions whose development is lagging behind	Objective 1: Regions lagging behind in development terms ERDF, ESF, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance	Objective 1: Regions lagging behind in development terms	Objective 1: Regions lagging behind in development terms ERDF, ESF, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance	Convergence	Objective 1: Regions lagging behind in development terms ERDF, ESF	Investment for growth and jobs	Objective 1: promoting the development and structural adjustment of regions whose development is lagging behind ERDF, ESF
Objective 2: converting regions seriously affected by industrial decline	Objective 2: converting regions seriously affected by industrial decline ERDF, ESF, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance	Objective 2: Economical and social conversion zones	Objective 2: Economical and social conversion zones ERDF, ESF	Regional competitiveness and employment	Objective 2: Economical and social conversion zones ERDF, ESF	Investment for growth and jobs	Objective 2: converting regions seriously affected by industrial decline ERDF, ESF
Objective 3: combating long-term unemployment and facilitating the integration into working life of young people and of those excluded from the labour market	Objective 3: combating long-term unemployment and facilitating the integration into working life of young people and of those excluded from the labour market ERDF, ESF, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance	Objective 3: Training systems and employment policies	Objective 3: Training systems and employment policies ERDF, ESF	Regional competitiveness and employment	Objective 3: Training systems and employment policies ERDF, ESF	Investment for growth and jobs	Objective 3: combating long-term unemployment and facilitating the integration into working life of young people and of those excluded from the labour market ERDF, ESF
Objective 4: facilitating the adaptation of workers to industrial changes and changes in production systems	Objective 4: facilitating the adaptation of workers to industrial changes and changes in production systems ERDF, ESF, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance, ERDF-Guidance	Objective 4: facilitating the adaptation of workers to industrial changes and changes in production systems ERDF, ESF	Objective 4: facilitating the adaptation of workers to industrial changes and changes in production systems ERDF, ESF	Regional competitiveness and employment	Objective 4: facilitating the adaptation of workers to industrial changes and changes in production systems ERDF, ESF	Investment for growth and jobs	Objective 4: facilitating the adaptation of workers to industrial changes and changes in production systems ERDF, ESF



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