European Commission

The impact of varying per capita intensities of EU Funds on regional growth: Estimating dose response treatment effects through statistical matching

FINAL REPORT

Work package 14d: Propensity score matching

Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF)

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Author: Daniele Bondonio

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Contact: Kai Stryczynski

E-mail: REGIO_EVAL@ec.europa.eu

European Commission
B-1049 Brussels

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Summary

As part of the Ex post evaluation of the 2007-2013 programming period of the European Cohesion Policy this report deals with the impact of the varying per capita intensities of EU funds on regional growth. The works was separated in three tasks. The first one focuses on the analysis of how the intensity variation of EU structural funds affected regional growth in the EU-15 regions in the 1994-2006 period. Task 2 deals with the impact of EU cohesion policy on regional growth in the EU-27 regions. Task 3 is wider because it tackles the analysis of cohesion policy effects for all European countries, considering data up to 2013. Thanks to statistical methods impacts are estimated. The tasks involved using a counterfactual impact evaluation design, implementing with propensity score matching (PSM) and generalized propensity score matching (GPSM).

As concerns the Task1 of this project, there were two main objectives of the analysis. A) Compare results obtained with a PSM approach to those from earlier RDD analysis research (Pellegrini et al. 2013 and Becker et al. 2013) to highlight lessons that can be learned on the data availability scenarios that make preferable to use of one method as supposed to the other. B). Estimate different impacts for different levels of the per capita intensity of the EUF. As mentioned in the technical offer, objective B) of the analysis can be achieved by operationalizing the intensity level of the EUF either dichotomously (as implemented in Pellegrini et al 2013) or with multiple categories of intensity levels (in discrete or continuous terms, as implemented, at the NUTS3 level, in Becker et al. 2013). To enhance comparability with the RDD work package, and because of serious reliability issues with the NUTS3 level data, it was agreed with DG-regio to use NUTS2 level as the units of observation of the analysis, instead of the NUTS3 level used by in Becker et al. 2013. Because of the choice to focus on NUTS2 regions as units of observation, the overall sample size of the regions with comparable pre-intervention characteristics is not large enough (at the EU15 level for the 1994-2006 period) to allow statistically significant estimations of a continuous or categorical dose-response function. For this reason the Task 1 analyses presented in this report is implemented entirely within the framework of the dichotomous difference in the degree of intensity of the EUF adopted in Pellegrini et al 2013 (i.e. a binary treatment status variables that distinguishes the higher per capita intensity of the EUF related with "Obj.1"/"Convergence Obj" eligibility from the lower per-capita intensity related with the "non-Obj.1/Convergence Obj.1 eligibility"). Thus, as indicated in the technical offer, the actual data availability scenario and sample size considerations dictated the choice of the exact model that was used in the Task 1 analysis.

Generalised Propensity Score Matching and propensity score matching estimators with multiple categorical treatment status variables for the different intensities of the EUF were instead applied to the analysis for the Tasks 2 and 3 of this projects. These tasks involve estimating how varying per capita intensity of EUF affected regional growth, extending the analysis of Task 1 to include the larger sample of EU-27 regions over the period 1994-2013 and considering a larger number of outcome variables to include, employment growth and growth of (per capita) gross fixed capital formation, in addition to the per capita regional growth of GDP used in Task 1[1].

[1] As mentioned in the technical offer, the list of outcome variables used for the analysis has been determined in agreement with DG-Regio based on the actual data availability for the entire list of NUTS2 regions considered in the analysis.

PART I

1. RDD vs Matching for Regional-Level CIEs of EU Funds (EUF)

When adopting RDD for regional-level CIEs of structural and cohesion fund programmes, the following considerations apply:

- The units of observation for the analysis (i.e. the EU regions) did not self-selected into applicants and non-applicant for obtaining the former Obj.1 / Convergence Obj status: such eligibility was based, by the most part on the GNI in PPS recorded by Eurostat. For this reason, no obvious advantage of RDD versus other CIE methods exist due to the fact that in RDD the treated units can be compared only with untreated units with the same initial desire to be treated (while, with other CIE methods, the treated units can be potentially compared with a general population of non-treated units, regardless of whether or not they participated into the program application process). Thus applying RRD versus other CIE methods does not guarantee any better controlling of the unobservable confounding factors (i.e factors affecting the outcome variable a part from the treatment) leading to the same desire to be treated.

- In set ups suitable for RDD, the more the forcing variable (determining the treatment status of the units of observations) is a factor with a weak influence on the outcome variable Y of the analysis (i.e. a "non-dominant" forcing variable), the more the treatment assignment process mimic an actual randomization also away from the cut-off point. This bears an important consequence: The more the forcing variable does not constitute a "dominant" confounding factor, the larger is the band across the cut-off point in which conditions similar to a randomized experiment apply.

- Since RDD mimics a block randomization within the neighbourhoods of the cut-off point, in the presence of small samples and of a "non-dominant" forcing variable, it has to checked whether or not the sample of treated and non-treated units in the neighbourhood of the cut-off point are indeed balanced with regards to the other relevant confounding factors (different from the forcing variable). As widely discussed in the literature, this is common wisdom in the field of randomized experiments: with small samples, unbalanced compositions can happen and the randomization process has to be repeated or implemented as block randomization with regards to all the major confounding factors.

- In the presence of small samples, the more "dominant" is the forcing variable, the less it is necessary to check whether or not the treated and non-treated units in the neighbourhood of the cut-off are balanced with regard to other confounding factors (this is because similar levels of a "dominant" forcing variable ensure per-se an overall balance between treated and non-treated units even in the presence of small samples). When the sample size is small, the more the forcing variable is a weak confounding factor ("non-dominant"), the more it has to checked whether or not the treated and non-treated units in the neighbourhood of the cut-off are indeed balanced with regard to the actual major confounding factors (which are different from the forcing variable)

In the case of the EU regions, for the 1994-1999 period, the forcing variable to determine Obj.1 eligibility was the per-capita GNI in terms of PPS recorded by Eurostat in 1988-1990 , which is almost 6 years before the start of the implementation of any actual subsidized Ob.1 project. Similar large temporal gaps were in existence also for the 2000-06 and 2007-13 programming periods, with the eligibility to the higher intensities of EU funds –EUF- (i.e.

Objective 1/Convergence Objective area eligibility) based on a forcing variable measured in 1994-96 and 2000-02 respectively. Because of such large temporal gaps and because the forcing variable measures GDP levels while the outcome variables of the analysis are in terms of regional growth, it can be deemed that the forcing variable is not a confounding factor that capture all the relevant regional characteristics that may affect the outcome variables Y used in the analysis.

Moreover, the sample size of the regions that can be found near the cut-off is very small. Thus, in light of the arguments discussed above, the treated and non-treated units positioned only sharply in the neighbourhood of the cut-off are guaranteed to be balanced only with respect to the forcing variable. Because of the small sample size of the regions in the neighbourhood of such cut-off, no guarantee is offered with regard of the actual balancing of other important regional characteristic that influence the outcome Y (in the same way as no balancing is guaranteed with small samples even with actual randomization).

Thus, with small sample sizes, forcing the comparison to only the regions sharply across the cut-off point (compared to other CIE methods such as matching) may prevent balancing to occur with respect to the other important regional characteristics that are important risk factors for selection bias. In other word, enlarging the neighbourhood across the cut-off of the forcing variable and ensuring statistical matching between treated and non-treated regions, may achieve a better overall balancing of all the confounding factors compared to a standard sharp RDD design. If the forcing variable has the same (or lower) importance as a confounding factor as other regional characteristics, thus, a best overall balancing between treated and non-treated regions could be achieved ensuring a good matching of all confounding factors (i.e. using matching estimators), rather than with standard RDD in which an exact matching occurs only for the forcing variable and (due to the small sample size) no guarantee is offered with regard to the actual balancing of other important confounding factors.

2. Data (Task 1)

The sources of the data used in the analysis are as follows:

- **Outcome variable (Y):** As mentioned in the ToR and in the Technical Offer, to enhance result comparability, the analysis exploits the same GDP data used in the RDD study of Pellegrini et. al (2012). Such GDP data were made available to the analysis directly by the authors of that study and the sources they mentioned for the data are DG-Regio for 1995-1999 and Eurostat for the period 2000-2006. The outcome variable used for the analysis is operationalized as the average per-capita annual GDP growth;

- **Treatment status variable (T):** based on the figures from DG-Regio on the EUF allocated at the NUTS2 level, the different per-capita intensity of EUF has been coded dichotomously in the following way:

  T_i=1 if a NUTS2 *i* has the additional per-capita EUF availability typically associated with Obj1 (convergence Obj.) eligibility ("hard financed regions"). The threshold for operationalizing such "hard financed" regions is, following Pellegrini et al. (2013) a minimum total value of EUF of 1960 Euro per head[2].
  T_i=0 if a a NUTS2 *i* does not have the additional per-capita EUF associated with Obj1 (convergence Obj.) eligibility ("soft financed regions");

- **Control variables (X):** the control variables used in the analysis to ensure good balancing between the treatment (T_i=1) and the comparison group (T_i=0) were constructed based on the following 1991-1994 yearly data provided at the NUTS2 level by Cambridge Econometrics:
  - GDP;
  - employment rate;
  - per capita worker compensation;
  - gross fixed capital formation;
  - labour productivity (GDP per worker).

  These yearly NUTS2 data were used to operationalize two sets of control variables:
  X_{grw} = set of yearly growth rates of the control variables X, operationalized as yearly percentage changes;
  X_{lev} = set of average levels of the control variables X, operationalized as yearly average level of X over the period 1991-1994;

- **Forcing variable (Z):** for the purpose of comparing the PSM results with those of the RDD analysis, the Obj.1 area eligibility variable (Z) was also considered in the analysis. Such variable (Z), referred to as the "forcing variable" is the average per capita GDP of the NUTS2 regions during the 1988-1990 period, in term of purchasing power standards (PPS).

[2] To enhance result comparability, we adopted such dichotomous operationalization of the treatment status variable based on the same data on the regional EU funds allocation used in Pellegrini et. al 2013. The data that were provided to us for the analysis did not include the exact figures of the 1995-2006 EU funds expenditures sorted by NUTS2 regions. Further details on the matter can be found in Pellegrini et. al 2013.

3. Caveats and limitations of the data (Task 1)

The data availability scenario described in the previous section poses the following limitations to the analysis:

- The pre-intervention control variables X available for the analysis are measured in the 1991-1994 period which is right before the beginning of the 1995-2006 period of observation of the EUF expenditures under evaluation. This solution is standard practice in the literature and it is adopted, for example, in the Generalized Propensity Score –GPS- study of Backer et al. (2013). However, a large group of NUTS2 regions of Spain and southern Italy, five NUTS2 regions of France (Corsica and the outer territories) in addition of the whole group of NUTS2 of Greece and Ireland received Obj.1 EUF assistance from the 1989-1993 programming period that could have potentially affected the GDP growth in the 1991-1994 period. The Obj.1 EUF assistance for the 1989-1993 programming period amounted to 13 Billion Euro for Greece, 9.75 Billion Euro for Spain, 1 Billion for France, 4.1 Billion for Ireland and 8.4 Billion for Italy. For Spain and Italy, however, deadline extensions and amendments of Operational Programmes were granted until the end of 1994 (source: Fifth annual report on the implementation of the reform of the structural funds, 1993[3]). Such deadline extensions and re-programming resulted in an actual the implementation of the Obj.1 subsidized projects that took part, by the most part not before the end of 1994. An actual completion of the funded projects and initiatives beyond the end of the 1989-1993 programming period is also documented for the Obj.1 regions Ireland, Greece and France. For this reason it can be deemed that the presence of the 1989-1993 EUF devoted to the Obj.1 regions had little chances to have heavily affected the regional GDP growth (and other control variables) before 1994.

- In empirical studies that investigates at the NUTS2 level the causality links between regional characteristics and future economic growth, some additional covariates were found to be good predictors of future GDP growth. Such predictors were, for example, the percentage of residents with high educational attainments. These variables, were not available for the analysis at the moment in which task 1 was implemented, but they are included in the control variables used for Task2 and Task3 (in Part II of this report)

[3] http://aei.pitt.edu/4011/1/4011.pdf

4. Sample sizes and descriptive statistics (Task 1)

The 1995-2006 GDP data made available to the analysis contained information on 213 NUTS 2 regions in the EU 15 area. 61 of such regions were eligible for the additional support related to Obj.1 (conv. Obj.) eligibility and 152 regions were not eligible for the additional Obj.1 (convergence Obj,) support.

To ensure result comparability, as specifically required in the ToR, from such group of 213 NUTS2 regions, we operated the same exclusions as in Pellegrini et al (2013):

- -Four regions where excluded because their level of per capita GDP in the period 1988–1990 (i.e., the reference period for the determination of Objective 1 eligibility by the European Commission) was above 75 per cent of EU average [these regions are: Prov. Hainaut (BE), Corse (FR), Molise(IT), Lisboa (PT)];
- -Ten regions were excluded because they were not Obj. 1 in the 1994–1999 period but turned out to be eligible (or partially eligible) for Objective 1 funds in the 2000–2006 period: Burgenland (AT), Itä-Suomi (FI), South Yorkshire (UK), Cornwall and Isles of Scilly (UK), West Wales and The Valleys (UK); Länsi-Suomi (FI), Pohjois-Suomi (FI), Norra Mellansverige (SE), Mellersta Norrland (SE), Övre Norrland (SE);
- -Nine regions were excluded from the comparison group of "soft-financed" non-Obj.1 regions because, considering all the different sources of EUF financing in the two programming periods, they received a total per-capita aid intensity greater than the minimum threshold (1960 Euro per head) recorded for the actual Obj.1 (Convergence Obj) regions. These regions are seven NUTS2 from Spain (Pais Vasco, Comunidad Foral de Navarra, La Rioja, Aragón, Comunidad de Madrid, Cataluña, IllesBalears) and two NUTS2 from Finland (Etelä-Suomi, Åland);

In order to successfully merge the 1995-2006 GDP annual series (which adopted the NUTS2 2003 code definition) with the 1991-1994 control variable data (that adopted a more recent NUTS2 code definition), the following additional changes were required compared to the GDP series of Pellegrini et al. (2013):

- Two NUTS2 regions of Germany, DE40 and DE41 (in the pre-2003 code definition) had to be me merged into one NUTS2 code (DE40 Brandenburg);
- Three (pre-2003) NUTS2 regions of Germany (DEE1 Dessau, DEE2 Halle, DEE3 Magdeburg) had to be merged into the single NUTS2 region of Sachsen-Anhalt (DEE0).

4.1 Sample sizes of NUTS2 regions available for the analysis

Table 1 describes the final sample size of the groups of NUTS2 regions available for the analysis, sorted into Obj.1 regions and non-Obj.1 regions.

Table 1 : Sample sizes of NUTS2 regions by Eligibility Status (T=1 Obj.1; T=0 non-Obj.1)

T	Freq.	Percent
0	133	71.12
1	54	28.88
Total	187	100.00

To draw comparisons between the results of this study and the RDD results, in Tables 2-4 are reported the sample sizes of the Obj.1 and non-Obj.1 regions sorted based on their value of the "forcing variable" (Z) for Obj.1 (Convergence Obj,) eligibility. Table 2 displays the sample sizes of the NUTS2 regions with a value of Z within +/- ¼ of the Standard Deviation (SD) away from the cut-off point [i.e. with values of Z between 67.85% of the EU average (=75-7.15) and 82.15% (75+7.15)].

Table 2 : Sample sizes of NUTS2 regions within ¼ SD from cut-off of Z (67.85% <Z >82.15%)

T	Freq.	Percent
0	13	50.00
1	13	50.00
Total	26	100.00

Table 3 illustrates the sample sizes of the regions with Z within ½ SD away from the cut-off point (i.e. with values of Z between 60.70% and 89.30%).

Table 3 : Sample sizes of NUTS2 regions within 1/2 SD from cut-off of Z (60.70% <Z >89.30%)

T	Freq.	Percent
0	37	60.66
1	24	39.24
Total	61	100.00

4.2 Descriptive statistics on the balance of the pre-intervention covariates (X) between Obj.1 and non-Obj.1 regions

In order to draw comparisons between the PSM and the RDD results, it is useful to investigate how the pre-intervention (1991-1994) characteristics of the Obj1. and non-Obj.1 regions are balanced. This is done separately for the set of X_{grw} (control variables in terms of pre-intervention growth) and of X_{lev} (control variables in terms of average pre-intervention levels) and for three different groups of regions based on their values of the forcing variables "Z":

a) regions with values of Z just above or the below the cut-off (i.e. within ¼ SD away from the cut-off);
b) regions with values of Z +/- ½ SD from the cut-off;
c) regions with any values of Z (i.e. the whole sample of regions).

The figures reported in Table 4 shows that for the growth rate pre-intervention covariates, the overall balance between the Obj.1 regions (treated) and the non-Obj.1 regions (control) does not improve much by restricting the sample of NUTS2 to only the regions with similar values of the "forcing variable" Z (sample A), as supposed to whole sample of regions (C). Such finding is consistent with the hypothesis that the "forcing variable "(Z) that does not capture all the relevant pre-intervention growth-trends controls that may represent risk-factors for selection

Table 4 : Pre-intervention differences in Xgrw between Obj.1 (treated) and non-Obj.1 regions (control)

Variable	Mean			t-test	
	Treated	Control	%bias	t	p>|t|
A) Regions with Z within 1/4 SD away from the cut-off					
d_emprate	-1.3534	-1.3031	-3.2	-0.08	0.935
d_compens	-.24538	1.8341	-86.7	-2.21	0.037
d_grsfixcapt	-1.4274	-.83096	-15.5	-0.39	0.696
d_GDP	1.1565	1.5455	-28.8	-0.74	0.469
d_labprod	2.6028	2.9452	-22.1	-0.56	0.579
B) Regions with Z within 1/2 SD away from the cut-off					
d_emprate	-1.3187	-1.0414	-21.3	-0.84	0.406
d_compens	-.40011	1.6557	-80.7	-3.36	0.001
d_grsfixcapt	-2.7986	-.20104	-59.4	-2.34	0.023
d_GDP	.52153	1.5145	-67.6	-2.67	0.010
d_labprod	1.9545	2.6179	-37.3	-1.43	0.159
C) All Regions					
d_emprate	-.90036	-1.0859	15.1	0.98	0.326
d_compens	3.1352	1.24	35.9	2.86	0.005
d_grsfixcapt	-1.042	.02656	-21.7	-1.39	0.166
d_GDP	1.7761	1.0389	17.7	1.36	0.174
d_labprod	2.7872	2.1785	14.0	1.08	0.279

For what is concerns instead the set of control variables in terms of average pre-intervention levels (Table 6), the balance between the treated (Obj.1) and control (non-Obj.1) regions does somehow improves by considering solely the NUTS2 areas with similar values of Z (sample A) as supposed to the whole sample (C).). Such finding is consistent with the hypothesis that the "forcing variable "(Z) is somehow correlated solely with the pre-intervention average levels of the control variables that may represent risk-factors for selection bias.

Table 5 : Pre-intervention differences in X_{lev} between Obj.1 (treated) and non-Obj.1 regions (control)

Variable	Mean Treated	Mean Control	%bias	t-test t	t-test p>|t|
A) Regions with Z within 1/4 SD away from the cut-off					
avg_emprate	53.552	59.864	-79.4	-2.03	0.054
avg_compens	20073	27294	-174.0	-4.44	0.000
avg_grsfixcapt	3370.2	3705.6	-36.0	-0.92	0.368
avg_GDP	16049	19299	-153.7	-3.92	0.001
avg_labprod	44844	49933	-73.2	-1.87	0.074
B) Regions with Z within 1/2 SD away from the cut-off					
avg_emprate	52.289	60.146	-111.2	-4.31	0.000
avg_compens	19065	27060	-179.5	-7.10	0.000
avg_grsfixcapt	3356.5	3712.3	-28.6	-1.03	0.306
avg_GDP	14945	18970	-213.0	-8.30	0.000
avg_labprod	42923	48338	-93.9	-3.56	0.001
C) All Regions					
avg_emprate	55.002	66.808	-126.2	-7.56	0.000
avg_compens	16813	28429	-199.2	-13.54	0.000
avg_grsfixcapt	3325.6	4167.7	-59.4	-3.68	0.000
avg_GDP	13374	23271	-213.6	-11.59	0.000
avg_labprod	36934	52101	-183.5	-11.77	0.000

To further investigate how dominant is the "forcing variable" (Z) in controlling for some pre-intervention regional covariates that may be linked with future regional growth, we plot each value of Z against the corresponding value of each control variable, both in terms of pre-intervention growth-trends (Figures 1-5) and in terms of pre-intervention average levels (figures 6-10). In Figures 1-10, the cut-off point of the "forcing variable" Z (1988-1990 per-cpaita GDP as a % of EU mean) is indicated with a vertical red line.

Figure 1 : Pre-intervention annual % change in the employment rate (1=p.p.) plotted against values of Z (per-capita GDP in 1988-90 in terms of % of EU mean)

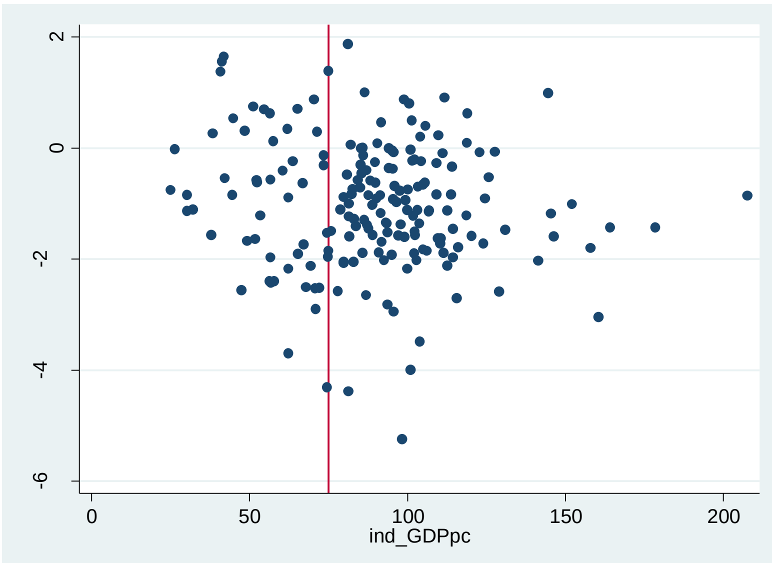


Figure 2 : Pre-intervention annual % growth in GDP per-capita (1=p.p.) plotted against values of Z (per-capita GDP level in 1988-90 in terms of % of EU mean)

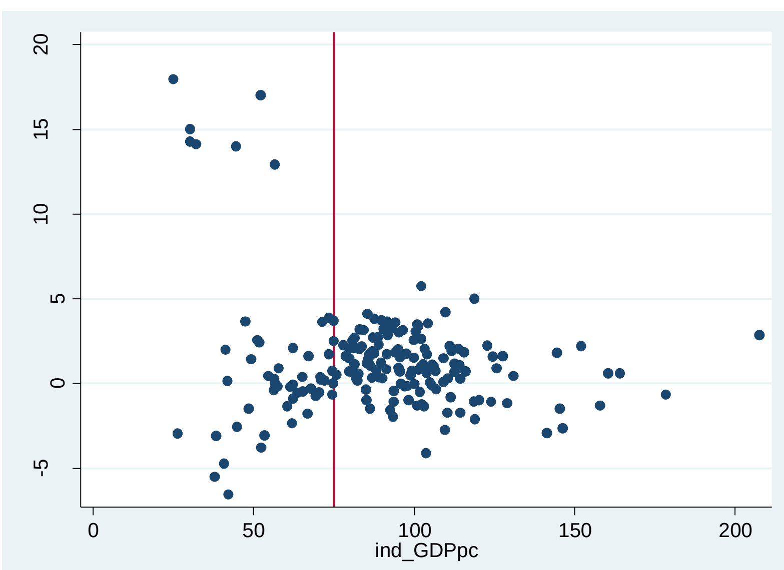


Figure 3 : Pre-intervention annual % change in worker compensation (1=p.p.) plotted against values of Z (per-capita GDP in 1988-90 in terms of % of EU mean)

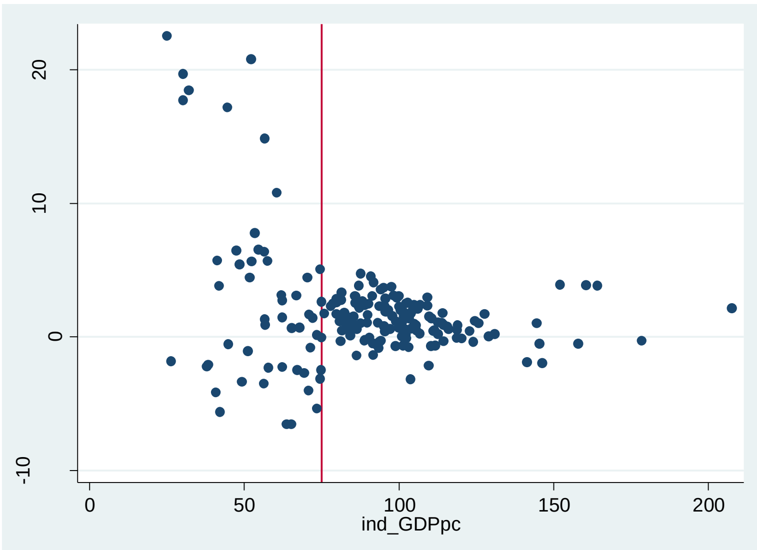


Figure 4 : Pre-intervention annual % growth in per-capita fixed capital formation (1=p.p.) plotted against values of Z (per-capita GDP level in 1988-90 in terms of % of EU mean)

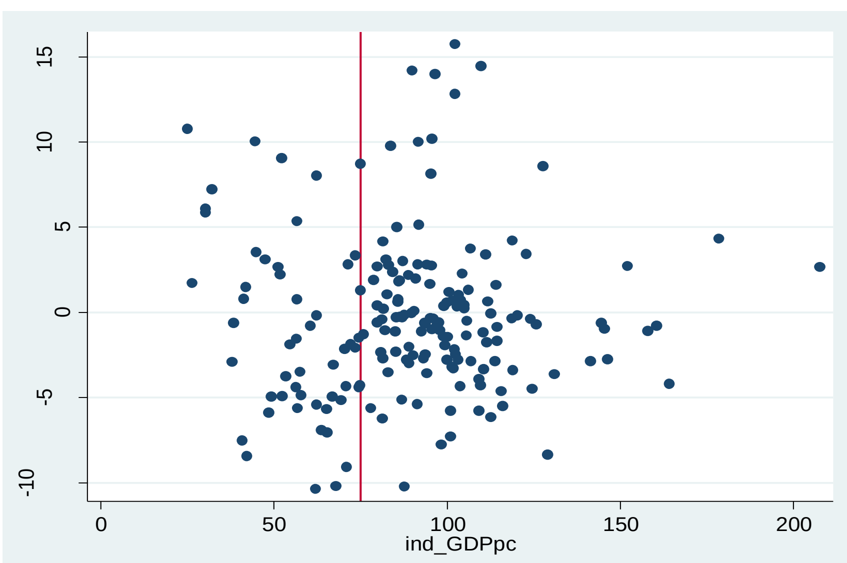
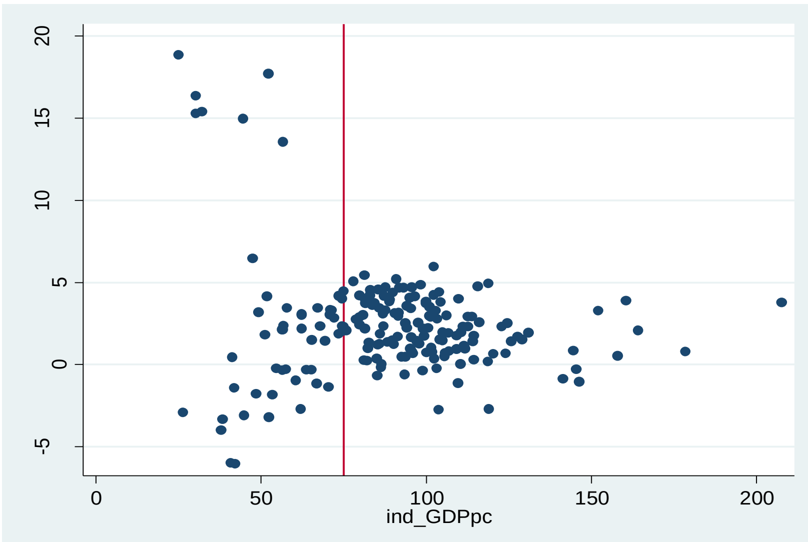


Figure 5 : Pre-intervention annual % growth (1=1 p.p.) in labour productivity (GDP per-worker) plotted against values of Z (per-capita GDP level in 1988-90 in terms of % of EU mean)



The plotted charts of Figures 1-5 illustrates well a lack of a strong correlation between the values of the "forcing variable" Z and the pre-intervention growth-rate of the control variables used in the analysis. Such lack of correlation does not ensure, in the presence of small samples, that an adequate balancing between the pre-intervention growth-trends is achieved between the Obj.1 (treated) and non-obj1 (non-treated) regions that have values of the "forcing variable" Z close to the cut-off point.

The plotted charts of Figures 6-10, instead, depict a fairly evident correlation between the "forcing variable" Z and the average pre-intervention values of the control variables. Such correlation has two important implications for the analysis:

a) The regions with balanced pre-intervention levels of the control variables across the treatment and comparison group, tend to be those with values of Z in the neighbourhood of the cut-off point;
b) The overall number of regions on the common support (i.e. with balanced pre-intervention characteristics) is drastically reduced when the control variables are operationalized also in terms of levels as supposed to solely in terms of growth trends.

Figure 6 : Pre-intervention average level of employment rate (1=1%) plotted against values of Z (per-capita GDP in 1988-90 in terms of % of EU mean)

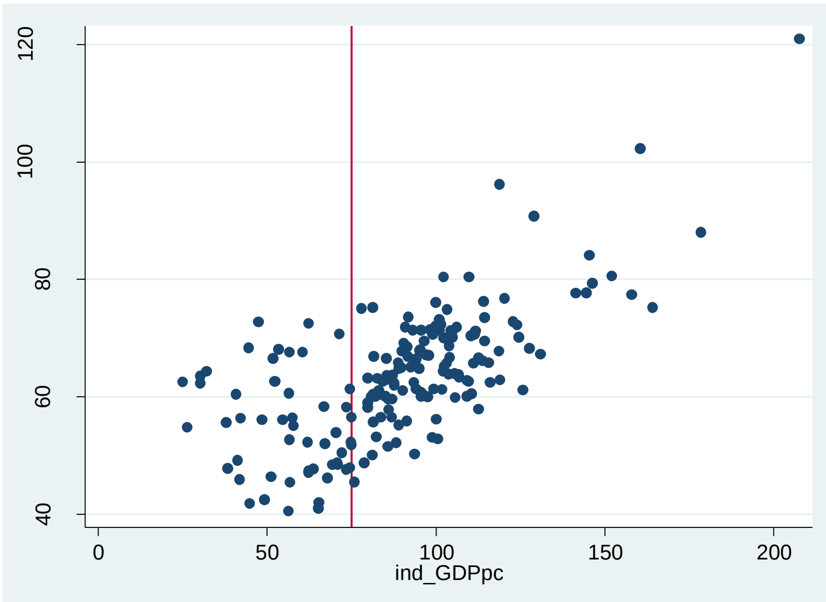


Figure 7 : Pre-intervention average level of GDP per-capita (1=EUR) plotted against values of Z (per-capita GDP level in 1988-90 in terms of % of EU mean)

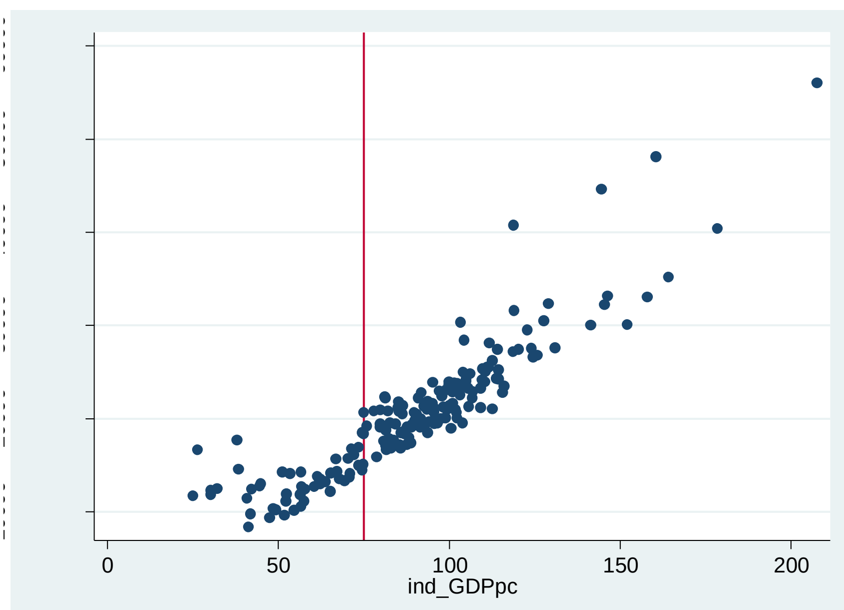


Figure 8 : Pre-intervention average level of worker compensation (1=EUR) plotted against values of Z (per-capita GDP in 1988-90 in terms of % of EU mean)

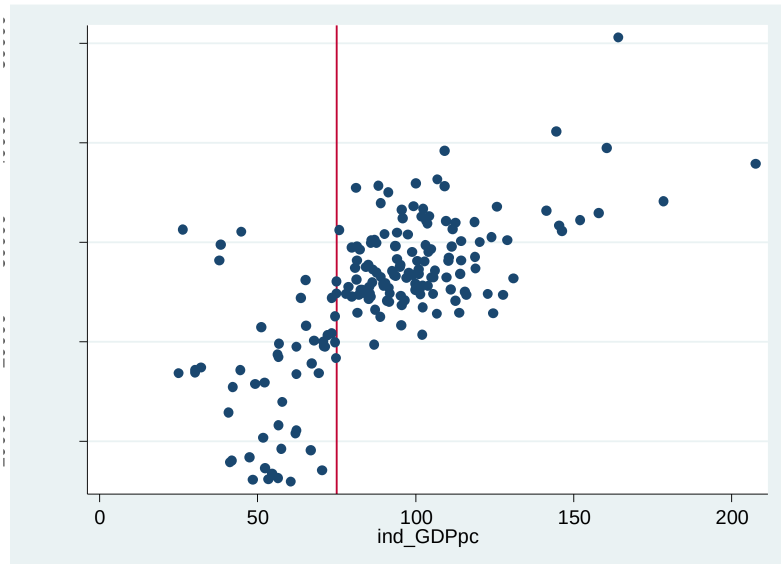


Figure 9 : Pre-intervention average level of per-capita fixed capital formation (1=EUR) plotted against values of Z (per-capita GDP level in 1988-90 in terms of % of EU mean)

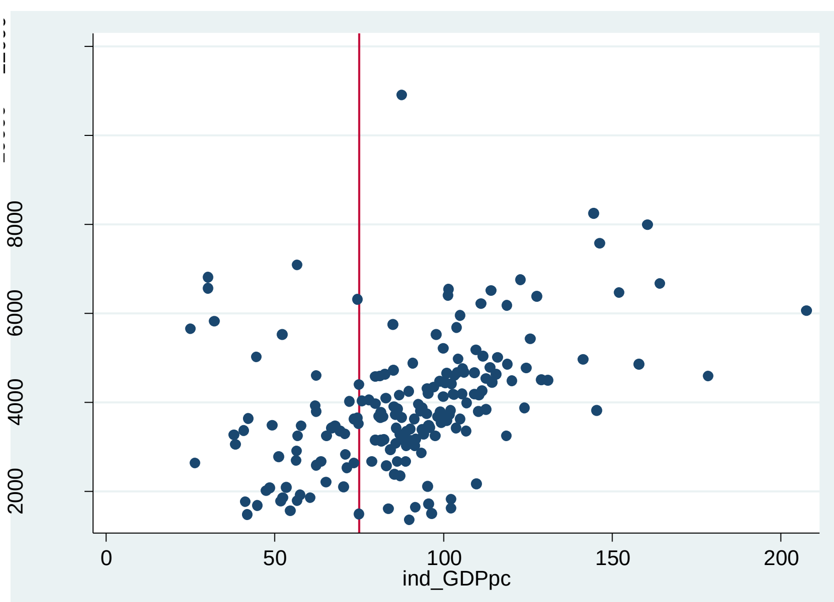
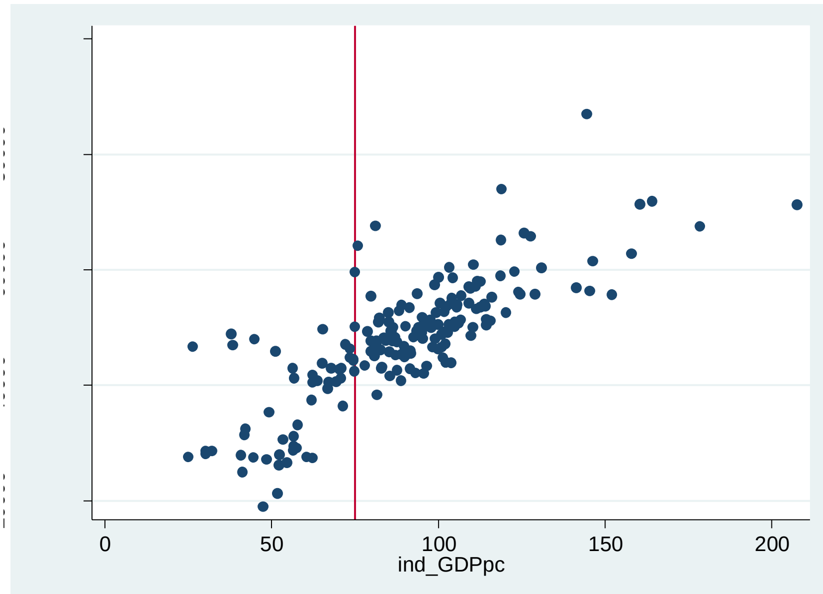


Figure 10 : Pre-intervention average level of labour productivity (GDP per-worker, 1=1 EUR) plotted against values of Z (per-capita GDP level in 1988-90 in terms of % of EU mean)



5. Methods: Propensity Score Matching estimation

The estimates of the impact of the additional EUF related to Obj.1 eligibility on the 1995-2006 average per-capita GDP growth have been obtained from the following Propensity Score Matching (PSM) models:

- Radius Matching;
- Nearest Available Caliper Matching;
- Kernel Matching.

5.1 Radius Matching estimators

Radius matching estimators were implemented in the analysis with different values of the tolerance radius (δ) and the following different specifications of the control variables:

- Growth-rate trends (X_{grw}) in terms of pre-intervention: employment rate (emplrate); worker compensation (wrk_compens), per–capita GDP (GDP), gross fixed capital formation (gross_fxd_cap_form) and labour productivity (in terms of GDP per-worker: lab_prod);
- Three growth-rate trends and three average-level controls (wrk_compens, GDP, gross_fxd_cap_form);
- A full set of controls ($X_{grw} + X_{lev}$) in terms of pre-intervention both growth-trends and levels (emplrate; wrk_compens; GDP; gross_fxd_cap_form; lab_prod).

Formally the estimation procedure entailed the following steps:

a) Estimation of three different probit specifications:

$P(T=1) = \Phi(X_{grw})$ (1) or

$P(T=1) = \Phi(X_{6var})$ (2) or

$P(T=1) = \Phi(X_{grw}, X_{lev})$ (3)

Where:

T=1 receiving the additional EU fund aid intensity related to the Obj.1 area designation;

X_{grw} = set of pre-intervention (1991-1994) control variables in terms average annual growth-rate trends of: employment rate (emplrate); worker compensation (wrk_compens), per–capita GDP (GDP), gross fixed capital formation (gross_fxd_cap_form) and labour productivity (in terms of GDP per-worker: lab_prod);

X_{6var} = set of six pre-intervention (1991-1994) control variables composed by three average annual growth-rate trends and three average annual levels of: worker compensation (wrk_compens), per–capita GDP (GDP), gross fixed capital formation (gross_fxd_cap_form);

X_{lev}= set of pre-intervention (1991-1994) control variables in terms average annual levels of: employment rate (emplrate); worker compensation (wrk_compens), per–capita GDP (GDP), gross fixed capital formation (gross_fxd_cap_form) and labour productivity (in terms of GDP per-worker: lab_prod).

b) The predicted probabilities $T^{\wedge} = \Phi(X\gamma^{\wedge})$ from the three probit specifications (1-3) represents three sets of Propensity Scores (PS) alternatively used for matching each single Obj.1 region with the non-Obj.1 regions sharing the most similar pre-intervention (1991-1994) characteristics. Such matching procedure is implemented with a radius of tolerance (δ) that represents the maximum distance (in absolute value) between the PS of the Obj,1 regions (T=1) and those of the non-Obj.1 regions (T=0) that are matched together. The radius (δ) that were used in the analysis were alternatively: 0.005; 0.01; 0.05; 0.10; 0.15[4].

c) Once each Obj.1 region is matched with the group of non-Obj1 regions that shares similar pre-intervention characteristics in terms of either X_{grw}, X_{6var} or both X_{grw} and X_{lev}, the impact estimates in terms of Average Treatment Effects on the Treated (ATT) parameters τ are retrieved as:

$$\tau = E[Y^1 \mid T=1, PS] - E[Y^0 \mid T=0, PS] \quad (4)$$

5.2 Nearest Available Caliper Matching

The Nearest Available Caliper Matching estimators were implemented in the analysis with different values of the caliper (γ) and the same three different sets of control variables used for the Radius Matching estimation: (X_{grw}), (X_{6var}) and (X_{grw}, X_{lev}). Formally the estimation procedure entailed the following steps:

a) Estimation of the three different probit specifications (1), (2), (3).

b) The predicted probabilities $T^{\wedge} = \Phi(X\gamma^{\wedge})$ from the three probit specifications (1-3) represents three sets of Propensity Scores (PS) alternatively used for matching each single Obj.1 region with the single non-Obj.1 region that shares the most similar pre-intervention (1991-1994) characteristics. Such matching procedure is implemented with a caliper (γ) that represents the maximum distance (in absolute value) between the PS of the Obj.1 region (T=1) and the matched non-Obj.1 region (T=0). Obj.1 regions that have a closest non-Obj.1 region with a PS outside the caliper of tolerance (γ) are discharged from the analysis. Similarly as for the radius matching, the caliper(γ) that were used in the analysis were alternatively: 0.005; 0.01; 0.05; 0.10; 0.15[5].

c) Once each Obj.1 region is matched with the non-Obj1 region that shares the most similar pre-intervention characteristics in terms of either X_{grw}, X_{6var} or both X_{grw} and

[4] The results presented in this report will be drown from the specifications of the radius (δ) that ensure the best overall balancing of the pre-intervention control variables, while the complete sets of results will be presented in the Appendix.
[5] The results presented in this report will be drown from the specifications of the caliper (γ) that ensure the best overall balancing of the pre-intervention control variables, while the complete sets of results will be presented in the Appendix.

X_{lev}, the impact estimates in terms of Average Treatment Effects on the Treated (ATT) parameters τ are retrieved as in (4).

5.3 Kernel Matching

The Kernel Matching estimators were implemented in the analysis with the following different smoothing functions:

- Gaussian, with different bandwidth (the STATA default 0.06, 0.1 and 0.15[6]);
- Biweight;
- Epanechnikov.

The set of control variables used for the estimation are the same (X_{grw}), (X_{6var}) and (X_{grw}, X_{lev}) used for radius and nearest neighborhood matching. More in detail, the estimation procedure entailed the following steps:

a) Estimation of the three different probit specifications (1), (2), (3).

b) The predicted probabilities $T^{\wedge} = \Phi(X\gamma^{\wedge})$ from the three probit specifications (1-3) represents three sets of Propensity Scores (PS) alternatively used for the Kernel matching procedures based on the different smoothing functions.

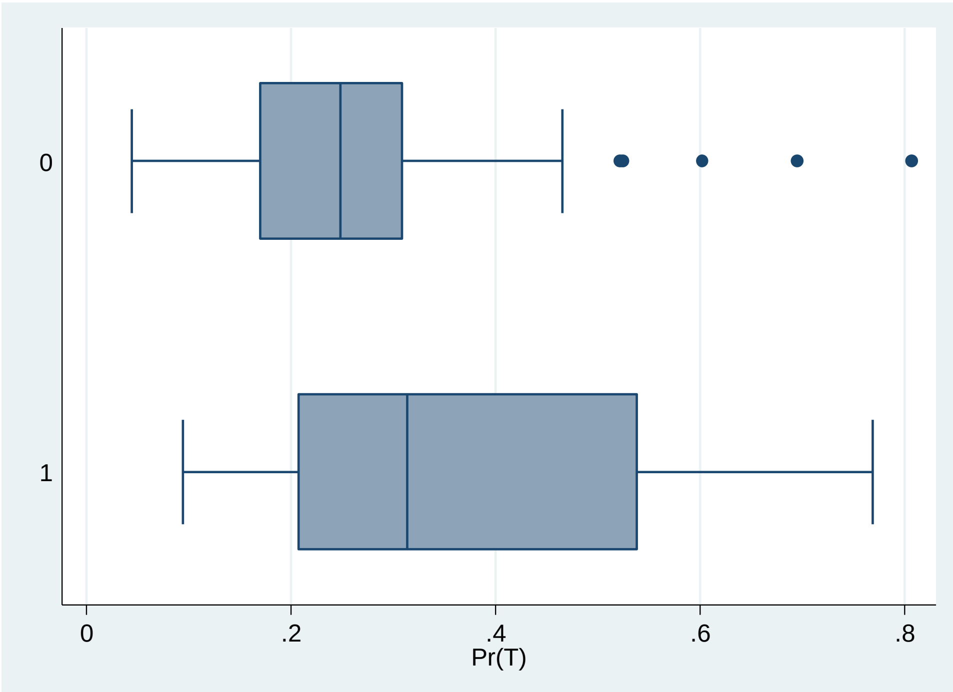
c) The outcome (Y^1) of each Obj.1 region is compared with a weighted average of the outcomes (Y^0) of each non-Obj.1 region with the weights of such average being inversely proportional to the distance between the PSs. One of the three different smoothing functions alternatively used in the analysis sets the pace of the decline in the importance of each non-Obj.1 area in contributing to the comparison average (Y^0) as the PS of the non-Obj.1 area gets more distant from that of the Obj.1 area.

5.4 PS estimation and common support

The goal of the Propensity Score Matching (PSM) procedures used in the analysis is to produce impact estimates based on comparisons between Obj.1 regions and regions with similar 1991-1994 growth potentials that were not designated as Obj.1 areas. No matter which PSM procedure is used, the potential for obtaining good internal and external validity for the analysis crucially relies on the whether or not and actual adequate balancing of the pre-intervention control variables exists between the treatment (Obj.1 regions) and the comparison group (non-Obj1 regions). The existence of such balancing is ensured in the presence of adequate "common support" in the estimated Propensity Scores (PS, which can be though as a variable which summarizes the relevant pre-intervention confounding factors). In the following Figures 11-13 we depict the boxplots of the PS distributions for the treatment and the comparison group. An adequate balancing of the 1991-1994 control variables would produce a large overlapping between the PS distributions of the Obj.1 and non-Obj.1 regions (i.e. an extensive "common support" is detected).

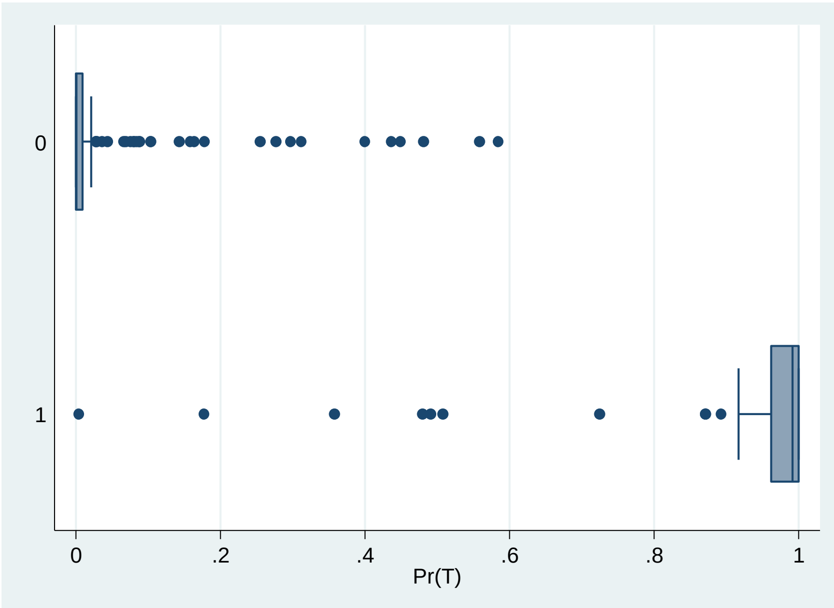
[6] The results in this report will be based on the bandwidth that ensure the best overall balancing of the pre-intervention control variables, while the complete sets of results will be presented in the Appendix.

Figure 11 : Boxplots of the PS distributions based on Xgrw (Growth-trends controls) [All Regions]



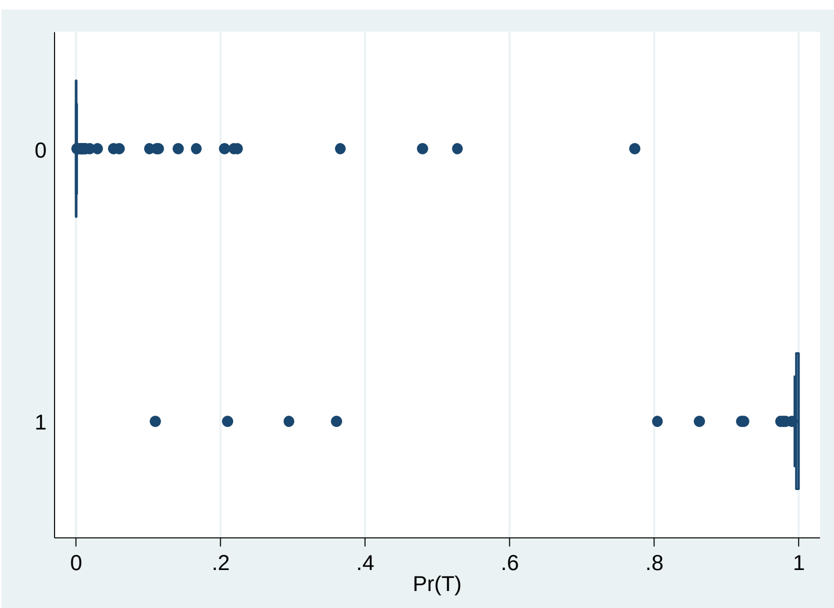
T=0 (above): comparison group
T=1 (below): treatment group

Figure 12 : Boxplots of the PS distributions based on three Xgrw (Growth-trend controls) and three Xlev (Average-level controls). [All Regions]



T=0 (above): comparison group
T=1 (below): treatment group

Figure 13 : Boxplots of the PS distributions based on all Xgrw (Growth-trend controls) and Xlev (Average-level controls). [All Regions]



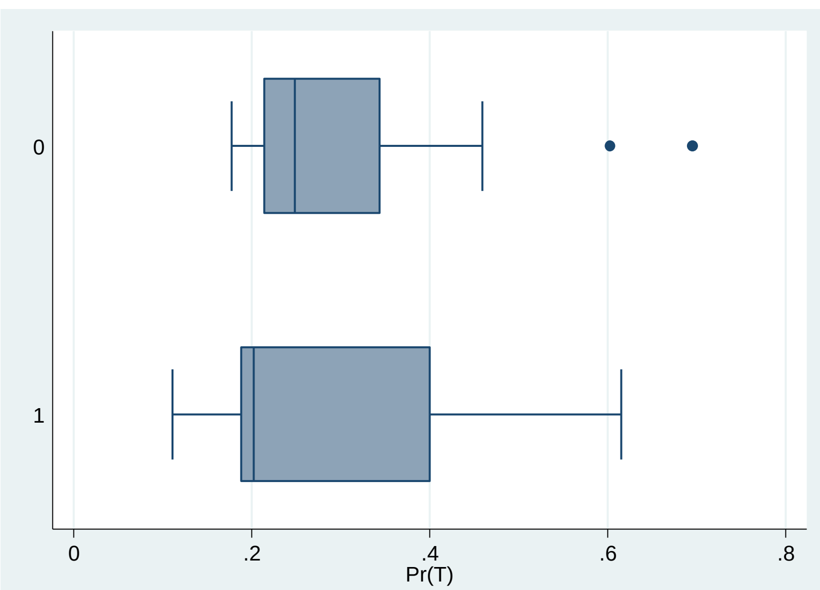
T=0 (above): comparison group
T=1 (below): treatment group

As shown in Figures 11-13, the "common support" of the PS distributions for the treated and the comparison group is much larger when the analysis is implemented based on the growth-trend control variables. This is not surprising as the forcing variable Z which determined the treatment assignment captured the average per-capita GDP in the years 1988-1990. For this reason, the distribution of the average pre-intervention levels of the control variables is much different between the treatment and the comparison group than the distribution of the pre-intervention growth-trends.

As a consequence PSM estimators that will include also control variables in terms of average pre-intervention levels will likely suffer from low common support, and weak statistical efficiency (low significance) and external validity. This is due to the small sample of regions for which the full set of growth-rates and average-levels control variables are balanced between the treatment and the comparison group.

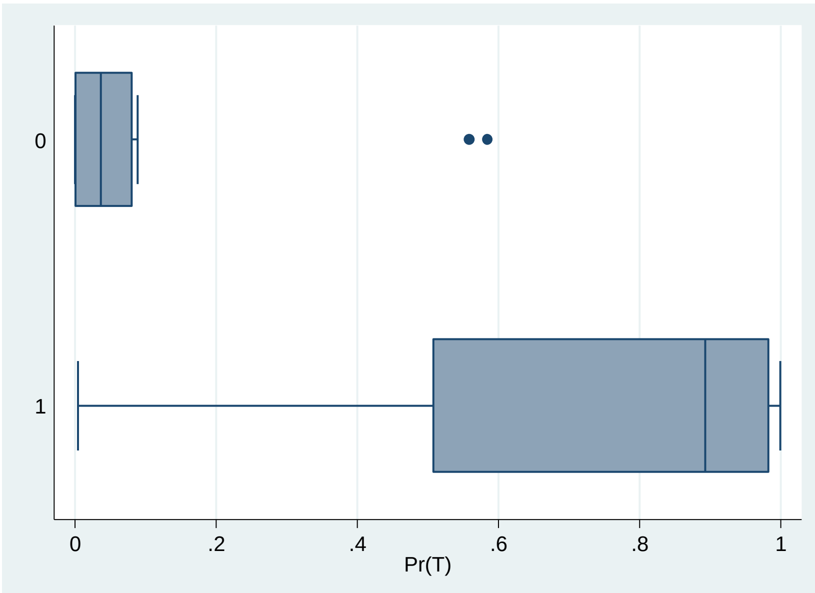
When the average-level of the control variables are used in the analysis, the unbalance between the treatment and the comparison group is not much mitigated even by restricting the focus solely on the regions close to the cut-off of the forcing variable Z (Figures 14-16). Thus, applying such restricted focus on the regions in the neighbourhood of the cut-off would yield the same (if not greater) weak statistical efficiency and external validity as in the case of PSM estimators implemented on the common support.

Figure 14 : Boxplots of the PS distributions based on Xgrw (Growth-trends controls). [Regions close to the cut-off of eligibility: Z within 1/4 SD away from the cut-off]



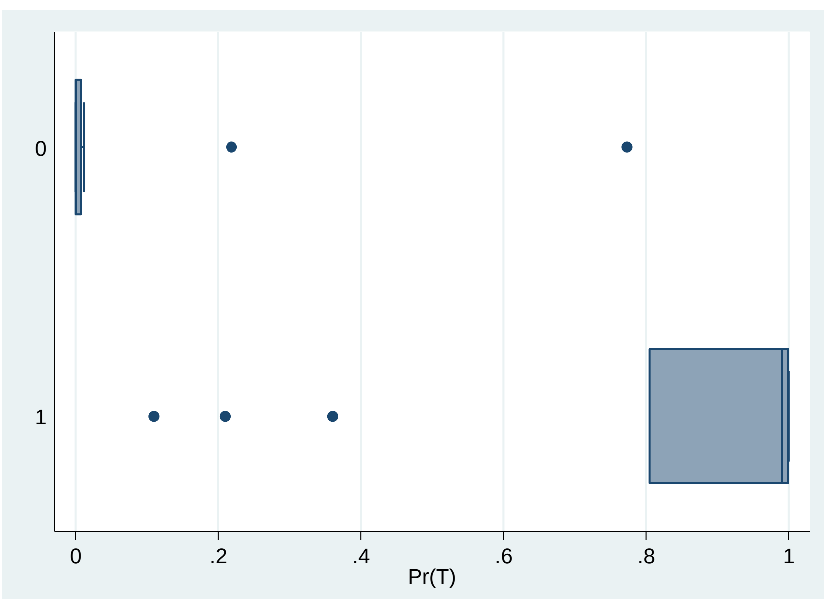
T=0 (above): comparison group
T=1 (below): treatment group

Figure 15 : Boxplots of the PS distributions based on three Xgrw (Growth-trend controls) and three Xlev (Average-level controls). [Regions close to the cut-off of eligibility: Z within 1/4 SD away from the cut-off]



T=0 (above): comparison group
T=1 (below): treatment group

Figure 16 : Boxplots of the PS distributions based on all Xgrw (Growth-trend controls) and Xlev (Average-level controls)



The set of boxplot figures reported above indicates the presence of a trade-off for the analysis: controlling for pre-intervention trends ensures higher efficiency, external validity and balancing of the growth-rate controls. If also average-levels of the region pre-intervention characteristics are to be controlled for, the available data do allow impact identification only for a very small number of regions on the common support (with low statistical efficiency and external validity).

6. Summary of the results (Task 1)

The main results from the analysis are reported in Tables 6-8, which contain the impact estimates of the PSM specifications that offer the best overall balancing of the pre-intervention covariates within each of the three different types of matching procedures used in the analysis: radius, nearest available with caliper and kernel. The complete set of results for all the estimated specifications are contained in the Technical Appendix.

Table 6 : Results from the PS Radius Matching estimators (preferred specifications with the best balancing of the control variables)

	Radius (0.01) Grw ctr (1)	Radius (0.01) 6 ctr (2)	Radius (0.15) All ctr (3)
ATT	0.829***	0.528	0.368
Balance (%bias)			
d_emprate	-5.5		-11.1
d_compens	-5.4	-20	20.5
d_grsfixcapt	-12.8	-3.3	14.4
d_GDP	-10	-37	8.1
d_labprod	-8.1		11.7
avg_emprate			8.4
avg_compens		12.2	-9.2
avg_grsfixcapt		-20.2	55.2
avg_GDP		-10.6	-10.3
avg_labprod			-31.7

The results from the PS radius matching estimator reported in Table 6 indicate that the additional intensity of the EUF associated with the Obj.1 eligibility[7] generated an average of +0.82 percentage points (p.p.) in the yearly growth rate of the per-capita GDP during the 1995-2006 period. Such additional growth-rate gain is estimated compared to the counterfactual yearly growth rate that would have occurred in the absence of the additional Obj.1 intensity of the EUF. The +0.82 (p.p.) estimated impact is obtained by estimating the counterfactual trend through the yearly GDP data from the non-Obj.1 regions that shared similar pre-intervention (1991-1994) growth trends (column 1 of Table 6) of the Obj.1 regions in terms of: employment rate (emplrate); worker compensation (wrk_compens), per–capita

[7] As mentioned before, such additional intensity corresponds to a per-capita overall value of EU funds greater than 1960 Euro. Further details on the distribution of the per-capita EU funds 1995-2006 expenditures between Obj.1 and non-Obj.1 regions can be found in Pellegrini et al. 2013.

GDP (GDP), gross fixed capital formation (gross_fxd_cap_form) and labour productivity (in terms of GDP per-worker: lab_prod).

When the set of control variables used in the analysis includes instead both the growth trends and the average pre-intervention levels of three control varaibles [Column 2 of Table 6: worker compensation (wrk_compens), per–capita GDP (GDP), gross fixed capital formation (gross_fxd_cap_form)], the estimated impact (+0.53 p.p.) fails to reach statistical significance. As discussed in the previous sections, this is due to the smaller common support between the treatment and the comparison group that is encountered when also the average pre-intervention levels of the control variables are included in the analysis. The same small common support issues plagues also the estimates from the PS specification that includes the full set of growth-trends and average pre-intervention levels for all the control variables considered in the analysis [column 3 of Table 6: employment rate (emplrate); worker compensation (wrk_compens), per–capita GDP (GDP), gross fixed capital formation (gross_fxd_cap_form) and labour productivity (in terms of GDP per-worker: lab_prod)].

The results from the PS nearest available caliper matching (Table 7) and the Kernel matching (Table 8) follows a similar pattern to those from the PS radius matching. The specification (1) that controls for the pre-intervention growth-rate trends yields statistically significant impact estimates with magnitude close to the that of the radius matching: +1.01 p.p. for the nearest available matching (Table 7, column 1); + 0.90 p.p. for the Kernel matching (Gaussian smoothing function). For both the nearest available and the kernel matching estimators, similarly to the radius matching, the specifications that controls also for the pre-intervention average levels (in addition to the pre-intervention growth trends) yield impact estimates with no statistical significance: +0.40 and +0,41 p.p. for the nearest available matching estimator (Table 7, columns 2 and 3, respectively); +0.53 and +0.34 p.p. for the Gaussian Kernel matching estimator (Table 8, columns 2 and 3 respectively).

Table 7 : Results from the PS Nearest Available estimators with Caliper (preferred specifications)

Model	Nearest γ(0.01) Grw ctr (1)	Nearest γ (0.15) 6 ctr (2)	Nearest γ (0.15) All ctr (3)
ATT	1.018***	0.408	0.416
Balance (%bias)			
d_emprate	-2.9		-25.5
d_compens	-7.6	-26.4	22.7
d_grsfixcapt	-9.9	-9.4	44
d_GDP	-5.4	-36.4	25.9
d_labprod	-4.4		33
avg_emprate			12.3
avg_compens		14.3	-18.9
avg_grsfixcapt		-11.6	36.3
avg_GDP		4.4	-3.9
avg_labprod			-65.2

Table 8 : Results from the PS Kernel Matching estimators, Gaussian with bandwidth (preferred specifications)

Model	Kernel Gaus ϕ(0.01) Grw ctr (1)	Kernel Gaus ϕ(0.06) 6 ctr (2)	Kernel Gaus ϕ (0.15) All ctr (3)
ATT	0.901***	0.528	0.339
Balance (%bias)			
d_emprate	-3.6		-18
d_compens	-6.2	-18.9	21.9
d_grsfixcapt	-10.2	-1.1	20.3
d_GDP	-9.7	-37.7	10.8
d_labprod	-8.3		16.3
avg_emprate			10.5
avg_compens		13.9	-12.5
avg_grsfixcapt		-19.3	49
avg_GDP		-10.2	-12.6
avg_labprod			-40.3

7. Concluding remarks (Task 1)

The main goal of Task1 was to draw a comparison between RDD and PSM in estimating the impact of EUF on regional growth. This is done both through reviewing and comparing some theoretical properties of the two types of estimators and by replicating with PSM the dichotomous-treatment RDD analysis implemented in the literature (Pellegrini et al. 2013). The main findings of this study can be summarized as follows:

- RDD and PSM are both viable ways to implement regional-level CIEs of the EUF, however, because no true self-selection into applying occurred: RDD does not have the advantage of better controlling for unobservable regional characteristics;
- In order to decide which approach to use: it's crucial to assess how dominant is the forcing variable as a confounding factor that captures all major risk-factors for selection bias and how large is sample of regions near the cut-off point of the forcing variable. If the forcing variable is non-dominant and the sample size is small, RDD may fail to ensure proper balancing of the relevant control variables (in the same way as randomized experiments may fail to ensure proper balancing of all relevant confounding factors with small samples). In such circumstance, statistical matching between regions above and below the cut-off point of the forcing variable can be seen as conceptually similar to a block randomization design (with regard to the relevant control variables) to ensure proper balancing in the presence of small samples of regions;
- If little common support is found for certain controls: both the external validity and the statistical efficiency of the estimates will suffer. The ultimate decisions on the types and number of control variables to be used in the analysis should be based on specific knowledge about factors that have been linked to future regional growth;
- The results from the present PSM analyses show that the EUF, in the 1995-2006 period, spurred additional growth in the amount of 0.8-1 p.p. These results are estimated under the assumption that important confounding factors to be controlled for are the pre-intervention growth-rate trends of the control variables;
- If instead also the pre-intervention average levels of the control variables are included in the Propensity Score estimation, the impact of the EUF on the regional GDP growth is somehow lower (0.3-0.5 pp) and the impact estimates fail to reach statistical significance because of a very small common support between the treatment and the comparison group.

PART II

8. Data (Tasks 2-3)

The sources of the data used in the analysis are as follows:

8.1 Outcome variables (Y)

The EU27 GDP data used in the analysis[8] were obtained by DG-Regio for the 2000-2011 period and from Cambridge Econometrics for the years 1989-1999. The EU27 1989-2011 employment rate and gross fixed capital formation data used in the analysis were drown from Cambridge Econometrics. At the time of the analysis, no NUTS2-level reliable data were available for the years past 2011. For this reason, in agreement with DG-Regio, the observation period covered by the analysis spans from 1994 to 2011, for the outcome variables, and from 1994 to 2010 for the EU Fund (EUF) payments.

8.2 EU Funds (EUF) per-capita intensities

In agreement with DG-Regio, the different per-capita intensity of the EUF over the programming periods 1994-2013[9] has been operationalized based on the EU fund payment data provided by DG-Regio with details for each operational programme and each year of payment from 1976 to 2015. Such EU fund payment information data has been apportioned into NUTS2 regions using the percentage of EU fund allocation found in the EPSON database (for the 1994-1999 period) and in the EU fund database produced by WIIW and Ismeri Europa[10].

The EUF included in the data are: CF (Cohesion Fund), EAGGF (Agricultural Fund), ENPI (European Neighbourhood and Partnership Instrument), ERDF (European Regional Development Fund), ESF (European Social Fund), FIFG (, IPA (Instrument of Pre-Accession Assistance), ISPA (Instrument for Structural Policies for Pre-Accession)[11].

[8] In agreement with DG-Regio, to ensure a better internal consistence of the temporal series of data across the different sources, the GDP figures used in the analysis are in terms of GVA.
[9] The period 2007-2013 has been considered up to the year 2010 because of the above-mentioned data availability limitation.
[10] Geography of Expenditure, Ex post evaluation of Cohesion Policy programmes 2007-2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF). Contract: 2014CE16BAT067. WIIW and Ismeri Europa, Final Report July 2015.
[11] For Bulgaria and Romania, 2000-06 pre-accession funds cannot be apportioned at the NUTS 2 level. For this reason BG and RO NUTS2 are excluded from the analysis in the 2000-06 period.

8.3 Control variables (X)

For Tasks 2 and 3, the control variables used in the analysis to ensure good balancing between the NUTS2 regions pertaining to different groups of EU fund per-capita intensities were operationalized as follows:

1994-99 period

-average annual % growth of per-capita GVA (years 1992-94)

-average annual change of employment rate (years 1992-94)

-average annual % change of per-capita gross fixed capital formation (years 1992-94)

-percentage of employment in agriculture (year 1994)

-percentage of employment in manufacturing, energy and construction (year 1994)

-percentage of population 25-64 with high education (year 1994)[12].

2000-06 period

-average annual % growth of per-capita GVA (years 1997-00)

-average annual change of employment rate (years 1997-00)

-average annual % change of per-capita gross fixed capital formation (years 1997-00)

-percentage of employment in agriculture (year 2000)

-percentage of employment in manufacturing, energy and construction (year 2000)

-percentage of population 25-64 with high education (year 2000).

2007-13 period[13]

-average annual % growth of per-capita GVA (years 2004-07)

-average annual change of employment rate (years 2004-07)

-average annual % change of per-capita gross fixed capital formation (years 2004-07)

-percentage of employment in agriculture (year 2007)

-percentage of employment in manufacturing, energy and construction (year 2007)

-percentage of population 25-64 with high education (year 2007).

[12] Data for the year 1994 is estimated based on extrapolation of the 2000-2011 trend from the Eurostat.
[13] Because the outcome variables data for the analysis are available only up to the year 2011, the EU fund payments from the 2007-13 period can be used in the analysis only for the actual 2007-2010 period.

Aggregate impact estimates for the whole 1994-10 period

-average annual % growth of per-capita GVA (years 1992-94)

-average annual change of employment rate (years 1992-94)

-average annual % change of per-capita gross fixed capital formation (years 1992-94)

-percentage of employment in agriculture (average level for the year s1992-94)

-percentage of employment in manufacturing, energy and construction (average level for the years 1992-94)

-percentage of population 25-64 with high education (average level for the year s1992-94)

In the sensitivity analysis some alternative specifications of the models also included as control variables the average levels of GVA, GFCF and employment rate, recorded in the three years before the beginning of the programming period (and in the years 1992-94 in the analyses pertaining the whole undivided 1994-2010 period.

9. Caveats and limitations of the data (Tasks 2-3)

The data available to the analysis pose the following limitations:

- The EU Fund payments information for the three programming periods were provided by a coherent and reliable DG-Regio internal database that contains, sorted by year and county, a record for each payment occurred from 1975 to 2015. The NUTS 2 allocation of these Funds, within each member state, had to be estimated based on the percentage allocation of the Funds computed for different sources of the data. For the ESF and the EAGGF, the NUTS 2 apportioning for the periods 2000-06 and 2007-13 was performed based on the share of the total population and the share of agricultural employment.
- The year in which the EU Fund payments are recoded in the DG-Regio database is an administrative record and often it does not indicate the period in which the corresponding investment projected was actually completed. In order to account for such potentially relevant temporal mismatches, in agreement with DG-Regio we used the following rule to apportion the payments to the different periods:
    - the payments of the 1994-99 period were allocated to the same period if they had a date from 1994 to 2000 while they were allocated to the 2000-06 period if they had a date from 2001 to 2006;
    - the payments of the 2000-06 period were allocated to the same period if they had a date from 2000 to 2006 while they were allocated to the 2007-10 period if they had a date from 2007 to 2010;
    - the payments of the 2007-10 period were allocated to the same period if they had a date from 2007 to 2010.
- In order to test the sensitivity of the results to such operationalization rules (which entail a certain degree of model dependence in the results), we replicated our estimates with a model in which the whole 1994-2010 period was considered for the analysis , without breaking down the estimates by the single programing periods.

- The payment information on the EUF does not include the specific information on the different types of programme interventions and/or investment projects implemented by each member-state over the three programming periods examined here. In other words, for example, it is not possible to identify how much funding in each region went, for example, to business support as opposed to environmental or social infrastructure. The exact timing of the specific project implementations is also unknown. In addition, no comprehensive information were available on the intensities of the public aids from national and regional sources that may affect the NUTS-2 growth outcomes, together with the EUF.

All of the above limitations do not enable our empirical evidence to further investigate other important conditions under which the different intensities of the EUF produce desirable regional growth outcomes. These conditions are, for example, the different compositions and scopes of the actual programme interventions, the duration of the project implementations (which may affect the temporal lag needed to observe the regional growth outcomes), and the intensities of the national or regional sources of public aids that may affect the regional growth outcomes in conjunction with the EUF.

In order to remove such limitation, a much-improved data availability scenario is needed. In this regard, it can be recommended to make steps toward the possibility of linking the currently available database on the EUF payments with the detailed information on the single programmes submitted by the member-states (in terms of: scope and nature of the project;

exact geographic location, amounts of national/regional co-funding). Additional information, beyond the year 2011, is also needed for a more robust empirical analysis of the last programming period (2007-2013), where the heterogeneity across regions is higher, due to the presence of new Member States and the largest economic crisis in Europe since WWII was in action.

The empirical findings for this programming period will have to be confirmed when the complete data become available.

10. Sample sizes and descriptive statistics (Tasks 2-3)

10.1 Descriptive statistics on the value of the EU Funds (EUF) across the three programming periods 1994-99; 2000-06; 2007-13 (EU27)

The total value and per-capita value of the aggregate of the EU Funds (EUF) considered in the analysis, apportioned by country and by programming period, are illustrated in Table 9 and 10 , respectively.

Table 9 : Total EU Funds (1=1 Million €) by country and by period

Country	F_tot94_99	F_tot00_06	F_tot07_13**
AT	712	1484	2748
BE	1077	1432	1386
BG*	-	-	1912
CY	-	29	268
CZ	-	1030	7969
DE	16919	24546	17193
DK	218	515	520
EE	-	355	1787
ES	36506	47746	21996
FI	899	1623	1884
FR	6576	9784	9748
GR	15698	15424	16126
HU	-	1500	8008
IE	6958	3904	1983
IT	15138	22750	16079
LT	-	600	3918
LU	18	64	82
LV	-	481	2201
MT	-	28	220
NL	834	1680	1575
PL	-	4563	27486
PT	17494	18452	11677
RO*	-	-	4960
SE	510	1811	1605
SI	-	211	1622
SK	-	711	4091
UK	7197	12548	8816

* The 2000-06 pre-accession funds to Bulgaria and Romania are excluded from the analysis because of lack of reliable and consistent information on the NUTS 2 level apportioning.
** Data for the 2007-13 period are capped at the year 2010.

Table 10 : Total per-capita EU Funds (1=1 € / per capita) by country and by Programming period

Country	F_tot94_99 _percap	F_tot00_06 _percap	F_tot07_13* _percap
AT	90	185	331
BE	106	140	130
BG	-	-	250
CY	-	41	349
CZ	-	100	772
DE	208	299	209
DK	42	96	95
EE	-	258	1331
ES	929	1186	490
FI	177	313	356
FR	114	166	157
GR	1488	1413	1445
HU	-	147	796
IE	1949	1026	451
IT	266	400	271
LT	-	171	1213
LU	45	147	171
LV	-	203	1000
MT	-	72	540
NL	54	105	96
PL	-	119	721
PT	1750	1804	1101
RO	-	-	238
SE	58	204	175
SI	-	106	803
SK	-	132	758
UK	124	213	145

* Data for the 2007-13 period are capped at the year 2010.

In order to better compare the intensities of the EUF across the different periods, Table 11 highlights the average annual per-capita intensity of the EUF payments received by each member State.

Table 11 : Average annual per-capita EU Funds (1=1 € / per capita / per year) by country and by Programming period

Country	F_ann94_99 _percap	F_ann00_06 _percap	F_ann07_13* _percap
AT	15	26	83
BE	18	20	33
BG	-	-	62
CY	-	6	87
CZ	-	14	193
DE	35	43	52
DK	7	14	24
EE	-	37	333
ES	155	169	123
FI	29	45	89
FR	19	24	39
GR	248	202	361
HU	-	21	199
IE	325	147	113
IT	44	57	68
LT	-	24	303
LU	7	21	43
LV	-	29	250
MT	-	10	135
NL	9	15	24
PL	-	17	180
PT	292	258	275
RO	-	-	59
SE	10	29	44
SI	-	15	201
SK	-	19	190
UK	21	30	36

** Data for the 2007-13 period are capped at the year 2010.

Table 12 contains the information on the pooled distribution of the average annual per-capita value of the total EU funds received by each NUTS2 region in the three different programming periods.

The total number of NUTS available to the analysis varies across the three programming periods, as a consequence of the annexation of the new EU member states : 204 NUTS2 for the 1994-99 period; 245 NUTS2 for the 2000-06 period and 259 NUTS2 for the 2007-13 period. The pooled total number of NUTS2 used in the analysis is 708.

Table 12 : Pooled distribution of the NUTS2 annual per-capita EU Fund intensities in the three programming periods (1=1€ / per capita / per year)

Total n. NUTS2		708
n. NUTS2 in 1994-99	204	
n. NUTS2 in 2000-06	245	
n. NUTS2 in 2007-13	259	
Mean	85.21€	
Std. Dev.	112.72€	
Smallest	0.89€	
1%	3.05€	
5%	6.47€	
10%	11.88€	
25%	19.99€	
Median	35.19€	
75%	112.50€	
90%	226.13€	
95%	302.02€	
99%	541.79€	
Largest	824.88€	

The 25%, 50%, and the75% thresholds of the distribution of Table 12 are used as cut-off points to identify 4 categories of the per-capital intensity of the EUF:

- I Quartile (low intensity) = Avg. annual per-capita EUF in the period below 19.99€
- II Quartile (medium-low intensity) = Avg. annual per-capita EUF in the period between 19.99€ and 35.19€
- III Quartile (medium-high intensity) = Avg. annual per-capita EUF in the period between 35.19€ and 112.50€
- IV Quartile (high intensity) = Avg. annual per-capita EUF in the period above 112.50€

These 4 categories are used in the Propensity Score Matching analysis for estimating the impact of multiple categorical treatment intensities. Because of sample size limitations, impact estimates based on larger number of discrete intensities of the EUF are not sustainable and cannot be used in the analysis.

Table 13, finally, describes the total sum of the EUF received in the whole period 1994-2010 by each of the 259 NUTS2 regions within the EU27 countries. For the EU15 countries these figures summarize the EUF payments available in all 1994-2010 years. For the late member state countries, instead, the figures of Table 10 highlight the EUF payment received in the years in which they were part of the EU.

Table 13 : Total sum of EU Funds received by NUTS2 regions over the whole 1994-2010 period

country	F_tot94_10 (1=1 Million €)	F_tot94_10pc (1=1€ per capita)	n_nuts2
AT	4945	623	9
BE	3895	385	11
BG	1912	226	6
CY	296	464	1
CZ	8999	871	8
DE	58658	720	38
DK	1253	241	1
EE	2142	1450	1
ES	106248	2704	18
FI	4406	866	5
FR	26108	453	22
GR	47248	4477	13
HU	9509	919	7
IE	12846	3597	2
IT	53968	949	20
LT	4518	1235	1
LU	165	408	1
LV	2682	1064	1
MT	248	660	1
NL	4088	266	12
PL	32049	838	16
PT	47623	4763	7
RO	4960	218	8
SE	3926	447	8
SI	1833	921	1
SK	4802	898	4
UK	28561	494	37

10.2 EU Funds (EUF) in the EU-27 regions sorted by Objective1/Convergence Obj. status (years 1994-2010)

Table 14 reports the average annual per-capita intensity of the EU Funds sorted by programming period and by Obj.1/Convergence Obj versus Non-Obj1/Non-Convergence Obj areas.

Table 14 : Average intensity of the EU Funds (EUF) by Obj.1/Convergence Obj status

	EU Funds 1994-99* (1= 1€ annual per-capita)	EU Funds 2000-06** (1= 1€ annual per-capita)	EU Funds 2007-13*** (1= 1€ annual per-capita)
Non- Obj1/Non-conv. Obj.	19	33	50
Obj1/conv. Obj	181	168	178
* EU15 considerd			
**EU15 considered			
*** EU27 considered. Funds accounted for In the analysis up to the year 2010			

Table 15 reports the number of NUTS2 regions(sorted by Obj.1/Convergence Obj. status) included in each of the four categories of the annual per-capita intensities of the EUF defined by the quartiles of the aggregate distribution of Table 12.

Table 15 : NUTS2 regions sorted by categories of intensities of the EU Funds (EUF)

	EU Fund Intensity			
	I category (1st quartile 20€<=annual per-capita)	II category (2nd quartile 20<annual per-capita<=35€)	III category (3rd quartile 35<annual per-capita<=112€)	IV category (4th quartile 112<annual per-capita)
1994-99 (EU15)				
N. of Non-Obj1	100	32	16	2
N. of Obj1	0	0	8	46
2000-06 (EU15)				
N. of Non-conv. Obj.	39	75	35	6
N. of Conv. Obj	0	0	12	37
2007-13 (EU 27)				
N. of Non-conv. Obj.	9	59	90	22
N. of Conv. Obj	0	0	15	64

10.3 Descriptive statistics on the outcome variables of the analysis: GVA, gross-fixed capital formation and employment rate

Tables 16-18 summarizes the descriptive statistics for the three outcomes of the analysis: average annual growth of per-capita GVA; average annual growth of per-capita gross fixed capital formation (GFCF) and average annual change of employment rate.

Such descriptive statistics are sorted by programming period (1994-99 in Table 16; 2000-06 in Table 17 and 2007-13 in Table 18) and by categories of EUF intensities (defined in terms of total average annual per-capita value of all EUF received by the NUTS2 regions over the programming period). The four categories of EUF intensities are those defined by the 25%, 50%, and the75% thresholds of the aggregate distribution over the three periods combined (cat. I below 19.99€ annual per-capita EUF; cat. II between 19.99€ and 35.19€; cat. III between 35.19€ and 112.50€; cat. IV above 112.50€).

Due to data availability limitations, as previously mentioned, the figures for the 2007-13 period include EUF up to the year 2010 and GVA, GFCF and employment rate outcomes up to the year 2011.

The GVA, GFCF and employment rate outcomes are attributed to each programming period with following temporal gaps:

- the years 1996-2001 are considered for the 1994-99 period;
- the years 2002-2008 are considered for the 2000-06 period;
- the years 2009-2011 are considered for the 2007-13 period.

Such temporal gaps are established for two reasons: I) to allow enough time after the formal conclusion of the programming period for a full completion of all subsidized projects: II) to allow enough time for the possible impacts to occur after the conclusion of the interventions.

In order to test how sensible the results are to changes of such temporal gap options, we also estimate a model in which the whole 1994-2010 period is considered both in terms of the EUF allocations and GVA, GFCF and employment rate outcomes.

Table 16 : Annual average changes of GVA, gross fixed capital formation and employment rate by categories of EU Fund (EUF) intensities. Programming period 1994-99

Category of EU-Fund intensity	Number of NUTS2 regions	Mean EUF Intensity (1=1€ /per capita /per year)	Median EUF Intensity (1=1€ /per capita /per year)	GVA per-capita annual avg. growth (1= 1 %)	Gross Fixed Capital Formation per-capita annual avg. growth (1= 1 %)	Empl. Rate annual avg. change (1=1 p.p.)
I	100	10	9	2.38%	2.96%	0.46
II	32	25	25	2.19%	3.10%	0.26
III	24	67	66	2.74%	6.62%	0.69
IV	48	254	220	2.72%	5.35%	0.53

Table 17 : Annual average changes of GVA, gross fixed capital formation and employment rate by categories of EU Fund (EUF) intensities. Programming period 2000-06

Category of EU-Fund intensity	Number of NUTS2 regions	Mean of EU-Fund Intensity (1=1€ /per capita /per year)	Median of EU-Fund Intensity (1=1€ /per capita /per year)	GVA per-capita annual avg. growth (1= 1 %)	Gross Fixed Capital Formation per-capita annual avg. growth (1= 1 %)	Empl. Rate annual avg. change (1=1 p.p.)
I	68	15	15	3.05%	4.44%	0.21
II	86	27	27	1.81%	1.71%	0.21
III	48	63	49	1.90%	1.62%	0.29
IV	43	223	218	1.79%	2.84%	0.34

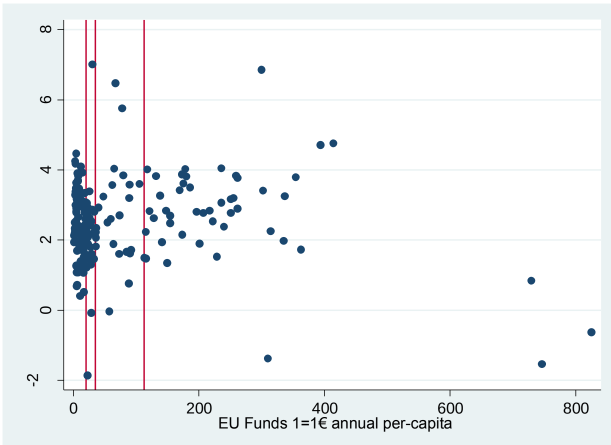
Table 18 : Annual average changes of GVA, Gross fixed capital formation and Employment rate by categories of EU Fund intensities. Programming period 2007-13(*)

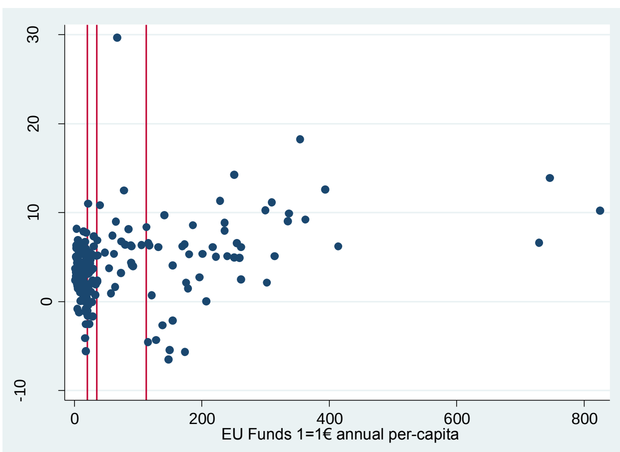
Category of EU-Fund intensity	Number of NUTS2 regions	Mean of EU-Fund Intensity (1=1€ /per capita /per year)	Median of EU-Fund Intensity (1=1€ /per capita /per year)	GVA per-capita annual avg. growth (1= 1 %)	Gross Fixed Capital Formation per-capita annual avg. growth (1= 1 %)	Empl. Rate annual avg. change (1=1 p.p.)
I	9	18	19	-0.42%	-1.84%	-0.32
II	59	28	28	-0.33%	-1.99%	-0.20
III	105	60	52	-0.36%	-4.28%	-0.37
IV	86	240	191	-0.82%	-5.57%	-0.71

(*) GVA, Gross fixed capital formation (GFCF) and employment rate outcomes are available consistently (for all NUTS2 regions) only until the year 2011. For this reason, the programming period 2007-13 is considered only up the year 2010 for the EU Fund payments and up to the year 2011 for the GVA, GFCF and employment rate variables.

In the following Figures 17-19, separately for each programming period and for each outcome variable, we plot the average annual amount of per-capita EUF received by each NUTS2 region against the average yearly change of the outcome variables GVA, GFCF and Employment rate.

Figure 17: Avg. annual amount of per-capita EUF plotted against the avg. annual growth rate of per-capita GVA, GFCF, and annual change of employment rate. Programming period 1994-99





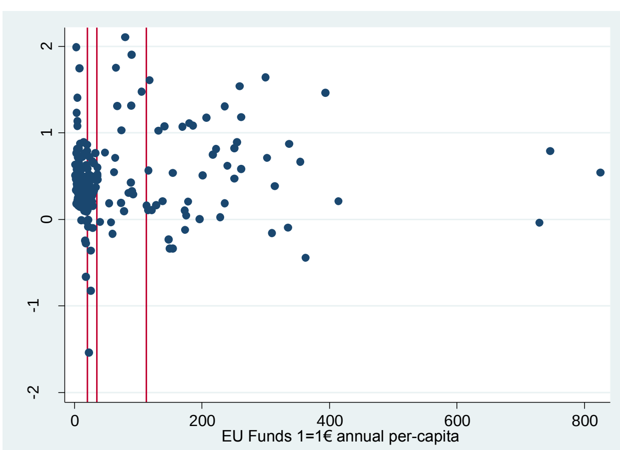
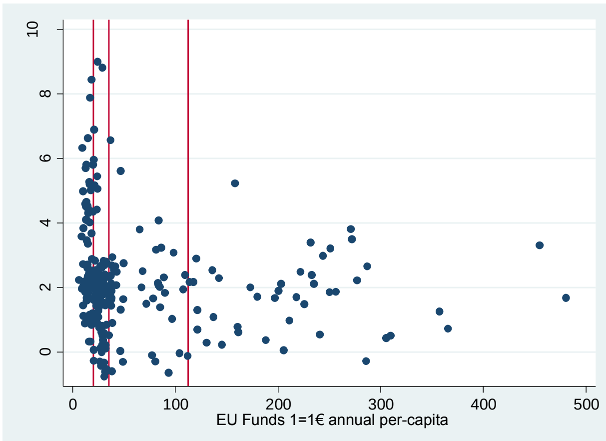
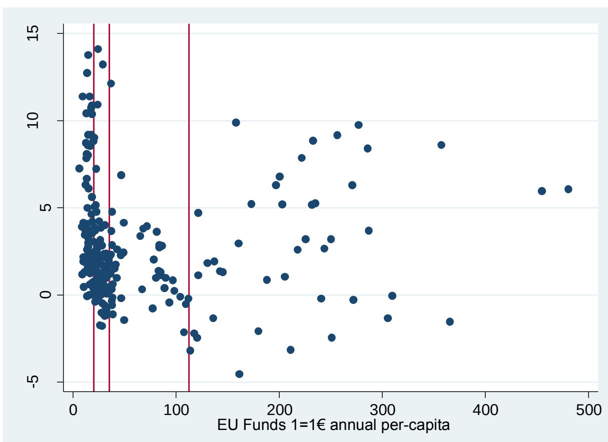


Figure 18 : Avg. annual amount of per-capita EUF plotted against the avg. annual growth rate of per-capita GVA, GFCF, and annual change of employment rate. Programming period 2000-06





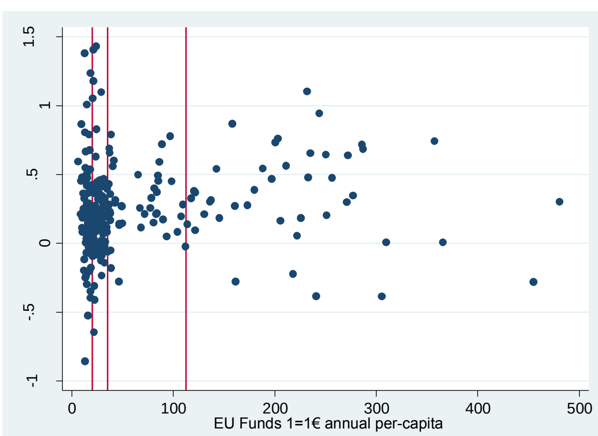
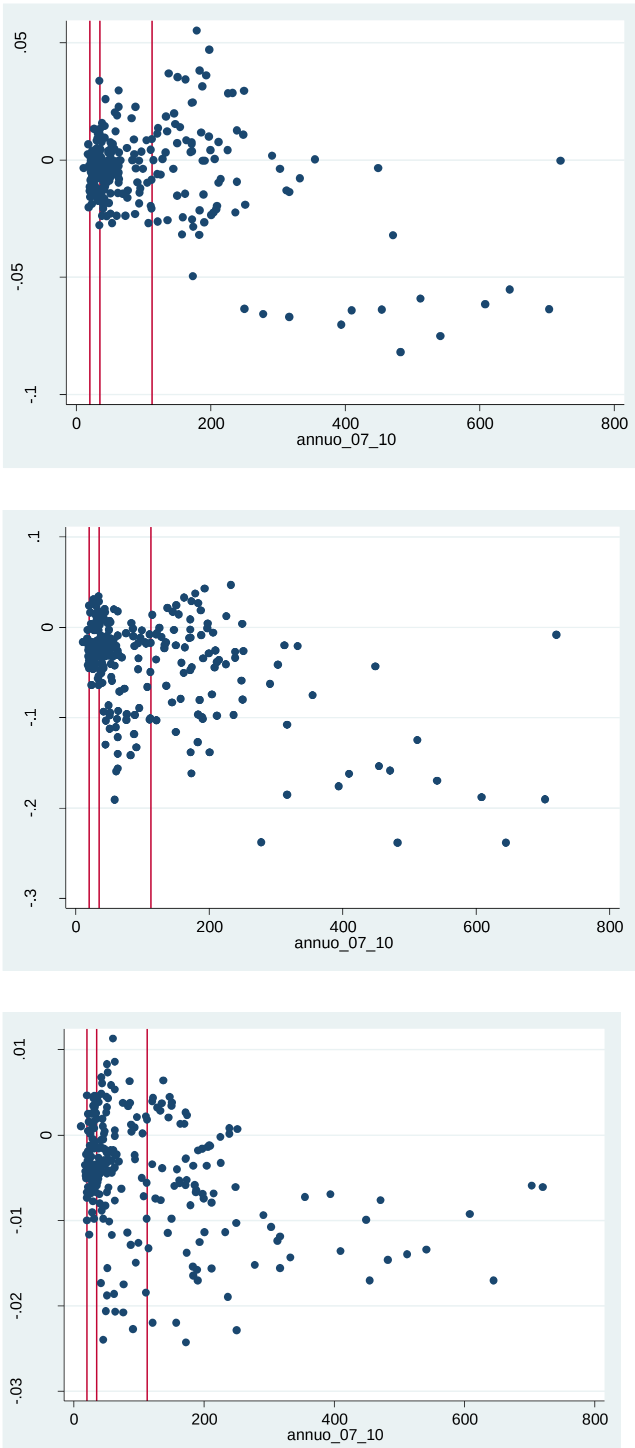


Figure 19 : Avg. annual amount of per-capita EUF plotted against the avg. annual growth rate of per-capita GVA, GFCF, and annual change of employment rate. Programming period 2007-13(*)



(*) Due to data constraints, 2007-13 EUF are capped at the year 2011

Table 19, finally, describes the average annual regional growth of per-capita GVA and GFCF and the average annual change of employment rate sorted by Obj.1/Conv. Obj status.

Table 19 : Average annual growth by Obj.1/Conv. Obj status

	N. Nuts2	GVA[1]	GFCF[1]	Employment rate[2]
1994-99 (EU15)[3]				
Non- Obj1/Non-conv. Obj.	150	2.40%	3.46%	0.47 p.p.
Obj1/conv. Obj	54	2.66%	5.39%	0.46 p.p.
2000-06 (EU15)[3]				
Non- Obj1/Non-conv. Obj.	155	1.56%	1.51%	0.19 p.p.
Obj1/conv. Obj	49	1.83%	2.50%	0.33 p.p.
2007-13 (EU 27)[3]				
Non- Obj1/Non-conv. Obj.	180	-0.57%	-3.28%	-0.39 p.p.
Obj1/conv. Obj	79	-0.36%	-5.98%	-0.55 p.p.

1 Avg. annual growth rate (1=1%)
2 Avg. annual change (1=1 percentage point)
3 Growth outcomes are measured with two-year gaps: 1996-01 for the first period, 2002-2008 for the second; 2009-2011 for the third.

11. Dynamic Propensity Score Matching (PSM) models for estimating the average impacts of the highest intensity of the EU Funds (EUF) in the Objective 1/Convergence Obj. regions

For the EU-27 regions and the 1994-2013 periods, the estimates of the average impacts of the additional EU Funds (EUF) allocated to the Objective 1/ Convergence Obj. regions have been obtained from dynamic specifications of the following Propensity Score Matching (PSM) models:

- Radius Matching;
- Nearest Available Caliper Matching;
- Kernel Matching.

These dynamic model specifications entails producing local Average Treatment on the treated (ATTs) estimates based on each period programming period. Global impact estimates are then obtained as weighted average of the local ATTs, with weights proportional to the number of treated Nut2 regions within the common support in each period.

Details on the exact composition of the variables used in the model are summarized in Table 20.

Table 20 : Variable specifications of the Dynamic PSM model with binary treatment intensity (EU-27 regions, 1994-2013 periods)

Dynamic PSM with binary treatment intensity (run separately in the three periods)

Outcome data:

- Avg. annual % growth of GVA; GFCF; avg. annual change of Employment rate
- I period: EU15 data (204 NUTS2) outcomes measured in (1996-2001)
- II period: EU25 data (245 NUTS2) outcomes measured in (2002-2008)
- III period: EU27 data (259 NUTS2) outcomes measured in (2009-2011)

Treatment intensity:

- Binary status: average highest EUF intensity allocated in the Obj.1/Conv. Obj. regions vs. lowest EUF intensity of non-Obj.1/non-Conv. Obj. regions

Control variables:

- average annual growth (measured in the following years before the beginning of each period: I period 1992-94; II period 1997-00, III period 2004-07) of: GVA, GFCF, Employment rate
- percentage of employment (recorded at the beginning of each period: I period 1994 II period 2000; III period 2007) in: agriculture; manufacturing, energy and construction; other sectors
- percentage of population 25-64 with high education (recorded at the beginning of each period: I period 1994 II period 2000; III period 2007)

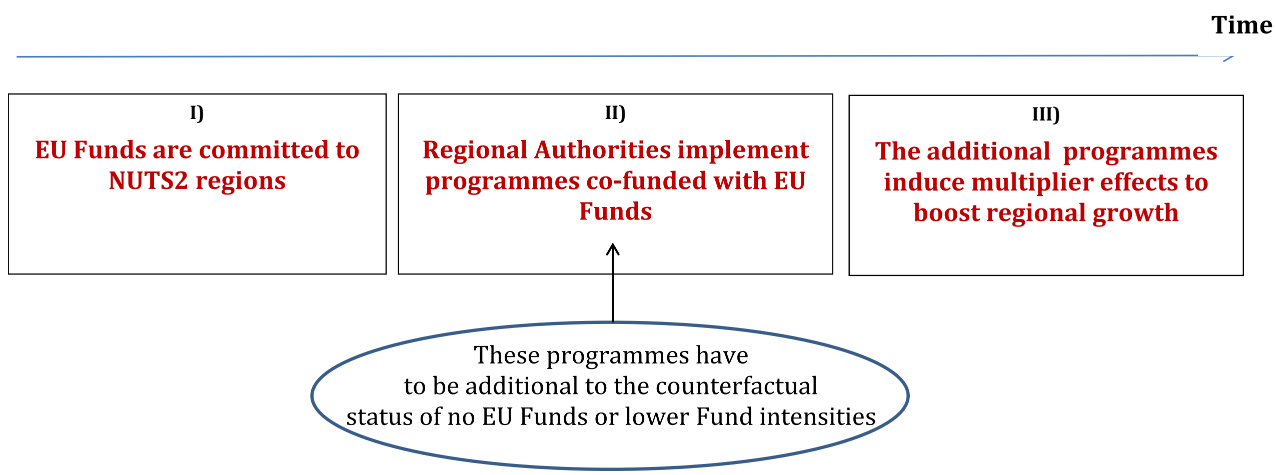
Local ATTs are estimated separately for each period. Global impact estimates obtained as weighted average of the local ATTs with weights proportional to the number of treated Nut2 regions within the common support in each period.

Total number of Units of observation: 204 for I period; 245 for II period; 259 for III period

12. Generalised Propensity Score (GPS) and Propensity Score Matching (PSM) models for estimating the impact of continuous and multiple categorical treatment intensities

The choice of the statistical matching models to estimate the impacts of the continuous and multiple categorical treatment intensities stems from considering the causality chain, from EU funds (EUF) to desirable regional growth outcomes, illustrated in Figure 20.

Figure 20 : Causality chain, from EU funds to desirable regional growth outcomes

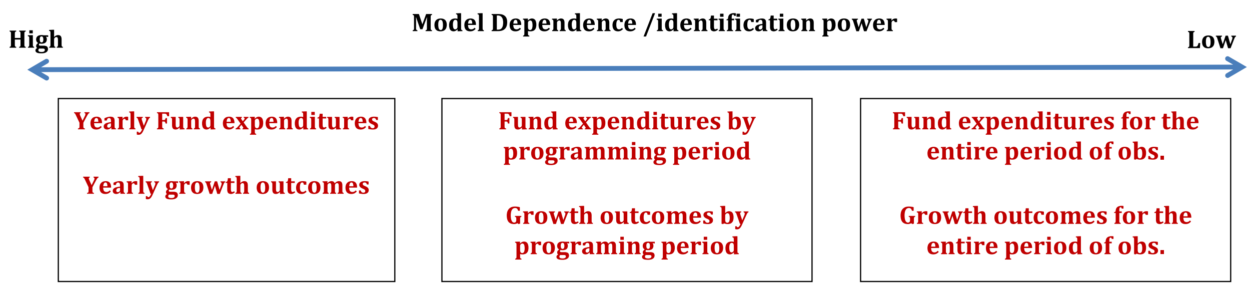


In order to achieve positive boosting effects on regional growth, the EUF have to be able to induce the implementation of additional programmes by the Regional Authorities, compared to the counterfactual status of no-EUF. Such additional programmes may be able to induce positive multiplier effects to further boost regional growth.

Thus, a certain degree of temporal lag may exist before the possible multiplier effects and spill-over effect of the EUF take place. For this reason, the regional growth of the first years of a certain programming period may be affected by the EUF of the previous period.. If the regional growth outcomes of a given programming period are wrongly assumed to be affected only by the EUF intensity of the same period, measurement error consequences would not be negligible. For example, in all cases of diminishing support (e.g. transition from Obj.1 –phasing out –no Obj.1 /Converge obj.) this could lead to overestimating the impact of low EUF intensity and underestimating the impact of high EUF intensity.

These measurement error consequences may be serious and they lead to considering a trade-off in designing the statistical matching strategy for estimating the impact of the varying per-capita EUF intensities. Such trade-off involves the degree of model dependence in the estimates and the possibility of exploiting temporal variation of EUF to identify the impact estimates (Figure 21)

Figure 21 : Trade-off between model dependence and impact identification power

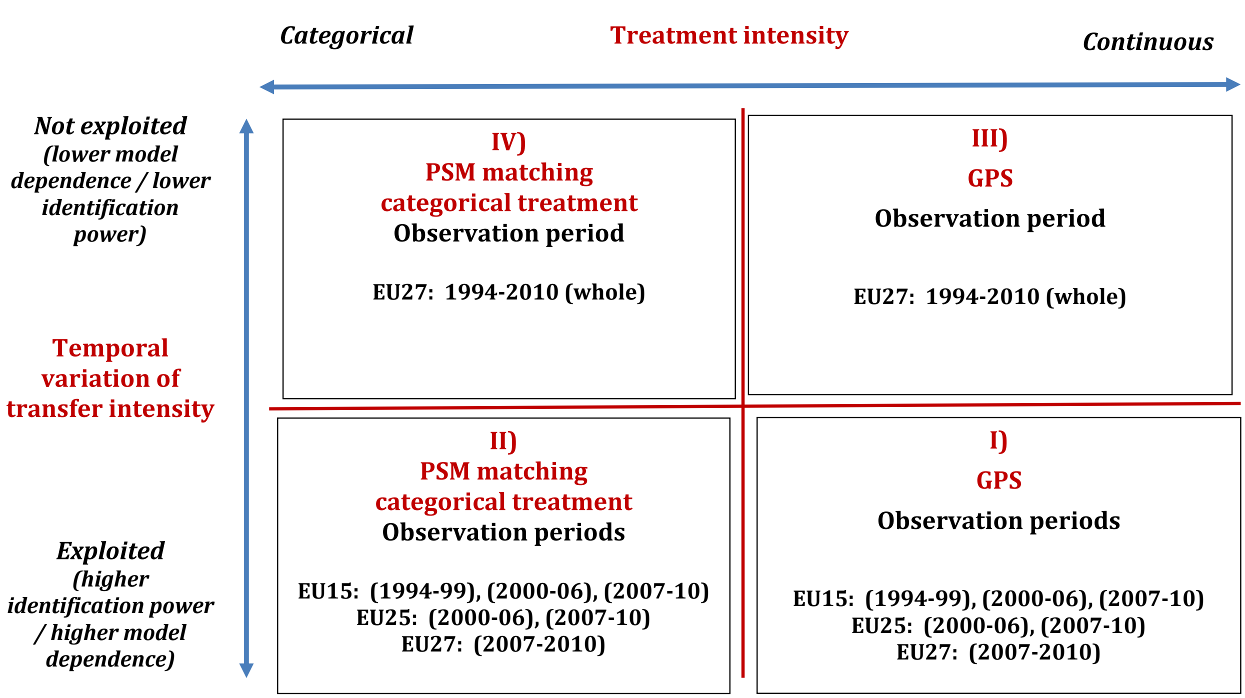


In light of the trade-off illustrated in Figure 21, two possible options are available for the analyses of the Tasks 2 and 3:

I) Exploit the variation of the EUF intensity between the different programming periods. Such choice implies a moderate degree of model dependence but it allows the analysis to exploit the temporal variations of the EUF across the different programming periods.
II) Exploit only the cross-sectional variation of the EUF intensities by using data aggregated over the entire (1994-2010) period of observation for the analysis. Such choice implies the lowest degree of model dependence at the expense of a much reduced variation of the EUF intensities (with a resulting low impact identification power).

Based on these two options and on the possibility of operationalizing the variation of the EUF intensities in a discrete or continuous way, the following empirical strategies can be used for estimating the impacts of the varying EUF intensities (Figure 22).

Figure 22 : Statistical matching models for estimating the impacts of the varying EUF intensities



In agreement with DG-Regio, the analyses of Tasks 2 and 3 were implemented using as first option the statistical matching models I) and II) of the lower half of Figure 22: those that do exploit the temporal variation (across the three different programming periods) of the EUF intensities. This is because the moderate model dependence involved with the need to operationalize the temporal lag between the times in which the EUF payments are recorded and the times in which the regional growth outcomes are recorded can be effectively handled in the following way:

-the regional growth outcomes, in terms of GVA, employment rate and gross fixed capital formation are recorded with a temporal lag of two years following the end of each programming period. Thus, for the EUF payments pertaining to the programming period 1994-99, the regional growth outcomes were measured over the 1996-2001 period. For the EUF payments of 2000-06, the growth outcomes were measured over the 2002-2008 period, while for the EUF payments of 2007-13, the growth outcomes were measured over the 2009-2011 period.

As sensitivity analysis, however, we implemented also the models III) and IV) of the upper part of Figure 22. These models do not exploit the temporal variation (across the three different programming periods) of the EU-fund intensities. However they pose the following advantages:

- No assumptions are required to apportion the EUF to the different periods, no model dependence is deriving by having to choose a certain temporal lag between the Fund payments and the effects produced by the actual underlying investment projects on the regional economies of the NUTS 2 regions.
- For the NUTS 2 regions outside the EU15 Countries, the lack of EUF in the early periods is exogenous to their specific economic trends. With the models I) and II) such source of exogenous treatment exclusions cannot be exploited because, within each period, only the NUTS 2 regions with positive EUF intensities are included. In the models III) and IV), instead, such source of exogenous treatment exclusion can be exploited. This is because for each region of the EU27 countries, the models III) and IV) take into consideration the aggregate volume of EU funds over the entire undivided 1994-2010 period. In this way, the model estimates whether or not the NUTS2 regions with high overall intensities of EUF performed better, over the entire 1994-2010 period than the NUTS 2 with low intensities but similar initial (pre-1994) local economic and high educational attainments.

Based on the above-considerations the statistical matching models used for the analyses of Tasks 2 and 3 were the following:

- **(Models I)** A set of GPS specifications, implemented on pooled longitudinal data obtained by operationalizing separately the three periods 1994-99, 2000-06 and 2007-10
- **(Models II)** A set of dynamic Propensity Score Matching (PSM) models with four categorical treatment intensities. These PSM models yield local impact estimates (LATT) of the four different categories of treatment for each of the three periods. Such LATTs are then aggregate to yield the global impact estimates of interest. The different types of PSM specifications used in this part of the analysis are:
    - radius matching (with different radius calipers: 0.005; 0.01; 0.05; 0.1). The results are shown from the caliper specifications that best preserves the balancing of the control variables while maximizing the number of treated regions on common support.
    - nearest neighbour with caliper (0.005; 0.01; 0.05; 0.1). Also in this case, the results are shown from the caliper specifications that best preserves the balancing of the

control variables while maximizing the number of treated regions on common support.
  - Kernel matching (Epanechnikov with bandwidth =0.06).

- **(Models III)** A set of GPS specifications, implemented on aggregated cross-sectional data (EU27) covering the period whole 1994-2010. These models are aimed at estimating the impacts of the EUF on the average growth of GDP, GFCF and employment rate changes recorded over the entire period 1994-2010.
- **(Models IV)** A set of Propensity Score Matching (PSM) models estimated on the aggregated cross-sectional data (EU27) covering the period whole 1994-2010. Similarly to the Models II, the different types of PSM specifications used in this part of the analysis are:
  - radius matching (with different radius calipers: 0.005; 0.01; 0.05; 0.1). The results are shown from the caliper specifications that best preserves the balancing of the control variables while maximizing the number of treated regions on common support.
  - nearest neighbour with caliper (0.005; 0.01; 0.05; 0.1). Also in this case, the results are shown from the caliper specifications that best preserves the balancing of the control variables while maximizing the number of treated regions on common support.
  - Kernel matching (Epanechnikov with bandwidth =0.06).

Following is a more detailed and formal description of the basic common characteristics of the four sets of models (I-IV).

12.1 Generalized propensity score (GPS) matching (Models I, III)

The basic common characteristics of all GPS model used in the analysis can be summarized through the following steps:

I) Estimation of the determinants of the treatment intensities

$T|X \sim N(\beta_0 + X\beta_1, \sigma^2)$

II) Estimation of the GPS:

$$\widehat{GPS} = \frac{1}{\sqrt{2\Pi\hat{\sigma}^2}} \exp\left(-\frac{1}{2\hat{\sigma}^2}(T - \widehat{\beta_0} - X\widehat{\beta_1})^2\right)$$

III) Balance checking: control variables X has be balanced (no statistically-significant differences across different treatment intensities) once conditioned to the same $\widehat{GPS}$

$[X \perp 1\ (T=\tau)]\ |\ \widehat{GPS}$

IV) With NUTS 2 –level data (small sample size) the balancing of covariates is checked only at very coarsened intervals of the treatment intensities and blocks of GPS

V) Estimation of the conditional expectation of Y given T and $\widehat{GPS}$

$$E[Y \mid T, GPS] = f\,(T, T^2, \widehat{GPS}, \widehat{GPS}^2, \widehat{GPS}\,T)$$

VI) Estimation of the dose response functions at each intensity of treatment value $T=\tau$ by averaging the conditional expectation of Y over the $\widehat{GPS}$

12.2 PSM with categorical treatment intensities (Models II, IV)

All the categorical–treatment PSM specifications used in the analysis are implemented as a modification of the model in Gerfin and Lechner (2000) and Lechner (2002). In our specifications the Average Treatment Effects on the Treated (ATTs) $\tau(c)$ are estimated against a counterfactual state of receiving the lower intensity category of EUF payments (as supposed to a counterfactual state were NUTS2 regions would be randomly assigned to one of the other treatment intensities, with probabilities given by weights defined by the relative participation frequencies).

The main common features of our models can be summarized as follows:

I) Estimation of the predicted probabilities of receiving transfer intensity c=2…n with respect to the reference category c=1

$$P[T^{c=2}=1] = \Phi[h(X)]$$

[…]

$$P[T^{c=n}=1] = \Phi[h(X)]$$

II) Elimination of the regions outside the common support

III) Separately for each categorical treatment c, matching of the $T^c=1$ firms with the $T^{c=1}=1$ firms with similar propensity score $P(X)^c$. Such matching procedure will be implemented replicating the analysis with a number of the different algorithms and common support restriction

IV) Estimation of impacts for each Fund-expenditure intensity category c as differences between the mean pre-post intervention outcome changes of the treated ($T^c=1$) and the matched of the benchmark lower intensity category ($T^{c=1}=1$).

12.3 Exact model specifications

Details on the exact composition of the variables used in the four types of models are summarized in Tables 21-22.

Table 21 : Variable specifications of Models I -II

Model I: GPS, continuous EUF intensity, longitudinal data on three periods

Outcome data:

- Avg. annual % growth of GVA; GFCF; avg. annual change of Employment rate
- NUTS-2 level (EU 27) pooled longitudinal data on the three periods
- I period: EU15 data (204 NUTS2) outcomes measured in (1996-2001)
- II period: EU25 data (245 NUTS2) outcomes measured in (2002-2008)
- III period: EU27 data (259 NUTS2) outcomes measured in (2009-2011)

Treatment intensity:

- Avg. annual per-capita value of the EUF in each period=
  (Total EU Fund /population in the 1st year of period) / n. years

Control variables:

- average annual growth (measured in the following years before the beginning of each period: I period 1992-94[14]; II period 1997-00, III period 2004-07) of: GVA; GFCF, Employment rate[15]
- percentage of employment (recorded at the beginning of each period: I period 1994 II period 2000; III period 2007) in: agriculture; manufacturing, energy and construction; other sectors
- percentage of population 25-64 with high education (recorded at the beginning of each period: I period 1994 II period 2000; III period 2007)
- Period dummies

Total number of Units of observation: 708 (i= NUTS2; t= programming periods)

Model II: Dynamic PSM with categorical treatment intensities (run separately in the three periods)

Outcome data:

- Avg. annual % growth of GVA; GFCF; avg. annual change of Employment rate
- I period: EU15 data (204 NUTS2) outcomes measured in (1996-2001)
- II period: EU25 data (245 NUTS2) outcomes measured in (2002-2008)
- III period: EU27 data (259 NUTS2) outcomes measured in (2009-2011)

Treatment intensity:

- 4 categories of the EUF intensities based on quartiles of the overall distribution across the three periods

Control variables:

- average annual growth (measured in the following years before the beginning of each period: I period 1992-94; II period 1997-00, III period 2004-07) of: GVA, GFCF, Employment rate
- percentage of employment (recorded at the beginning of each period: I period 1994 II period 2000; III period 2007) in: agriculture; manufacturing, energy and construction; other sectors
- percentage of population 25-64 with high education (recorded at the beginning of each period: I period 1994 II period 2000; III period 2007)

Local ATTs are estimated separately for each period. Global impact estimates obtained as weighted average of the local ATTs with weights proportional to the number of treated Nut2 regions within the common support in each period.

[14] We consider 1992-94 instead of 1991-94 because the 1991 data was missing for a number of NUTS2 region.

[15] In terms of average annual change.

Total number of Units of observation: 204 for I period; 245 for II period; 259 for III period

Table 22 : Variable specifications of Models III-IV

Model III: GPS continuous EUF intensity, whole 1994-2010 period

Outcome data:
- Avg. annual % growth of GVA; GFCF; avg. annual change of Employment rate
- NUTS-2 level (EU 27) cross-sectional data

Treatment intensity:
- Avg. per-capita value of the EUF in the whole 1994-2010 period= (Total EU Fund /1994 population)

Control variables:
- average annual growth (measured in 1992-94): GVA; GFCF, Employment rate
- average percentage of employment (in the years1992-94) in: agriculture; manufacturing, energy and construction; other sectors
- percentage of population 25-64 with high education (recorded in 1994)

Total number of Units of observation: 259

Model IV: PSM with categorical treatment intensities, whole 1994-2010 period

Outcome data:
- Avg. annual % growth of GVA; GFCF; avg. annual change of Employment rate
- I period: EU15 data (204 NUTS2) outcomes measured in (1996-2001)
- II period: EU25 data (245 NUTS2) outcomes measured in (2002-2008)
- III period: EU25 data (259 NUTS2) outcomes measured in (2009-2011)

Treatment intensity:
- 4 categories of EUF intensities based on quartiles of the avg. per-capita value of the EUF in the whole 1994-2010 period= (Total EU Fund /1994 population)

Control variables:
- average annual growth (measured in 1992-94): GVA; GFCF, Employment rate
- average percentage of employment (in the years1992-94) in: agriculture; manufacturing, energy and construction; other sectors
- percentage of population 25-64 with high education (recorded in 1994)

Total number of Units of observation: 259

13. Summary of the results (Tasks 2 and 3)

For the EU27 regions, in the 1994-99, 2000-06 and 2007-13[16] periods, the higher average annual per-capita intensity of EU Funds (EUF) devoted to the Obj.1 /Convergence Obj. regions yielded the impacts summarized in the Tables 23-25.

Table 23 : Impacts of EU Funds (EUF) on GVA growth. EU-27, 1994-2011

Impact estimates of the Highest EUF intensity in Obj.1/Convergenece Obj. regions	**ATT**	**Std. Err.**	**Common support (N. Obj1 Nuts2)**
Radius matching (δ=0.05)	0.0055***	0.0025	107
Nearest available matching (caliper = 0.05)	0.0067*	0.0044	107
Kernel matching (Epanechnikov)	0.0072***	0.0033	115

Table 23 summarizes the estimated impacts on GVA growth. The higher average annual per-capita intensity of EUF devoted to the Obj.1 or convergence Obj. regions (compared to the counterfactual status of receiving the lower average intensity of the Non-Obj.1/Non-converg. Obj. regions) determines an increase in the annual growth of per-capita GVA from +0.55 percentage point (p.p.), in the radius matching specification, to +0.72 p.p. , in the kernel matching specification.

The results on gross fixed capital formation (GFCF, in terms of annual per-capita growth) are reported in Table 24. The GFCF impacts of the higher EUF intensity of the Obj.1/Convergence Obj. regions are similar to the GVA results, ranging from +0.51 p.p. (in the radius matching specification) to +1.10 p.p.(in the nearest available matching specification). Due to high standard errors, however, none of the GFCF estimates reach statistically significance levels.

[16] As mentioned earlier in this report, because of data availability limitations, the 2007-13 period is capped at the year 2010 for the EU Funds and the year 2011 for the regional growth variables.

Table 24 : Impacts of EU Funds (EUF) on Gross fixed capital formation growth. EU-27, 1994-2011

Impact estimates of the Highest EUF intensity in Obj.1/Convergenece Obj. regions	ATT	Std. Err.	Common support (N. Obj1 NUTS2)
Radius matching (δ=0.05)	0.0051	0.0068	107
Nearest available matching (caliper = 0.05)	0.0110	0.0177	107
Kernel matching (Epanechnikov)	0.0098	0.0089	115

Table 25, finally, reports the impacts on the yearly change of employment rate. In this case, the impact estimates of the higher EUF intensity of the Obj.1/Convergence Obj. regions are of a smaller magnitude: +0.10 p.p. in the radius matching specification, and +0.12 p.p. in the nearest available and kernel matching specification. Similarly as in the GFCF results, also in this case, the high standard errors of the impact estimates do not enable the impact estimates to reach statistical significance.

Table 25 : Impacts of EU Funds (EUF) on employment rate changes. EU-27, 1994-2011

Impact estimates of the Highest EUF intensity in Obj.1/Convergenece Obj. regions	ATT	Std. Err.	Common support (N. Obj1 Nuts2)
Radius matching (δ=0.05)	0.0010	0.0009	107
Nearest available matching (caliper = 0.05)	0.0012	0.0011	107
Kernel matching (Epanechnikov)	0.0012	0.0013	115

The PSM differential impacts of four different levels of the EUF intensities received by each NUTS2 region and the GPS impacts of each additional unit of intensity of the EUF at each continuous level across the entire distribution (regardless to the Obj1-Converg. Obj. status of the region), do not display a very high degree of robustness and statistical significance across the different models and specifications.

This is due to the fact that splitting the sample of the NUTS2 regions into multiple categories of regions based on different intensities of the EUF further reduces the possibility of finding suitable groups of regions with similar pre-intervention characteristics but belonging to different categories of EUF intensity. In this regard, our analysis shows that at the NUTS 2 level, the small sample size of EU regions available to the analysis does not guarantee the possibility of undertaking a rigorous counterfactual impact evaluation of very detailed different levels of EUF intensity.

Due to the above reasons, it is not possible to summarize in a coherent set of unique findings the heterogeneous and often volatile estimates from all the estimated categorical PSM models and the dose-response and treatment effect functions from the GPS models. We refer instead to the technical appendix of this report for a complete illustration of the categorical PMS and GPS results concerning the differential impacts of the varying intensities of the EUF on GVA and GFCF growth outcomes and employment changes outcomes.

14. Concluding remarks (Tasks 2 and 3)

The findings from the Task 2 and task 3 analyses show that, within the EU-27 regions and in the 1994-2011 period, the EU Funds (EUF) had a significant role in stimulating regional growth and economic development. Our impact estimates indicate that the higher average intensity of the EUF in the Ob.1/Convergence regions generates a positive effect on various regional growth outcomes, compared to the counterfactual status of the lower average EUF intensity of the non-Ob.1/non-Convergence regions. These impacts are in line with the results of other studies cast in a counterfactual framework.

The results from estimating the different impacts of the continuous or discrete changes of the EUF intensities across the different NUTS2 regions are hard to summarize and cannot offer clear-cut interpretations and/or policy recommendations. This is due to multiple data limitations, and, ultimately to the reduced sample size of regions that display very similar pre-intervention characteristics but different levels of EUF intensity. Nevertheless, the results from this study, combined with the results from the WP 14c (focusing on Regression Discontinuity Design techniques) point in the direction of showing that the marginal impact on regional growth of further increasing the intensity of the EUF tends to be higher for the regions that do not already receive an high intensity of the EUF. In other world, the marginal impact on growth of adding more EUF intensity tends to decrease for the regions with high EUF intensities.

A great deal of caution, however, should be exerted in interpreting these results as supportive of the hypothesis that diminishing returns to investment and/or limited absorption capacities may be in place to hamper the full economic-development potential of the high intensities of the EUF transfers.

This is for the following two reasons. First, the EUF transfers may have also other objectives apart from regional growth. Portions of the high EUF intensity of certain regions may be devoted to fulfil such diverse objectives, leading to a violation of the linearity in the relationship between EUF intensity and growth. Second, in regional-level counterfactual impact evaluation studies (CIE), like ours, the bulk of the empirical evidence comes from cross-sectional variation of the EUF intensities across the different regions. Variations of the EUF intensity within a same region are instead much more limited, as they are observed only across the three past programing periods.

For this reason the analysis has to face the challenge that the regions with high EUF intensities could be the most problematic ones, where the effect on growth would be less than elsewhere for any given level of EUF. Our Propensity Score Matching (PSM) and Generalised Propensity Score (GPS) analysis, aims at controlling for such potential differences between regions, producing impact estimates that indicate the net impact of the varying EUF intensity, holding constant every other regional characteristic (i.e. mimicking the results of an experiment in which the impacts of the EUF are estimated by mean of comparing the growth outcomes of regions with different levels of funding but identical characteristics). In this study, however, some regional features are unobservable in the available data (e.g. administrative and geo-physical characteristics, for PSM). For these reasons we cannot empirically confirm that a full balancing is perfectly achieved in our analysis between the regions with different levels of EUF intensity with regard to the characteristics that are not included in the data. This circumstance warrens further caution in extrapolating strong policy conclusions from the empirical evidence obtained within the data currently available.

Moreover, the strong limitations in the current data-availability scenario on the EUF payments do not enable any type of CIE analysis, including ours, to further investigate other important conditions under which the different intensities of the EUF produce desirable regional growth outcomes. These conditions are, for example, the different compositions and scopes of the actual programme interventions, the duration of the project implementations (which may affect the temporal lag needed to observe the regional growth outcomes), and the intensities of the national or regional sources of public aids that may affect the regional growth outcomes in conjunction with the EUF.

In order to overcome such data limitations it could be advisable to explore the possibility of linking the currently available EUF database with the detailed information on the single programmes submitted by the member-states for the EUF payments, as explicitly considered in Work Package 13 – Geography of Expenditure.

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Annex 1: Task 1 - Technical Appendix

Complete PSM impact estimates (EU-15, 1994-2006 periods)

A.1 Radius Matching estimates (GDP outcome)

The complete radius matching impact estimates of the EU Funds (EUF) on the average per-capita GDP growth, for the EU-15 regions, in the 1994-06 period (Task 1) are presented in the Tables included in the sections from A.1.1 (models with growth-rate control variables) to A.1.3 (model with all control variables9.

A.1.1 Growth-rate control variables

Table A1

```
. *RADIUS delta=0.005 GRW CTR *
. psmatch2 T, radius caliper(0.005) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.31906108   1.27388374   1.04517734   .249743937     4.18
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        19         34 |        53
-----------+----------------------+----------
     Total |        19        163 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8         |  0.90  0.369 |  1.73*
                        M |-1.2105  -1.1406      -5.7    58.8 | -0.26  0.797 |  1.55
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1         |  2.83  0.005 | 24.96*
                        M |-.28555   1.4386     -32.7     9.6 | -2.13  0.037 | 11.16*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0         | -1.41  0.160 |  1.48
                        M |-2.3111  -.59516     -34.8   -57.9 | -1.72  0.091 |  1.80
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1         |  1.45  0.148 | 11.25*
                        M | .20743   1.0792     -20.8    -9.1 | -1.37  0.174 |  6.29*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0         |  1.15  0.254 | 11.91*
                        M | 1.4789   2.2768     -18.4   -22.7 | -1.20  0.236 |  5.61*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A2

```
. *RADIUS delta=0.01 GRW CTR*
. psmatch2 T, radius caliper(0.01) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.36082391   1.53173681   .829087098   .223870247     3.70
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        13         40 |        53
-----------+----------------------+----------
     Total |        13        169 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |   1.73*
                        M |-1.1565  -1.0888      -5.5     60.1 |  -0.25  0.803 |   1.03
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 |  24.96*
                        M |  1.021   1.3079      -5.4     85.0 |  -0.31  0.754 |  14.97*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |   1.48
                        M |-1.6421  -1.0094     -12.8     41.8 |  -0.64  0.525 |   1.63
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 |  11.25*
                        M | .65578   1.0758     -10.0     47.4 |  -0.63  0.530 |   6.03*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 |  11.91*
                        M | 1.8779   2.2303      -8.1     45.8 |  -0.49  0.626 |   4.38*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A3

```
. *RADIUS delta=0.05 GRW CTR*
. psmatch2 T, radius caliper(0.05) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.78565311   .687087479   .222756406     3.08
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-.90036  -1.2098      25.2   -82.4 |   0.97  0.337 |  0.54*
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M | 3.1352   1.3586      33.6     6.9 |   1.73  0.086 | 26.30*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M | -1.042  -1.8951      17.3    21.5 |   0.92  0.358 |  1.78*
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | 1.8134   1.0139      19.1    -0.0 |   0.99  0.327 | 12.58*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M | 2.7872   2.3345      10.4    30.4 |   0.53  0.601 |  7.54*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A.1.2 Set of six control variables (three growth-rates and three pre-intervention levels)

Table A4

```
. *RADIUS delta=0.01 6CTR*
. psmatch2 T, radius caliper(0.05) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.61695877   .528016046   1.11161846     0.47
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352    1.2273     36.1        |   2.83  0.005 | 24.96*
                        M | .62595    1.6827    -20.0    44.6 |  -0.83  0.424 |  3.99
                          |                                  |               |
d_grsfixcapt            U | -1.042    .04467    -22.0        |  -1.41  0.160 |  1.48
                        M | 1.7825    1.9463     -3.3    84.9 |  -0.05  0.958 |  0.43
                          |                                  |               |
d_GDP                   U | 1.8134    1.0142     19.1        |   1.45  0.148 | 11.25*
                        M | .15959    1.7131    -37.0   -94.4 |  -0.94  0.369 |  9.88*
                          |                                  |               |
avg_compens             U |  16813     28255   -197.9        | -13.43  0.000 |  2.55*
                        M |  26243     25540     12.2    93.9 |   0.40  0.695 |  1.10
                          |                                  |               |
avg_grsfixcapt          U | 3325.6    4105.1    -55.8        |  -3.46  0.001 |  1.11
                        M | 3461.8    3744.3    -20.2    63.8 |  -0.24  0.813 |  0.54
                          |                                  |               |
avg_GDP                 U |  13366     22619   -249.2        | -13.77  0.000 |  0.29*
                        M |  18124     18519    -10.6    95.7 |  -0.27  0.796 |  0.19
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A5

```
. *RADIUS delta=0.05 6CTR*
. psmatch2 T, radius caliper(0.05) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.61695877   .528016046   1.11161846     0.47
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.6827    -20.0    44.6 |  -0.83  0.424 |  3.99
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825   1.9463     -3.3    84.9 |  -0.05  0.958 |  0.43
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   1.7131    -37.0   -94.4 |  -0.94  0.369 |  9.88*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    25540     12.2    93.9 |   0.40  0.695 |  1.10
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   3744.3    -20.2    63.8 |  -0.24  0.813 |  0.54
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18519    -10.6    95.7 |  -0.27  0.796 |  0.19
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A6

```
. *RADIUS delta=0.1 6CTR*
. psmatch2 T, radius caliper(0.05) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.61695877   .528016046   1.11161846     0.47
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.6827    -20.0    44.6 |  -0.83  0.424 |  3.99
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825   1.9463     -3.3    84.9 |  -0.05  0.958 |  0.43
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   1.7131    -37.0   -94.4 |  -0.94  0.369 |  9.88*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    25540     12.2    93.9 |   0.40  0.695 |  1.10
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   3744.3    -20.2    63.8 |  -0.24  0.813 |  0.54
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18519    -10.6    95.7 |  -0.27  0.796 |  0.19
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A.1.3 All control variables (five growth-rates and five pre-intervention levels)

Table A7

```
*RADIUS delta=0.05 ALL CTR*
. psmatch2 T, radius caliper(0.05) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 3.30378923   1.68427378   1.61951545   1.00894436     1.61
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        49          4 |        53
-----------+----------------------+----------
     Total |        49        133 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-1.2707  -.47941     -64.5  -366.4 |  -0.58  0.581 |  3.86
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M | 1.9488   .90869      19.7    45.5 |   0.71  0.504 |  2.14
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M | 2.9689   1.8939      21.8     1.1 |   0.32  0.758 |  0.72
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | 2.3553   1.5122      20.1    -5.5 |   0.69  0.518 |  2.71
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M | 3.7519   2.0278      39.7  -165.1 |   1.66  0.147 |  0.29
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9          | -13.43  0.000 |  2.55*
                        M |  24500    25660     -20.1    89.9 |  -0.63  0.552 |  0.19
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8          |  -3.46  0.001 |  1.11
                        M | 3715.5   3347.6      26.4    52.8 |   0.31  0.770 |  3.24
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2          | -13.77  0.000 |  0.29*
                        M |  18614    18330       7.7    96.9 |   0.22  0.832 |  0.56
                          |                                  |               |
avg_labprod             U |  36934    51674    -182.2          | -11.75  0.000 |  1.60
                        M |  49725    49953      -2.8    98.5 |  -0.05  0.964 |  1.12
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A8

```
. *RADIUS delta=0.1 ALL CTR*
. psmatch2 T, radius caliper(0.1) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.07205268   1.70538365   .366669026   1.10814071     0.33
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8         |   0.90  0.369 |  1.73*
                        M |-1.2033  -.61506     -48.0  -246.8 |  -0.64  0.536 |  2.52
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1         |   2.83  0.005 | 24.96*
                        M | 3.4033   1.2046      41.6   -15.2 |   0.85  0.415 | 16.61*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0         |  -1.41  0.160 |  1.48
                        M | 2.3857   1.1023      26.0   -18.1 |   0.52  0.613 |  1.08
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1         |   1.45  0.148 | 11.25*
                        M | 2.8046    1.511      30.8   -61.9 |   0.51  0.621 | 27.76*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0         |   1.15  0.254 | 11.91*
                        M |  4.099   2.1684      44.5  -196.8 |   0.80  0.440 | 11.11*
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9         | -13.43  0.000 |  2.55*
                        M |  24104    25603     -25.9    86.9 |  -0.82  0.433 |  1.23
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8         |  -3.46  0.001 |  1.11
                        M | 4204.9   3459.7      53.4     4.4 |   0.71  0.492 |  2.52
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2         | -13.77  0.000 |  0.29*
                        M |  17737    17987      -6.7    97.3 |  -0.21  0.838 |  1.08
                          |                                  |               |
avg_labprod             U |  36934    51674    -182.2         | -11.75  0.000 |  1.60
                        M |  46481    49771     -40.7    77.7 |  -0.73  0.483 |  2.41
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A9

```
. *RADIUS delta=0.15 ALL CTR*
. psmatch2 T, radius caliper(0.15) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.00694341   1.63839134   .368552071   .989817007     0.37
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        46          7 |        53
-----------+----------------------+----------
     Total |        46        136 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8        |   0.90  0.369 |  1.73*
                        M |-1.0343  -.89788     -11.1    19.6 |  -0.18  0.863 |  3.27
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1        |   2.83  0.005 | 24.96*
                        M | 2.6591   1.5764      20.5    43.3 |   0.47  0.647 | 19.72*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0        |  -1.41  0.160 |  1.48
                        M | 2.2911   1.5809      14.4    34.6 |   0.34  0.739 |  1.08
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1        |   1.45  0.148 | 11.25*
                        M | 1.9828   1.6415       8.1    57.3 |   0.15  0.884 | 28.97*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0        |   1.15  0.254 | 11.91*
                        M | 3.0951    2.586      11.7    21.7 |   0.23  0.824 | 20.78*
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9        | -13.43  0.000 |  2.55*
                        M |  25129    25664      -9.2    95.3 |  -0.28  0.787 |  1.72
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8        |  -3.46  0.001 |  1.11
                        M | 3980.5   3209.5      55.2     1.1 |   0.88  0.398 |  3.66
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2        | -13.77  0.000 |  0.29*
                        M |  17577    17958     -10.3    95.9 |  -0.27  0.794 |  0.37
                          |                                  |               |
avg_labprod             U |  36934    51674    -182.2        | -11.75  0.000 |  1.60
                        M |  46507    49074     -31.7    82.6 |  -0.66  0.521 |  2.14
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A.2 Nearest Available Matching estimates (GDP outcome)

The complete Nearest Available Matching impact estimates for the Task 1 analyses are detailed in the following Tables of the sections A.2.1 – A.2.3.

A.2.1 Growth-rate control variables

Table A10

```
. *CALIPER=0.005 *
. psmatch2 T, caliper(0.005) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.31906108    1.2724314   1.04662968   .270747065     3.87
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        19         34 |        53
-----------+----------------------+----------
     Total |        19        163 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-1.2105  -1.1531      -4.7    66.2 |  -0.21  0.835 |  1.46
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M |-.28555   1.5097     -34.0     5.9 |  -2.21  0.031 |  9.64*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M |-2.3111   -.5218     -36.3   -64.7 |  -1.82  0.073 |  1.97
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | .20743    .9712     -18.2     4.4 |  -1.20  0.234 |  6.16*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M | 1.4789   2.1823     -16.2    -8.2 |  -1.05  0.299 |  5.18*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A11

```
. *CALIPER=0.01 *
. psmatch2 T, caliper(0.01) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.36082391   1.34187195   1.01895196   .241852958     4.21
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        13         40 |        53
-----------+----------------------+----------
     Total |        13        169 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8         |   0.90  0.369 |  1.73*
                        M |-1.1565  -1.1206      -2.9    78.8 |  -0.13  0.896 |  1.01
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1         |   2.83  0.005 | 24.96*
                        M |  1.021   1.4213      -7.6    79.0 |  -0.44  0.663 | 13.65*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0         |  -1.41  0.160 |  1.48
                        M |-1.6421  -1.1565      -9.9    55.3 |  -0.50  0.617 |  1.85
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1         |   1.45  0.148 | 11.25*
                        M | .65578   .88367      -5.4    71.5 |  -0.34  0.733 |  6.12*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0         |   1.15  0.254 | 11.91*
                        M | 1.8779   2.0687      -4.4    70.7 |  -0.27  0.790 |  4.85*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A12

```
. *CALIPER =0.05 *
. psmatch2 T, caliper(0.05) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.58653568   .886204904   .232963179     3.80
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-.90036  -1.3205      34.3   -147.7 |   1.31  0.191 |  0.54*
                          |                                    |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M | 3.1352   1.4622      31.7     12.3 |   1.63  0.106 | 23.94*
                          |                                    |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M | -1.042  -2.0425      20.3      7.9 |   1.10  0.274 |  1.94*
                          |                                    |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | 1.8134   .87765      22.3    -17.1 |   1.16  0.251 | 13.15*
                          |                                    |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M | 2.7872    2.315      10.9     27.4 |   0.55  0.586 |  7.30*
                          |                                    |               |
----------------------------------------------------------------------------------------
```

A.2.2 Set of six control variables (three growth-rates and three pre-intervention levels)

Table A13

```
. *CALIPER=0.05 *
. psmatch2 T, caliper(0.05) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.71596671   .429008107   1.09470163     0.39
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.6997    -20.3    43.7 |  -0.80  0.441 |  2.55
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825    2.476    -14.1    36.2 |  -0.24  0.818 |  0.48
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   2.2715    -50.3  -164.3 |  -1.30  0.221 | 17.46*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    24274     34.0    82.8 |   1.49  0.166 | 10.85*
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   3628.4    -11.9    78.6 |  -0.17  0.865 |  1.08
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18075      1.3    99.5 |   0.05  0.960 |  0.63
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A14

```
. *CALIPER=0.1 *
. psmatch2 T, caliper(0.1) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.71596671   .429008107   1.09470163     0.39
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.6997    -20.3    43.7 |  -0.80  0.441 |  2.55
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825    2.476    -14.1    36.2 |  -0.24  0.818 |  0.48
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   2.2715    -50.3  -164.3 |  -1.30  0.221 | 17.46*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    24274     34.0    82.8 |   1.49  0.166 | 10.85*
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   3628.4    -11.9    78.6 |  -0.17  0.865 |  1.08
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18075      1.3    99.5 |   0.05  0.960 |  0.63
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A15

```
. *CALIPER=0.15 *
. psmatch2 T, caliper(0.15) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.11997134   1.71142497   .408546364   .922880688     0.44
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        46          7 |        53
-----------+----------------------+----------
     Total |        46        136 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .42041   1.8149    -26.4    26.9 |  -1.21  0.250 |  2.58
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.9325   2.3938     -9.4    57.6 |  -0.19  0.856 |  0.48
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .65238   2.1774    -36.4   -90.8 |  -1.05  0.316 | 18.26*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  25279    24451     14.3    92.8 |   0.56  0.587 | 15.19*
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3329.6   3491.7    -11.6    79.2 |  -0.20  0.849 |  1.07
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  17923    17761      4.4    98.2 |   0.18  0.858 |  0.59
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A.2.3 All control variables (five growth-rates and five pre-intervention levels)

Table A16

```
. *CALIPER=0.05 *
. psmatch2 T, caliper(0.05) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 3.30378923   1.37711556   1.92667366   1.04855641     1.84
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        49          4 |        53
-----------+----------------------+----------
     Total |        49        133 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod , both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036     -1.07      13.8         |   0.90  0.369 |  1.73*
                        M |-1.2707   -.92758     -28.0  -102.3 |  -0.24  0.816 |  2.82
                          |                                  |               |
d_compens               U | 3.1352    1.2273      36.1         |   2.83  0.005 | 24.96*
                        M | 1.9488    1.4791       8.9    75.4 |   0.33  0.751 |  2.68
                          |                                  |               |
d_grsfixcapt            U | -1.042    .04467     -22.0         |  -1.41  0.160 |  1.48
                        M | 2.9689   -.38237      68.0  -208.4 |   1.18  0.283 |  1.36
                          |                                  |               |
d_GDP                   U | 1.8134    1.0142      19.1         |   1.45  0.148 | 11.25*
                        M | 2.3553     .6438      40.8  -114.2 |   1.56  0.171 | 10.24
                          |                                  |               |
d_labprod               U | 2.7872    2.1368      15.0         |   1.15  0.254 | 11.91*
                        M | 3.7519    1.6284      48.9  -226.5 |   2.23  0.067 |  0.36
                          |                                  |               |
avg_compens             U |  16813     28255    -197.9         | -13.43  0.000 |  2.55*
                        M |  24500     25883     -23.9    87.9 |  -0.59  0.575 |  0.11
                          |                                  |               |
avg_grsfixcapt          U | 3325.6    4105.1     -55.8         |  -3.46  0.001 |  1.11
                        M | 3715.5    3621.6       6.7    88.0 |   0.08  0.937 |  6.18
                          |                                  |               |
avg_GDP                 U |  13366     22619    -249.2         | -13.77  0.000 |  0.29*
                        M |  18614     18050      15.2    93.9 |   0.49  0.644 |  0.78
                          |                                  |               |
avg_labprod             U |  36934     51674    -182.2         | -11.75  0.000 |  1.60
                        M |  49725     51582     -22.9    87.4 |  -0.45  0.667 |  2.81
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A17

```
. *CALIPER=0.1 *
. psmatch2 T, caliper(0.1) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.07205268   1.57463732   .497415353   1.14386699     0.43
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod , both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-1.2033  -.65806     -44.5  -221.4 |  -0.57  0.579 |  2.00
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M | 3.4033   1.2886      40.0   -10.8 |   0.82  0.433 | 15.65*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M | 2.3857  -.17292      51.9  -135.5 |   1.18  0.265 |  2.00
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | 2.8046    .7761      48.4  -153.8 |   0.81  0.436 | 86.07*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M |  4.099   1.4812      60.3  -302.5 |   1.09  0.300 | 12.02*
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9          | -13.43  0.000 |  2.55*
                        M |  24104    26342     -38.7    80.4 |  -1.10  0.295 |  0.82
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8          |  -3.46  0.001 |  1.11
                        M | 4204.9   3606.7      42.8    23.3 |   0.63  0.544 |  6.18
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2          | -13.77  0.000 |  0.29*
                        M |  17737    18029      -7.9    96.8 |  -0.25  0.805 |  1.22
                          |                                  |               |
avg_labprod             U |  36934    51674    -182.2          | -11.75  0.000 |  1.60
                        M |  46481    52187     -70.5    61.3 |  -1.37  0.201 |  4.80
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A18

```
. *CALIPER=0.15 *
. psmatch2 T, caliper(0.15) outcome (Y) pscore(PS_allctr)

----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.00694341    1.5902855   .416657915   .998924867     0.42
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        46          7 |        53
-----------+----------------------+----------
     Total |        46        136 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod , both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-1.0343  -.72222     -25.5    -84.0 |  -0.38  0.712 |  2.09
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M | 2.6591   1.4625      22.7     37.3 |   0.52  0.615 | 15.90*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M | 2.2911   .12331      44.0    -99.5 |   1.17  0.266 |  1.86
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | 1.9828   .89558      25.9    -36.0 |   0.48  0.641 | 77.64*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M | 3.0951   1.6643      33.0   -120.0 |   0.63  0.540 | 13.76*
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9          | -13.43  0.000 |  2.55*
                        M |  25129    26224     -18.9     90.4 |  -0.55  0.594 |  1.46
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8          |  -3.46  0.001 |  1.11
                        M | 3980.5   3473.1      36.3     34.9 |   0.60  0.560 |  5.63
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2          | -13.77  0.000 |  0.29*
                        M |  17577    17722      -3.9     98.4 |  -0.14  0.891 |  1.05
                          |                                  |               |
avg_labprod             U |  36934    51674    -182.2          | -11.75  0.000 |  1.60
                        M |  46507    51783     -65.2     64.2 |  -1.49  0.163 |  4.46
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A.3 Kernel Matching (GDP outcome)

The complete kernel matching impact estimates for the Task 1 analyses are presented in the Tables included in the following sections:

- from A.3.1 to A.3.3 for the Gaussian Kernel Matching, implemented with different bandwidth (0.06, 0.1 and 0.15);
- from A.3.4 to A.3.6 for the Biweight Kernel Matching;
- from A.3.7 to A3.9 for the Epanechnikov Kernel Matching.

A 3.1 Gaussian estimates (growth control variables)

Table A19

```
. *KERNEL GAUSSIAN *
. psmatch2 T, kernel outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.77116297   .701577614   .224437687     3.13
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
               Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable         Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
-------------------------+----------------------------------+---------------+----------
d_emprate              U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                       M |-.90036  -1.1838      23.1    -67.1 |   0.89  0.378 |  0.54*
                         |                                  |               |
d_compens              U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                       M | 3.1352   1.3378      34.0      5.8 |   1.75  0.082 | 26.38*
                         |                                  |               |
d_grsfixcapt           U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                       M | -1.042  -1.8875      17.2     22.2 |   0.92  0.361 |  1.82*
                         |                                  |               |
d_GDP                  U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                       M | 1.8134    1.031      18.7      2.1 |   0.96  0.337 | 12.43*
                         |                                  |               |
d_labprod              U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                       M | 2.7872   2.3239      10.7     28.8 |   0.54  0.592 |  7.50*
                         |                                  |               |
----------------------------------------------------------------------------------------
```

Table A20

```
. *KERNEL GAUSSIAN bandwith 0.1 *
. psmatch2 T, kernel outcome (Y) pscore(PS_grwctr) bw(0.1)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.78162937   .691111221   .222425615     3.11
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8         |   0.90  0.369 |  1.73*
                        M |-.90036  -1.1813      22.9   -65.6 |   0.89  0.377 |  0.56*
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1         |   2.83  0.005 | 24.96*
                        M | 3.1352   1.3427      33.9     6.0 |   1.75  0.083 | 26.26*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0         |  -1.41  0.160 |  1.48
                        M | -1.042   -1.793      15.2    30.9 |   0.82  0.412 |  1.92*
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1         |   1.45  0.148 | 11.25*
                        M | 1.8134   1.0096      19.2    -0.6 |   0.99  0.323 | 13.36*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0         |   1.15  0.254 | 11.91*
                        M | 2.7872   2.2972      11.3    24.7 |   0.57  0.570 |  7.80*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A21

```
. *KERNEL GAUSSIAN bandwith 0.15 *
. psmatch2 T, kernel outcome (Y) pscore(PS_grwctr) bw(0.15)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.73079088   .741949706    .21224972     3.50
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8          |   0.90  0.369 |  1.73*
                        M |-.90036  -1.1745      22.4    -61.6 |   0.88  0.378 |  0.60
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1          |   2.83  0.005 | 24.96*
                        M | 3.1352   1.3558      33.7      6.7 |   1.74  0.085 | 26.24*
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0          |  -1.41  0.160 |  1.48
                        M | -1.042  -1.8138      15.7     29.0 |   0.84  0.402 |  1.85*
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1          |   1.45  0.148 | 11.25*
                        M | 1.8134   .99148      19.6     -2.8 |   1.01  0.313 | 12.58*
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0          |   1.15  0.254 | 11.91*
                        M | 2.7872   2.2676      12.0     20.1 |   0.60  0.547 |  7.86*
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A 3.2 Gaussian estimates (Set of six control variables -three growth-rates and three pre-intervention levels)

Table A22

```
. *KERNEL GAUSSIAN *
. psmatch2 T, kernel outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482    1.6165416   .528433221   1.10653988     0.48
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.6253    -18.9    47.6 |  -0.79  0.450 |  3.89
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825   1.8384     -1.1    94.9 |  -0.02  0.986 |  0.44
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   1.7422    -37.7   -98.0 |  -0.96  0.361 |  9.83*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    25439     13.9    93.0 |   0.46  0.659 |  1.04
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   3730.6    -19.3    65.5 |  -0.23  0.822 |  0.54
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18502    -10.2    95.9 |  -0.25  0.806 |  0.19
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A23

```
. *KERNEL GAUSSIAN bandwith 0.1 *
. psmatch2 T, kernel outcome (Y) pscore(PS_6ctr) bw(0.1)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.66535012   .479624703   1.08908332     0.44
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.3379    -13.5    62.7 |  -0.57  0.580 |  4.82
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825   1.0955     13.9    36.8 |   0.21  0.835 |  0.37
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   1.9665    -43.1  -126.1 |  -1.08  0.307 |  7.44*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    25418     14.3    92.8 |   0.46  0.655 |  0.98
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   4135.8    -48.3    13.5 |  -0.48  0.642 |  0.32
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18507    -10.3    95.9 |  -0.26  0.801 |  0.19
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A24

```
. *KERNEL GAUSSIAN bandwith 0.15 *
. psmatch2 T, kernel outcome (Y) pscore(PS_6ctr) bw(0.15)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.11997134   1.68777473   .432196603   .932849957     0.46
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        46          7 |        53
-----------+----------------------+----------
     Total |        46        136 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .42041   1.4493    -19.5    46.1 |  -0.94  0.364 |  4.23
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.9325   1.0955     17.0    23.0 |   0.32  0.757 |  0.41
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .65238   1.9737    -31.5   -65.3 |  -0.88  0.396 |  8.41*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  25279    25341     -1.1    99.5 |  -0.03  0.973 |  1.76
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3329.6   3833.8    -36.1    35.3 |  -0.43  0.677 |  0.34
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  17923    18054     -3.5    98.6 |  -0.10  0.922 |  0.20
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A 3.3 Gaussian estimates (All control variables -five growth-rates and five pre-intervention levels)

Table A25

```
. *KERNEL GAUSSIAN *
. psmatch2 T, kernel outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 3.30378923   1.70897436   1.59481486   1.02101514     1.56
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        49          4 |        53
-----------+----------------------+----------
     Total |        49        133 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8         |   0.90  0.369 |  1.73*
                        M |-1.2707  -.52817     -60.6  -337.7 |  -0.54  0.609 |  3.37
                          |                                  |               |
d_compens               U | 3.1352   1.2273      36.1         |   2.83  0.005 | 24.96*
                        M | 1.9488   .99714      18.0    50.1 |   0.65  0.540 |  2.10
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0         |  -1.41  0.160 |  1.48
                        M | 2.9689   1.8753      22.2    -0.6 |   0.32  0.758 |  0.68
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1         |   1.45  0.148 | 11.25*
                        M | 2.3553   1.5097      20.2    -5.8 |   0.69  0.517 |  2.71
                          |                                  |               |
d_labprod               U | 2.7872   2.1368      15.0         |   1.15  0.254 | 11.91*
                        M | 3.7519   2.0791      38.5  -157.2 |   1.59  0.163 |  0.28
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9         | -13.43  0.000 |  2.55*
                        M |  24500    25694     -20.6    89.6 |  -0.65  0.540 |  0.19
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8         |  -3.46  0.001 |  1.11
                        M | 3715.5   3336.1      27.2    51.3 |   0.31  0.764 |  3.16
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2         | -13.77  0.000 |  0.29*
                        M |  18614    18299       8.5    96.6 |   0.25  0.812 |  0.57
                          |                                  |               |
avg_labprod             U |  36934    51674    -182.2         | -11.75  0.000 |  1.60
                        M |  49725    49889      -2.0    98.9 |  -0.03  0.974 |  1.09
                          |                                  |               |
----------------------------------------------------------------------------------------
```

Table A26

```
. *KERNEL GAUSSIAN bandwidth 0.15*
. psmatch2 T, kernel outcome (Y) pscore(PS_allctr) bw(0.15)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.00694341   1.66754307    .33940034   .991638479     0.34
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        46          7 |        53
-----------+----------------------+----------
     Total |        46        136 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07      13.8        |   0.90  0.369 |  1.73*
                        M |-1.0343    -.8132    -18.0   -30.3 |  -0.28  0.784 |  2.82
                          |                                  |               |
d_compens               U | 3.1352    1.2273     36.1        |   2.83  0.005 | 24.96*
                        M | 2.6591    1.5014     21.9    39.3 |   0.50  0.625 | 17.77*
                          |                                  |               |
d_grsfixcapt            U | -1.042    .04467    -22.0        |  -1.41  0.160 |  1.48
                        M | 2.2911    1.2897     20.3     7.8 |   0.49  0.634 |  1.15
                          |                                  |               |
d_GDP                   U | 1.8134    1.0142     19.1        |   1.45  0.148 | 11.25*
                        M | 1.9828    1.5279     10.8    43.1 |   0.20  0.846 | 29.65*
                          |                                  |               |
d_labprod               U | 2.7872    2.1368     15.0        |   1.15  0.254 | 11.91*
                        M | 3.0951    2.3864     16.3    -9.0 |   0.31  0.759 | 16.31*
                          |                                  |               |
avg_compens             U |  16813     28255   -197.9        | -13.43  0.000 |  2.55*
                        M |  25129     25853    -12.5    93.7 |  -0.37  0.716 |  1.69
                          |                                  |               |
avg_grsfixcapt          U | 3325.6    4105.1    -55.8        |  -3.46  0.001 |  1.11
                        M | 3980.5    3295.8     49.0    12.2 |   0.77  0.454 |  3.53
                          |                                  |               |
avg_GDP                 U |  13366     22619   -249.2        | -13.77  0.000 |  0.29*
                        M |  17577     18043    -12.6    95.0 |  -0.33  0.747 |  0.38
                          |                                  |               |
avg_labprod             U |  36934     51674   -182.2        | -11.75  0.000 |  1.60
                        M |  46507     49770    -40.3    77.9 |  -0.84  0.416 |  2.17
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A 3.4 Biweight estimates (Growth control variables)

Table A27

```
. *KERNEL BIWIGHT *
. psmatch2 T, kernel k(biweight) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.76644339   .706297198   .225301143     3.13
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U  |-.90036    -1.07      13.8         |  0.90  0.369 |  1.73*
                        M  |-.90036  -1.1889      23.5   -70.1 |  0.90  0.370 |  0.54*
                           |                                   |               |
d_compens               U  | 3.1352   1.2273      36.1         |  2.83  0.005 | 24.96*
                        M  | 3.1352   1.3436      33.9     6.1 |  1.75  0.083 | 26.53*
                           |                                   |               |
d_grsfixcapt            U  | -1.042   .04467     -22.0         | -1.41  0.160 |  1.48
                        M  | -1.042   -1.893      17.3    21.7 |  0.92  0.358 |  1.80*
                           |                                   |               |
d_GDP                   U  | 1.8134   1.0142      19.1         |  1.45  0.148 | 11.25*
                        M  | 1.8134    1.056      18.1     5.2 |  0.93  0.353 | 12.38*
                           |                                   |               |
d_labprod               U  | 2.7872   2.1368      15.0         |  1.15  0.254 | 11.91*
                        M  | 2.7872   2.3548      10.0    33.5 |  0.50  0.617 |  7.46*
                           |                                   |               |
----------------------------------------------------------------------------------------
```

A 3.5 Biweight estimates (Set of six control variables -three growth-rates and three pre-intervention levels)

Table A28

```
. *KERNEL BIWIGHT *
. psmatch2 T, kernel k(biweight) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482   1.59909695   .545877873   1.12054242     0.49
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.7981    -22.2    38.6 |  -0.92  0.381 |  3.67
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825   2.0551     -5.5    74.9 |  -0.10  0.925 |  0.52
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | .15959   1.6602    -35.8   -87.8 |  -0.91  0.383 | 10.92*
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    25365     15.2    92.3 |   0.50  0.629 |  1.05
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8     3550     -6.3    88.7 |  -0.09  0.932 |  0.87
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18481     -9.6    96.1 |  -0.24  0.817 |  0.18
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A 3.6 Biweight estimates (All control variables -five growth-rates and five pre-intervention levels)

Table A29

```
. *KERNEL BIWEIGHT *
. psmatch2 T, kernel k(biweight) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 3.30378923   1.67969522   1.62409401   1.02200515     1.59
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        49          4 |        53
-----------+----------------------+----------
     Total |        49        133 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_grsfixcapt avg_GDP avg_labprod,
>  both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07     13.8         |   0.90  0.369 |  1.73*
                        M |-1.2707  -.50153    -62.7  -353.4 |  -0.56  0.596 |  3.42
                          |                                  |               |
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | 1.9488   1.0132     17.7    51.0 |   0.64  0.547 |  2.10
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 2.9689   1.8835     22.0     0.1 |   0.31  0.765 |  0.63
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | 2.3553   1.4976     20.4    -7.3 |   0.70  0.513 |  2.63
                          |                                  |               |
d_labprod               U | 2.7872   2.1368     15.0         |   1.15  0.254 | 11.91*
                        M | 3.7519   2.0384     39.5  -163.5 |   1.65  0.150 |  0.29
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3715.5   3341.7     26.8    52.1 |   0.31  0.768 |  3.11
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18614    18307      8.3    96.7 |   0.24  0.817 |  0.58
                          |                                  |               |
avg_labprod             U |  36934    51674   -182.2         | -11.75  0.000 |  1.60
                        M |  49725    50066     -4.2    97.7 |  -0.07  0.946 |  1.13
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A 3.7 Epanechnikov estimates (Growth control variables)

Table A30

```
. *KERNEL EPANECHNIKOV *
. psmatch2 T, kernel k(epan) outcome (Y) pscore(PS_grwctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.47274059   1.77116297   .701577614   .224437687     3.13
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

           | psmatch2:
 psmatch2: |   Common
 Treatment |  support
assignment | On suppor |     Total
-----------+-----------+----------
 Untreated |       129 |       129
   Treated |        53 |        53
-----------+-----------+----------
     Total |       182 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP  d_labprod, both

----------------------------------------------------------------------------------------
               Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable         Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
-------------------------+----------------------------------+---------------+----------
d_emprate              U |-.90036    -1.07     13.8         |   0.90  0.369 |  1.73*
                       M |-.90036  -1.1838     23.1   -67.1 |   0.89  0.378 |  0.54*
                         |                                  |               |
d_compens              U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                       M | 3.1352   1.3378     34.0     5.8 |   1.75  0.082 | 26.38*
                         |                                  |               |
d_grsfixcapt           U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                       M | -1.042  -1.8875     17.2    22.2 |   0.92  0.361 |  1.82*
                         |                                  |               |
d_GDP                  U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                       M | 1.8134    1.031     18.7     2.1 |   0.96  0.337 | 12.43*
                         |                                  |               |
d_labprod              U | 2.7872   2.1368     15.0         |   1.15  0.254 | 11.91*
                       M | 2.7872   2.3239     10.7    28.8 |   0.54  0.592 |  7.50*
                         |                                  |               |
```

A 3.8 Epanechnikov estimates (Set of six control variables -three growth-rates and three pre-intervention levels)

Table A31

```
. *KERNEL EPANECHNIKOV *
. psmatch2 T, kernel k(epan) outcome (Y) pscore(PS_6ctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 2.14497482    1.6165416   .528433221   1.10653988     0.48
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        47          6 |        53
-----------+----------------------+----------
     Total |        47        135 |       182
```

```
. pstest d_compens d_grsfixcapt d_GDP avg_compens avg_grsfixcapt avg_GDP, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_compens               U | 3.1352   1.2273      36.1         |   2.83  0.005 | 24.96*
                        M | .62595   1.6253     -18.9    47.6 |  -0.79  0.450 |  3.89
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467     -22.0         |  -1.41  0.160 |  1.48
                        M | 1.7825   1.8384      -1.1    94.9 |  -0.02  0.986 |  0.44
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142      19.1         |   1.45  0.148 | 11.25*
                        M | .15959   1.7422     -37.7   -98.0 |  -0.96  0.361 |  9.83*
                          |                                  |               |
avg_compens             U |  16813    28255    -197.9         | -13.43  0.000 |  2.55*
                        M |  26243    25439      13.9    93.0 |   0.46  0.659 |  1.04
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1     -55.8         |  -3.46  0.001 |  1.11
                        M | 3461.8   3730.6     -19.3    65.5 |  -0.23  0.822 |  0.54
                          |                                  |               |
avg_GDP                 U |  13366    22619    -249.2         | -13.77  0.000 |  0.29*
                        M |  18124    18502     -10.2    95.9 |  -0.25  0.806 |  0.19
                          |                                  |               |
----------------------------------------------------------------------------------------
```

A 3.9 Epanechnikov estimates (All control variables -five growth-rates and five pre-intervention levels)

Table A33

```
. *KERNEL EPANECHNIKOV *
. psmatch2 T, kernel k(epan) outcome (Y) pscore(PS_allctr)
----------------------------------------------------------------------------------------
        Variable     Sample |    Treated     Controls   Difference         S.E.   T-stat
----------------------------+-----------------------------------------------------------
               Y  Unmatched | 2.47274059   1.54776593   .924974661   .158414056     5.84
                        ATT | 3.30378923   1.70897436   1.59481486   1.02101514     1.56
----------------------------+-----------------------------------------------------------
Note: S.E. does not take into account that the propensity score is estimated.

 psmatch2: |   psmatch2: Common
 Treatment |        support
assignment | Off suppo  On suppor |     Total
-----------+----------------------+----------
 Untreated |         0        129 |       129
   Treated |        49          4 |        53
-----------+----------------------+----------
     Total |        49        133 |       182
```

```
. pstest d_emprate d_compens d_grsfixcapt d_GDP d_labprod avg_compens avg_grsfixcapt avg_GDP
> avg_labprod, both

----------------------------------------------------------------------------------------
                Unmatched |       Mean               %reduct |     t-test    |  V(T)/
Variable          Matched | Treated Control    %bias  |bias| |    t    p>|t| |  V(C)
--------------------------+----------------------------------+---------------+----------
d_emprate               U |-.90036    -1.07     13.8         |   0.90  0.369 |  1.73*
                        M |-1.2707  -.52817    -60.6  -337.7 |  -0.54  0.609 |  3.37
                          |                                  |               |
d_compens               U | 3.1352   1.2273     36.1         |   2.83  0.005 | 24.96*
                        M | 1.9488   .99714     18.0    50.1 |   0.65  0.540 |  2.10
                          |                                  |               |
d_grsfixcapt            U | -1.042   .04467    -22.0         |  -1.41  0.160 |  1.48
                        M | 2.9689   1.8753     22.2    -0.6 |   0.32  0.758 |  0.68
                          |                                  |               |
d_GDP                   U | 1.8134   1.0142     19.1         |   1.45  0.148 | 11.25*
                        M | 2.3553   1.5097     20.2    -5.8 |   0.69  0.517 |  2.71
                          |                                  |               |
d_labprod               U | 2.7872   2.1368     15.0         |   1.15  0.254 | 11.91*
                        M | 3.7519   2.0791     38.5  -157.2 |   1.59  0.163 |  0.28
                          |                                  |               |
avg_compens             U |  16813    28255   -197.9         | -13.43  0.000 |  2.55*
                        M |  24500    25694    -20.6    89.6 |  -0.65  0.540 |  0.19
                          |                                  |               |
avg_grsfixcapt          U | 3325.6   4105.1    -55.8         |  -3.46  0.001 |  1.11
                        M | 3715.5   3336.1     27.2    51.3 |   0.31  0.764 |  3.16
                          |                                  |               |
avg_GDP                 U |  13366    22619   -249.2         | -13.77  0.000 |  0.29*
                        M |  18614    18299      8.5    96.6 |   0.25  0.812 |  0.57
                          |                                  |               |
avg_labprod             U |  36934    51674   -182.2         | -11.75  0.000 |  1.60
                        M |  49725    49889     -2.0    98.9 |  -0.03  0.974 |  1.09
                          |                                  |               |
```

Annex 2: Task 2 and 3 - Technical Appendix

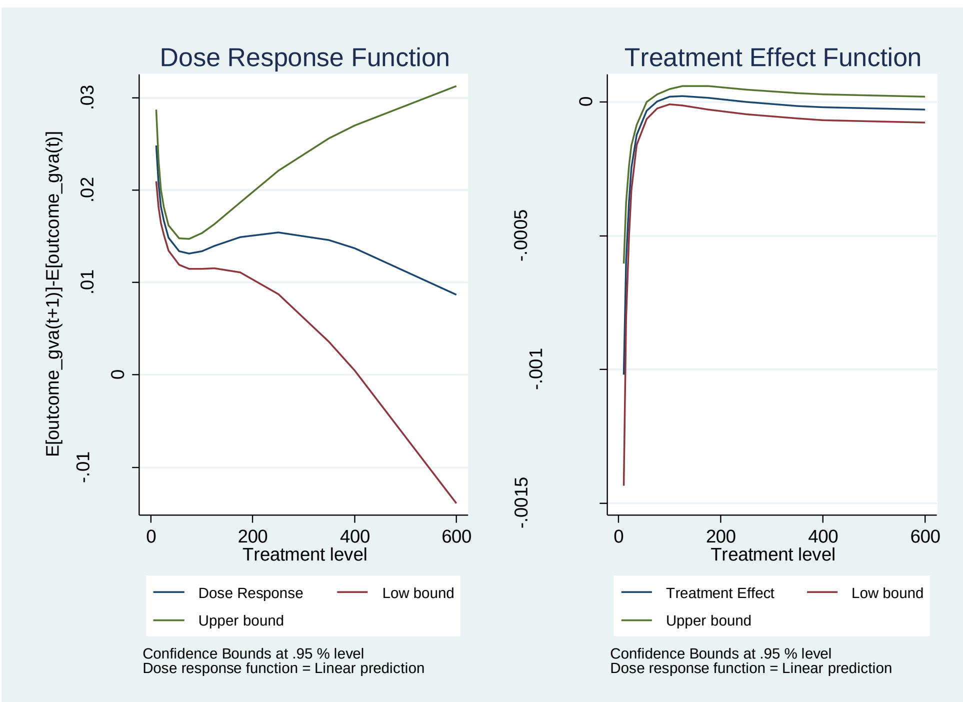
Complete results from GPS and PSM models with multiple intensities of the EU Funds (EU-27, 1994-2013 periods)

A.1 Gross Value Added (GVA) Results

A.1.1 Model I (GPS, longitudinal data on three periods). GVA results

The impacts estimates on the average annual % growth of GVA from Models I are summarizes in Figure A1 that illustrates the estimated dose response function and its derivative (the treatment effect function), respectively.

Figure A1: Dose Response function and Treatment effect functions. Estimates from Model I.
Outcome: Average annual % growth of GVA



Treatment level: (1=1€ /per capita /per year)
Outcome: Avg. annual % growth of per capita Gross Value Added (0.1 = 1%)

A.1.2 Model II: Dynamic PSM (three separate periods) GVA results

Table A1 highlights the GVA impact estimates from Model II (dynamic PSM with four categories of EU Fund –EUF- intensities) implemented with a radius ((δ=0.05) matching specification. The global ATT impact estimates are obtained as weighted average of the local ATTs estimated separately for each of the three periods 1994-99; 2000-06 and 2007-13 (capped at the year 2010 for the EUF and the year 2011 for the GVA growth outcomes).

Table A1

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	-0.0057	0.0055	60
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	-0.0035	0.0029	69
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	-0.0066***	0.0022	153

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates.
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

The ATTs estimates of Table A1 are in terms of percentage points (0.01= 1 p.p.) and indicate the additional annual % growth of per-capita GVA induced in a NUTS2 region by receiving a total intensity of EUF belonging to Cats. (IV), (III) or (II) versus a counterfactual scenario of receiving the low intensity of Cat. (I). None of the impact estimates reach statistical significance levels, except for the negative impact of Cat.II (-0.67 p.p., significant at the 10% level).

Table A2 highlights the GVA impact estimates from Model II (dynamic PSM with four categories of EUF intensities) implemented with a Nearest Neighbour (with caliper) matching specification.

Table A3 highlights the GVA impact estimates from Model II (dynamic PSM with four categories of EUF intensities) implemented with a Kernel matching (Epanechnikov) specification

Table A2

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	-0.0057	0.0055	60
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	-0.0035	0.0029	69
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	-0.0066***	0.0022	153

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A3

Category of EU Fund Intensity(*)	**ATT**	**Std. Err.**	**Common support (N. NUTS2)**
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	-0.0065	0.0039	96
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	-0.0046*	0.0025	66
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	-0.0063***	0.0028	128

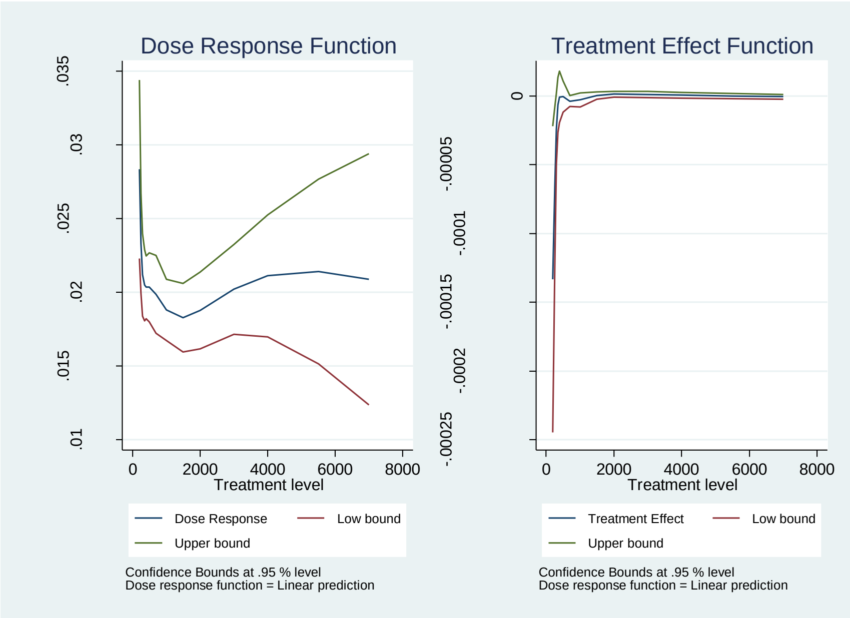
(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

A.1.3 Model III: GPS, whole 1994-2010 period

GVA results

Figure A2 summarizes the GVA results from Model III that implements a GPS estimator on aggregated data for the whole 1994-2010 period of EUF. The right portion of Figure A2 shows the dose response function, while the left part illustrates the treatment effect function.

Figure A2: Dose Response function and Treatment effect functions. Estimates from Model III.
Outcome: Average annual % growth of GVA



Treatment level: (1=1€ per capita, total value for the 1994-2010 period)
Outcome: Avg. annual % growth of per capita Gross Value Added (0.1 = 1%)

A.1.4 Model IV: PSM with categorical treatment intensities, whole 1994-2010 period GVA results

Tables A4-A6 summarize the results from Model IV, the PSM estimator with four categorical treatment intensities implemented over the whole (undivided) 1994-2010 period. For these PSM models, the four categories of EUF intensities are based on the distribution of the total per-capita amount of the EUF received over the entire 1994-2010 period. This distribution is as follows:

- I Quartile (low intensity) = per-capita amount of EUF below 370.90€ (mean value of cat. I = 261.54€)
- II Quartile (medium-low intensity) = per-capita amount of EUF between 370.90€ and 613.65€
- III Quartile (medium-high intensity) = per-capita amount of EUF between 613.65€ and 1235.34€
- IV Quartile (high intensity) = Avg. annual per-capita EUF in the period above 1235.34€

Table A4 presents the results from the radius matching specification (δ=0.05), Table A5 the results from the Nearest Neighbour matching (with caliper δ=0.05) and Table A6, finally, the results from the Kernel matching (Epanechnikov) specification.

Table A4

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.003601*	0.002499	28
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.01386***	0.00417	53
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.00236***	0.0019	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A5

Category of EU Fund Intensity(*)	**ATT**	**Std. Err.**	**Common support (N. NUTS2)**
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.00484***	0.00229	28
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.01467***	0.002612	53
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.002474**	0.001271	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A6

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.004202*		29
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.01562***		57
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.002362		65

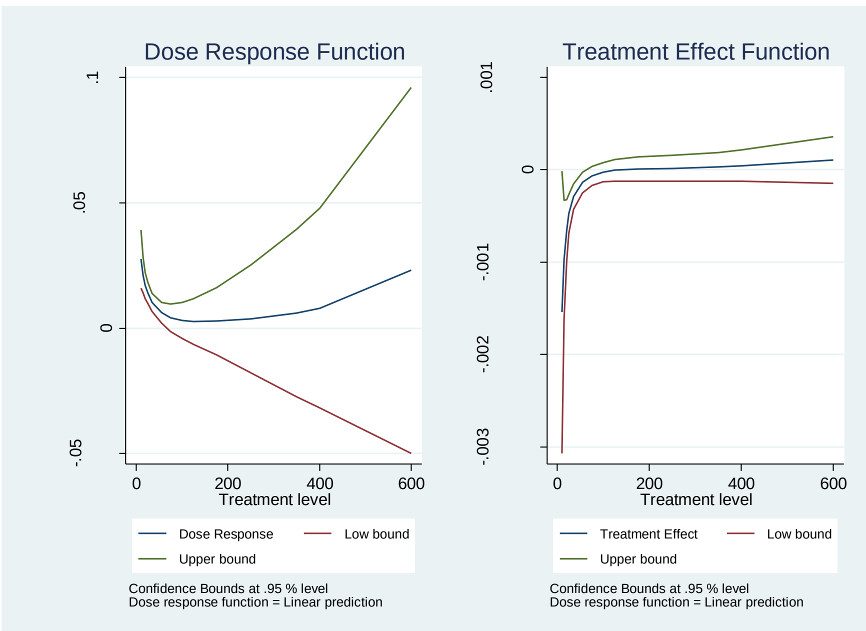
(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

A2. Gross-Fixed-Capital–Formation (GFCF) Results

A.2.1 Model I: GPS, longitudinal data on three periods. GFCF results

The impacts estimates on the average annual % growth of GFCF from Models I are summarizes in Figure A3 that illustrates the estimated dose response function and its derivative (the treatment effect function), respectively.

Figure A3: Dose Response function and Treatment effect functions. Estimates from Model I. Outcome: Average annual % growth of GFCF



Treatment level: (1=1€ /per capita /per year)
Outcome: Avg. annual % growth of per capita Gross Fixed Capital Form. (0.1 = 1%)

A.2.2 Model II: Dynamic PSM (three separate periods) GFCF results

Table A7 highlights the GFCF impact estimates from Model II (dynamic PSM with four categories of EUF intensities) implemented with a radius ((δ=0.05) matching specification. The global ATT impact estimates are obtained as weighted average of the local ATTs impacts of the three periods 1994-99; 2000-06 and 2007-13 (capped at the year 2010 for the EU Funds and the year 2011 for the GFCF growth outcomes9.

Table A7

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	-0.0143	0.0095	60
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	-0.0059	0.0052	69
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	-0.0052	0.008	153

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

The ATTs estimates of Table A7 are in terms of percentage points (0.01= 1 p.p.) and indicate the additional annual % growth of per-capita GFCF induced in a NUTS2 region by receiving a total intensity of EU funds belonging to Cats. (IV), (III) or (II) versus a counterfactual scenario of receiving the low intensity of Cat. (I).

Table A8 highlights the GFCF impact implemented with a Nearest Neighbour (with caliper) Matching, while Table A9 summarizes the estimates from a Kernel matching (Epanechnikov) specification.

Table A8

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	-0.0164	0.012	60
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	-0.0102**	0.0046	69
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	-0.0050	0.0064	153

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A9

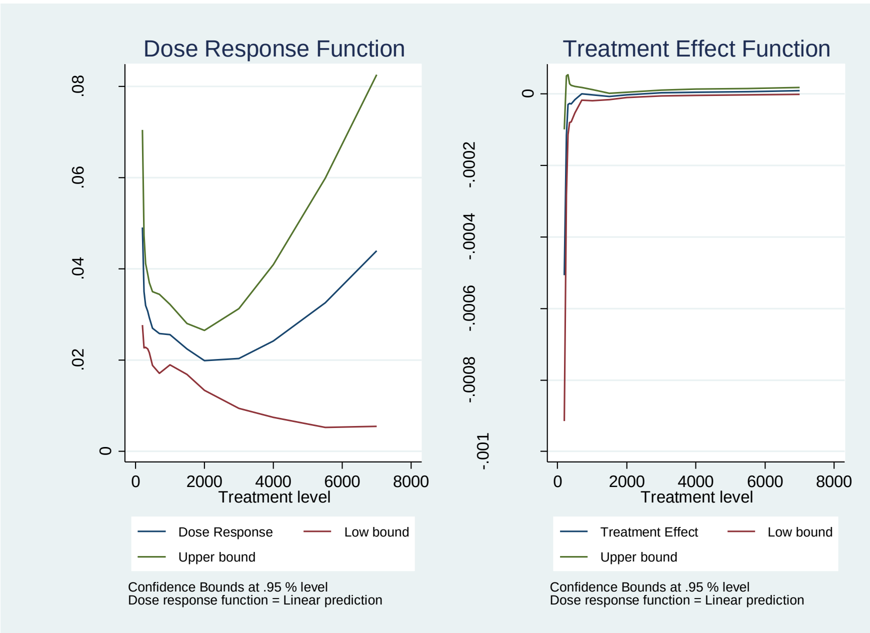
Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	-0.0100	0.0094	69
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	-0.0065	0.0047	66
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	-0.0104*	0.0056	128

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

A.2.3 Model III: GPS, whole 1994-2010 period GFCF results

Figure A4 summarizes the GFCF results from Model III that implements a GPS estimator on the aggregated data for the whole 1994-2010 period. The right portion of Figure A4 shows the dose response function, while the left part illustrates the treatment effect function.

Figure A4: Dose Response function and Treatment effect functions. Estimates from Model III. Outcome: Average annual % growth of GFCF



Treatment level: (1=1€ per capita, total value for the 1994-2010 period)
Outcome: Avg. annual % growth of per capita GFCF (0.1 = 1%)

A.2.4 Model IV: PSM with categorical treatment intensities, whole 1994-2010 period GFCF results

Tables A10-A12 summarize the results from Model IV, the PSM estimator with four categorical treatment intensities implemented over the whole (undivided) 1994-2010 period of EUF payments. For these PSM models, the four categories of intensities of the EUF are based on the distribution of the total per-capita amount of the EUF received over the entire 1994-2010 period. This distribution is as follows:

- I Quartile (low intensity) = per-capita amount of EUF below 370.90€ (mean value of cat. I = 261.54€)
- II Quartile (medium-low intensity) = per-capita amount of EUF between 370.90€ and 613.65€

- III Quartile (medium-high intensity) = per-capita amount of EUF between 613.65€ and 1235.34€
- IV Quartile (high intensity) = Avg. annual per-capita EUF in the period above 1235.34€

Table A10 presents the results from the radius matching specification (δ=0.05), Table A11 the results from the Nearest Neighbour matching (with caliper δ=0.05) and Table A12, finally, the results from the Kernel matching (Epanechnikov) specification.

Table A10

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.00242	0.00927	28
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.00785	0.0166	53
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.00571	0.0063	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A11

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.00794*	0.005577	28
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.00857	0.00748	53
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.00488*	0.002978	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A12

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.00304	0.00955	29
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.0111	0.01754	57
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.00564	0.00624	65

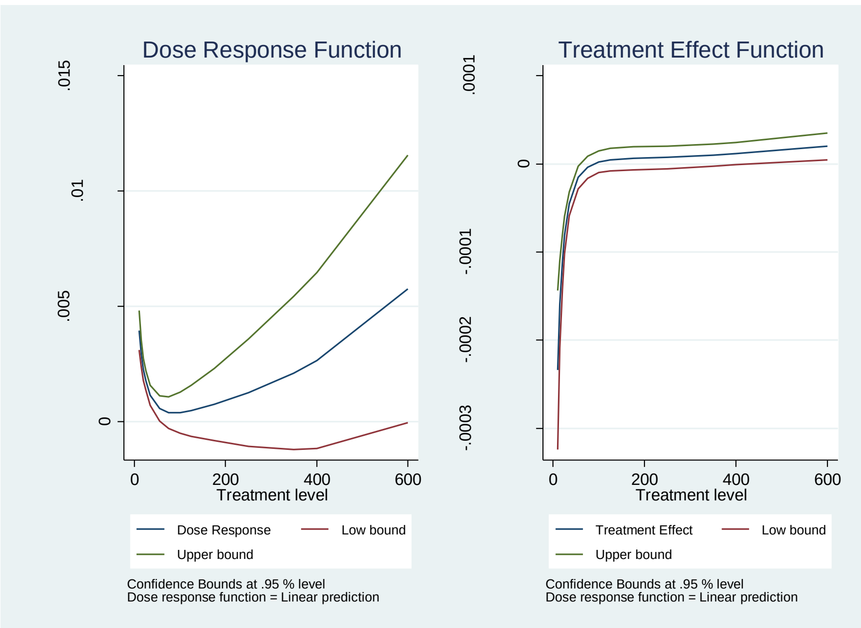
(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

A.3 Employment Rate (EMPRT) Results

A.3.1 Model I: GPS, longitudinal data on three periods. EMPRT results

The impacts estimates on the average annual change of EMPRT from Models I are summarizes in Figure A5 that illustrates the estimated dose response function and its derivative (the treatment effect function), respectively.

Figure A5: Dose Response function and Treatment effect functions. Estimates from Model I.
Outcome: Average annual change of EMPRT



Treatment level: (1=1€ /per capita /per year)
Outcome: Avg. annual change of Employment rate. (0.1 = 1 p.p.)

A.3.2 Model II: Dynamic PSM (three separate periods) EMPRT results

Table A13 highlights the EMPRT impact estimates from Model II (dynamic PSM with four categories of EUF intensities) implemented with a radius ((δ=0.05) matching specification. The global ATT impact estimates are obtained as weighted average of the local ATTs estimated separately for each of the three periods 1994-99; 2000-06 and 2007-13 (capped at the year 2011).

Table A13

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	0.0017	0.0011	60
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	0.0020***	0.0007	69
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	0.0012	0.0015	153

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

The ATTs estimates of Table A13 are in terms of percentage points (0.01= 1 p.p.) and indicate the change in the EMPRT of a NUTS2 region in which the intensity of the total EUF received in the whole period 1994-2010 belongs to Cats. (IV), (III) or (II) versus a counterfactual scenario of receiving EUF with the low intensity of Cat. (I).

Table A14 highlights the EMPRT impact estimates obtained through a Nearest Neighbour (with caliper) Matching, while Table A15 summarizes the estimates from a Kernel matching (Epanechnikov) specification.

Table A14

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	0.0015	0.0013	60
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	0.0015***	0.0006	69
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	0.0009	0.0013	153

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A15

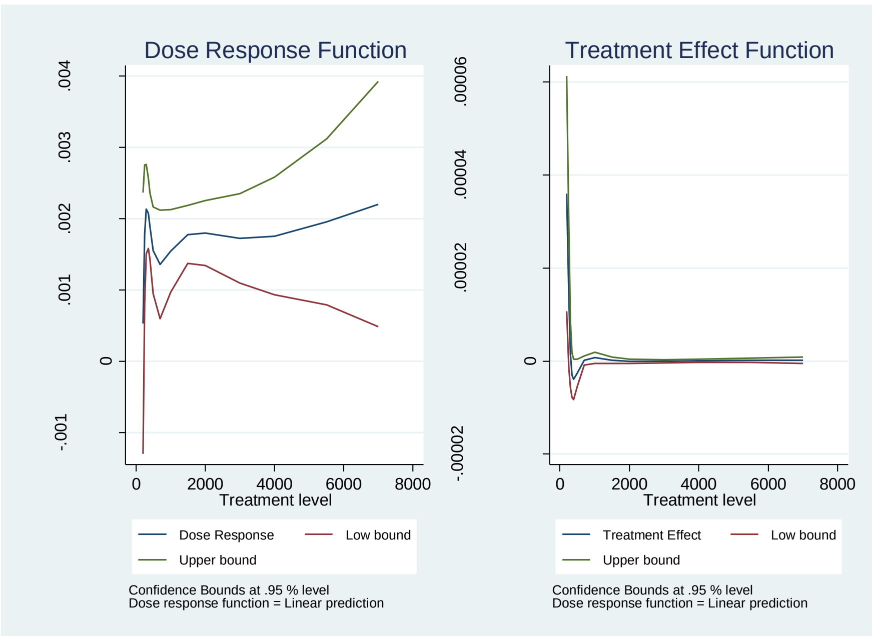
Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 112.50€ <[Avg. annual per-capita EU Funds]	0.0021	0.0011	69
Cat.(III): 35.19€ <[Avg. annual per-capita EU Funds]≤ 112.50€	0.0018	0.0006	86
Cat.(II): 19.99€ <[Avg. annual per-capita EU Funds]≤ 35.19€	0.0003	0.0007	128

(*) Cat. I [Avg. annual per-capita EU Funds]≤ 19.99€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

A.3.3 Model III: GPS, whole 1994-2010 period EMPRT results

Figure A6 summarizes the EMPRT results from Model III that implements a GPS estimator on the aggregated data for the whole 1994-2010 period of EUF payments. The right portion of Figure A6 shows the dose response function, while the left part illustrates the treatment effect function.

Figure A6: Dose Response function and Treatment effect functions. Estimates from Model III.
Outcome: Average annual % growth of GFCF



Treatment level: (1=1€ per capita, total value for the 1994-2010 period)
Outcome: Avg. annual change of Employment rate (0.1 = 1 p.p.)

A.3.4 Model IV: PSM with categorical treatment intensities, whole 1994-2010 period EMPRT results

Tables A16-A18 summarize the results from Model IV, the PSM estimator with four categorical treatment intensities implemented over the whole (undivided) 1994-2010 period of EUF payments. For these PSM models, the four categories of EUF intensities are based on the distribution of the total per-capita amount of the EUF received over the entire 1994-2010 period. This distribution is as follows:

- I Quartile (low intensity) = per-capita amount of EU Funds below 370.90€ (mean value of cat. I = 261.54€)
- II Quartile (medium-low intensity) = per-capita amount of EU Funds between 370.90€ and 613.65€

- III Quartile (medium-high intensity) = per-capita amount of EU Funds between 613.65€ and 1235.34€
- IV Quartile (high intensity) = Avg. annual per-capita EU Funds in the period above 1235.34€

Table A16 presents the results from the radius matching specification (δ=0.05), Table A17 the results from the Nearest Neighbour matching (with caliper δ=0.05) and Table A18, finally, the results from the Kernel matching (Epanechnikov) specification.

Table A16

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.00167**	0.000829	28
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.000286	0.00134	53
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.00079*	0.00057	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A17

Category of EU Fund Intensity(*)	**ATT**	**Std. Err.**	**Common support (N. NUTS2)**
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.000553	0.000752	28
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.000586	0.00565	53
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.000988***	0.000348	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

Table A18

Category of EU Fund Intensity(*)	ATT	Std. Err.	Common support (N. NUTS2)
Cat.(IV): 1235.34€ <[tot. per-capita EU Funds in 1994-10]	0.001594*	0.000872	29
Cat.(III): 613.65€ <[Tot. per-capita EU Funds in 1994-10]≤ 1235.34€	0.000215	0.00144	57
Cat.(II): 370.90€ <[Avg. annual per-capita EU Funds]≤ 613.65€	-0.000791*	0.000566	65

(*) Cat. I [Avg. tot. per-capita EU Funds 1994-10]≤ 370.90€ is the baseline reference for all ATTs estimates
*=statistical significance at 0.10 level
**=statistical significance at 0.05 level
***=statistical significance at 0.01 level

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