The response of EU regional well-being to European Social Fund transfers: a dose-response approach

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Roadmap

Outline of the presentation

- Aim of the paper
- Background literature
- What we do
- Well-being indicator
- Methodological approach
- Preliminary findings
- Concluding remarks

Aim of the paper

The aim of the paper is threefold:

- To define a composite measure of well-being for the European NUTS 2
- To assess how the exposure to ESF transfers affects regional well-being conditions
- To identify the functional form of the relationship between EU ESF transfer intensity and well-being growth rate.

This allows to investigate whether there is evidence of a maximum desirable treatment intensity and/or a minimum necessary level of regional transfers.

Background literature

- Effectiveness of EU Cohesion Policy has been deeply explored especially on GDP growth rate
- "Convergence in GDP growth is not a necessary nor a sufficient condition for the improvement of citizens well-being" (Barca and McCann 2011)
- However, measuring well-being is not yet a settled matter
- New hotly debated issue relying on the transfers' intensities and the "right dose" of the policy that maximise its effectiveness (Becker et al. 2012)

What we do

- This paper adopts a well-being outcome, defined by a composite indicator of well-being, to estimate the response to the Cohesion Policy transfers
- The focus is on the ESF transfers as they are more targeted on people than infrastructures respect to the over-analysed ERDF

Well-being indicator

This composite well-being index combines several dimensions of social and economic progress:

- **Income**: per-capita household disposable income
- **Jobs**: composite measure adopted to represent the labour market dimension based on female and youth participation to the labour market, and the share of neet.
- **Education**: share of persons aged 15-64 which have a level of education between ISCED3-8
- **Health**: combination of infant mortality rate and life expectancy at birth
- **Regional Attractiveness**: ratio between tourist arrival and touristic capacity and the reciprocal of the population density

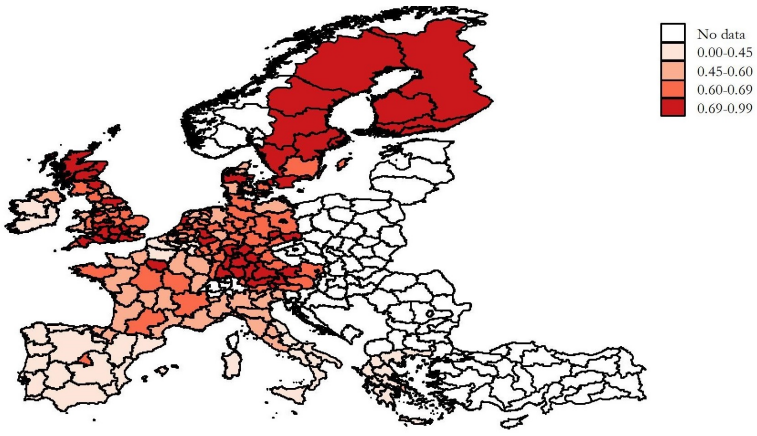
Well-being indicator

Aggregation and Normalisation

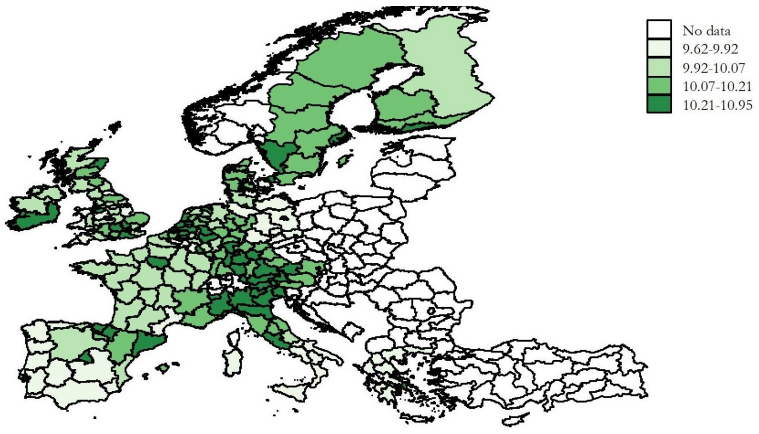
1. We check the respective correlations
2. We apply a min-max normalisation
3. We aggregate the indices into a unique well-being measure using arithmetic mean
4. To allow for intertemporal comparison, we again min-max normalise the index by year
5. The index ranges into (0,1) interval

All the data comes from Eurostat regional statistics, variables with many missing have been discarded (i.e. patent applications, R&D expenditure, etc).

Maps



Well-being 2000-2009



GDP 2000-2009

The two maps are similar but do not overlap, confirming that we are looking at two different phenomena (coef of corr= 0.59)

Methodological approach

- ESF funding is a **continuous treatment** so it is worth interesting to assess the **response** to different doses
- We focus on a **single programming period** and on the NUTS2 regions of EU15
- The **intensity measure** is normalised by considering the beginning-of-the-period population(or Gdp)-Cerqua and Pellegrini (2018) and Becker et al (2012)
- The treatment is **not normally distributed**, making not feasible the application of Generalised Propensity Score (Hirano and Imbens)
- We adopt a **parametric approach** to estimate the response of well-being to ESF doses
- Polynomials equation of different orders are estimated with **panel fixed effects**
- This approach allows to exploit the panel dimension of the data and to account for several type of **unobserved heterogeneity**
- Generalised Propensity Score is not considered at this stage
- We refer also to the method proposed by Cerulli (2014)

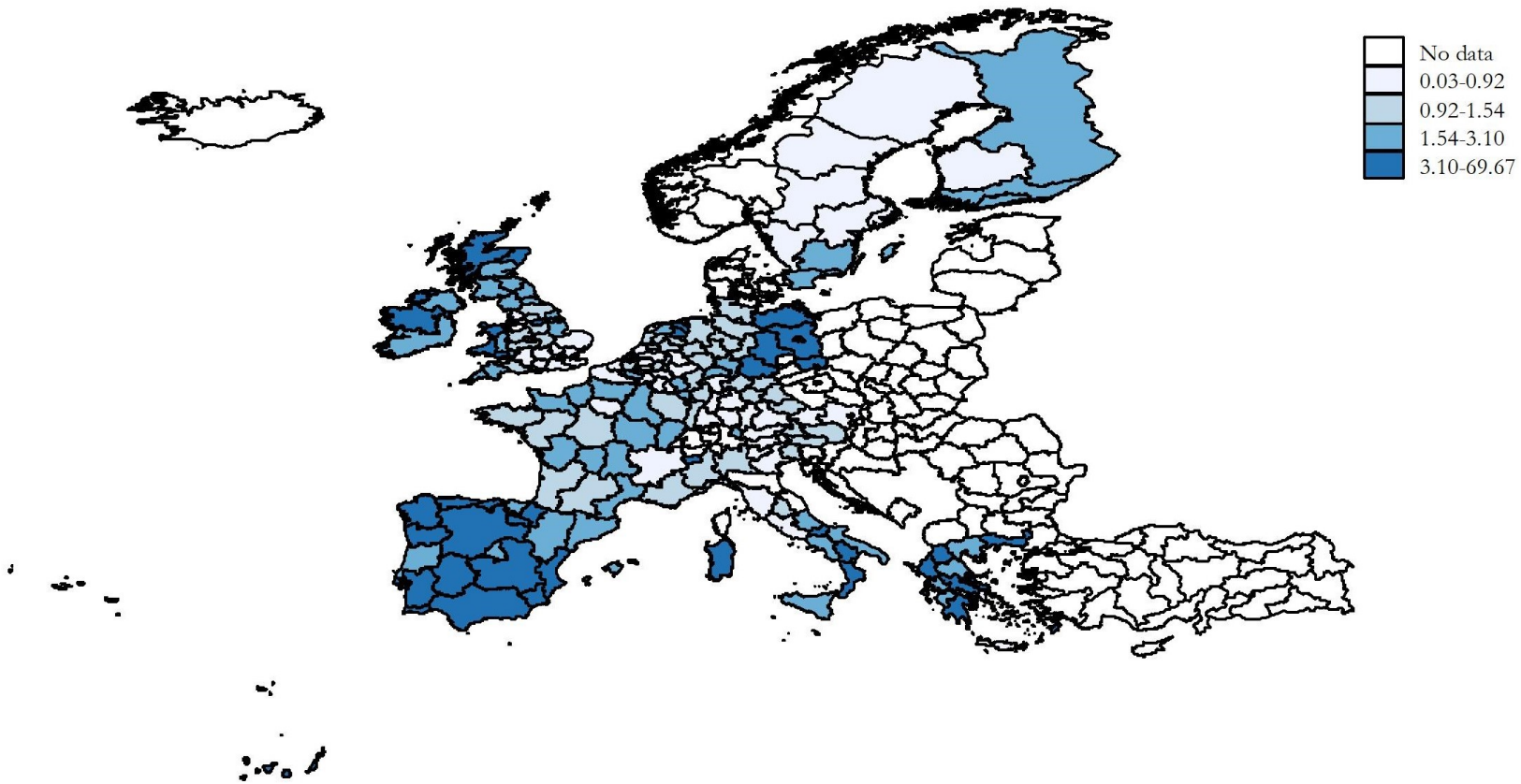
Baseline equation

$$gwb_{it} = \alpha + \beta_1 intensity_{it} + \beta_2 intensity_{it}^2 + \beta_3 intensity_{it}^3 + \gamma X_{it} + t + i + it + \epsilon_{it}$$

Where:

- gwb_{it} is the annual or bi-annual well-being growth rate
- $intensity_{it}$ is the treatment measure
- X_{it} are time varying control variables (log-gdp, education level 25-64, population density, unemployment rate 15-74, dummy for missing imputation)
- t are time fixed effects
- i are regional fixed effects
- ti are regional specific linear time trends

Modelled ESF expenditure



Modelled ESF expenditure (2000-2009)

European Commission

Preliminary findings

Before starting

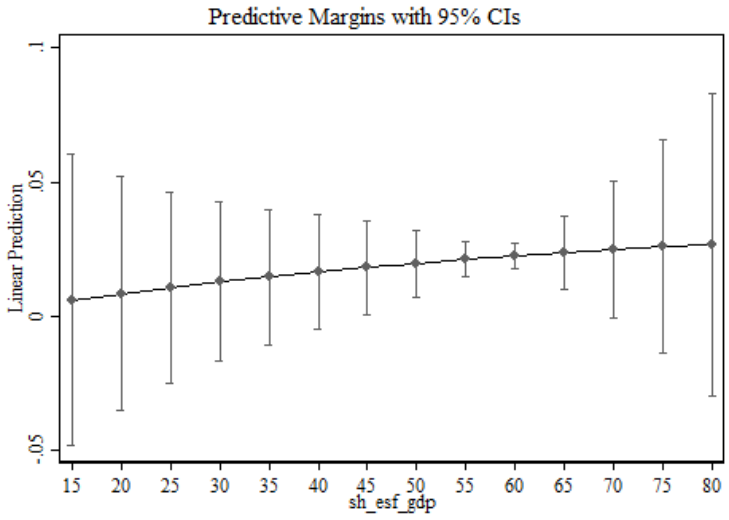
- Data on the regionalised annual expenditure of the programming period 2000-2006 is provided by DG REGIO in a recently published dataset (EC 2017, EC 2018) for 1989-2014
- We consider the annual and bi-annual growth rates of our well being indicator
- Missing values: we use linear ipolation to extrapolate the imputed value. We identify these values through a dummy variable, used as a control in the regressions

Treatment normalised by *bop* GDP

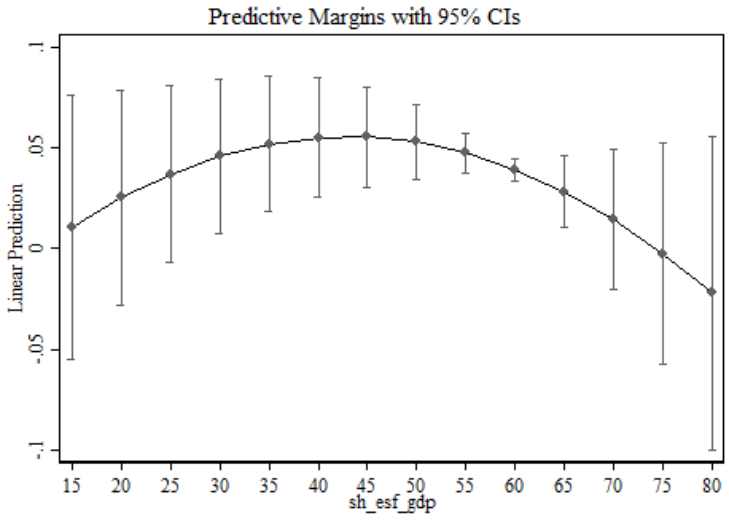
	(1) gwb	(2) gwb	(3) gwb	(4) gwb	(5) gwb2	(6) gwb2	(7) gwb2	(8) gwb2
intensity_esf_gdp	0.000512	0.000550	-0.00787	-0.0120	0.00465	0.00492*	0.000281	-0.0105
	(0.00190)	(0.00220)	(0.00995)	(0.0103)	(0.00294)	(0.00293)	(0.0120)	(0.0118)
intensity_esf_gdp^2	9.24e-07	-2.48e-06	0.000182	0.000270	-4.68e-05	-5.71e-05*	4.86e-05	0.000281
	(2.11e-05)	(2.41e-05)	(0.000218)	(0.000227)	(3.31e-05)	(3.31e-05)	(0.000274)	(0.000270)
intensity_esf_gdp^3			-1.22e-06	-1.84e-06			-6.49e-07	-2.30e-06
			(1.51e-06)	(1.58e-06)			(1.97e-06)	(1.93e-06)
Controls	no	yes	no	yes	no	yes	no	yes
Constant	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional trends	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,604	1,475	1,604	1,475	1,425	1,335	1,425	1,335
R^2	0.235	0.261	0.236	0.262	0.355	0.392	0.355	0.393
Number of codenuts	201	199	201	199	201	199	201	199

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Treatment normalised by *bop* GDP



Quadratic Function on annual growth



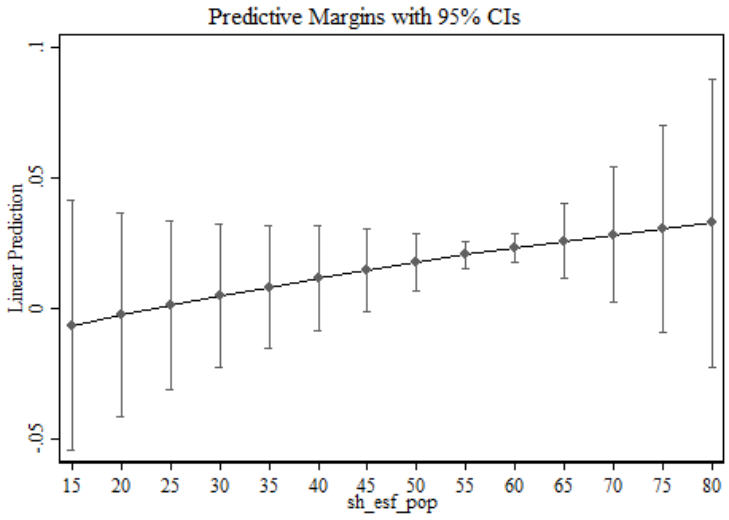
Quadratic Function on bi-annual growth

Treatment normalised by *bop* population

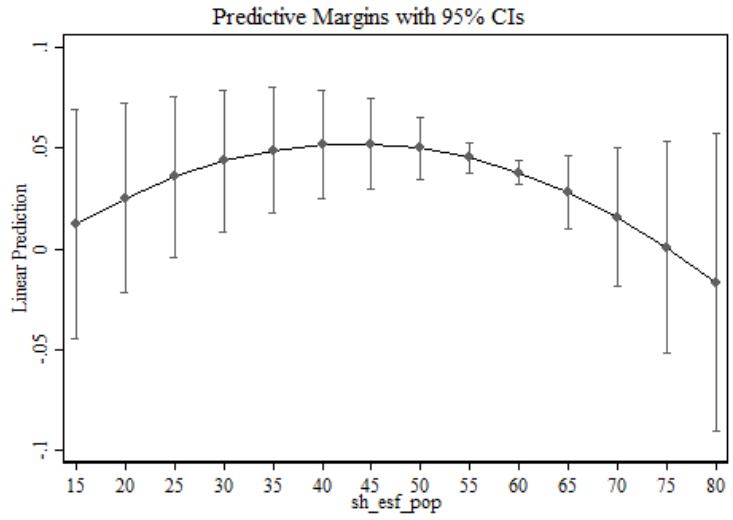
	(1) gwb	(2) gwb	(3) gwb	(4) gwb	(5) gwb2	(6) gwb2	(7) gwb2	(8) gwb2
intensity_esf_pop	0.000871	0.000874	-0.00940	-0.0129*	0.00398	0.00438*	0.00442	-0.00345
	(0.00166)	(0.00196)	(0.00751)	(0.00775)	(0.00252)	(0.00249)	(0.0102)	(0.00992)
intensity_esf_pop^2	-7.50e-07	-2.85e-06	0.000231	0.000309*	-3.97e-05	-5.07e-05*	-4.97e-05	0.000128
	(1.88e-05)	(2.20e-05)	(0.000170)	(0.000176)	(2.91e-05)	(2.90e-05)	(0.000236)	(0.000229)
intensity_esf_pop^3			-1.61e-06	-2.18e-06*			6.98e-08	-1.26e-06
			(1.21e-06)	(1.25e-06)			(1.71e-06)	(1.64e-06)
Controls	no	yes	no	yes	no	yes	no	yes
Constant	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional trends	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,604	1,476	1,604	1,476	1,425	1,335	1,425	1,335
R^2	0.237	0.261	0.238	0.263	0.364	0.401	0.364	0.401
Number of codenuts	201	199	201	199	201	199	201	199

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Treatment normalised by *bop* population



Quadratic Function on annual growth



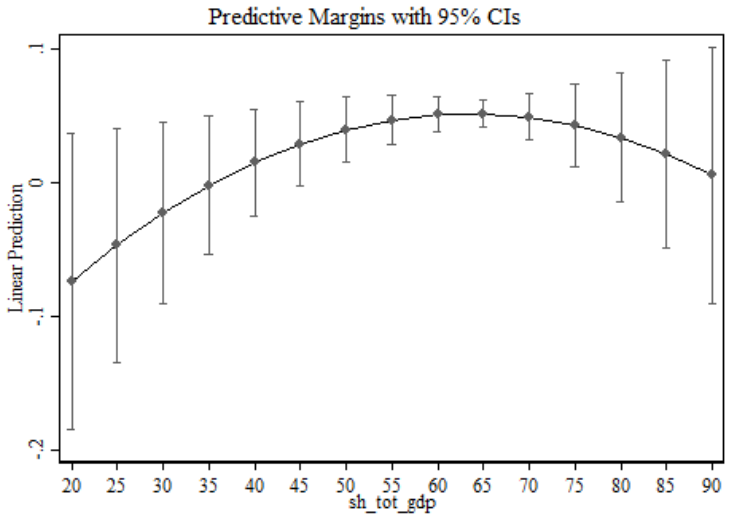
Quadratic Function on bi-annual growth

Treatment based on total transfers normalised by GDP

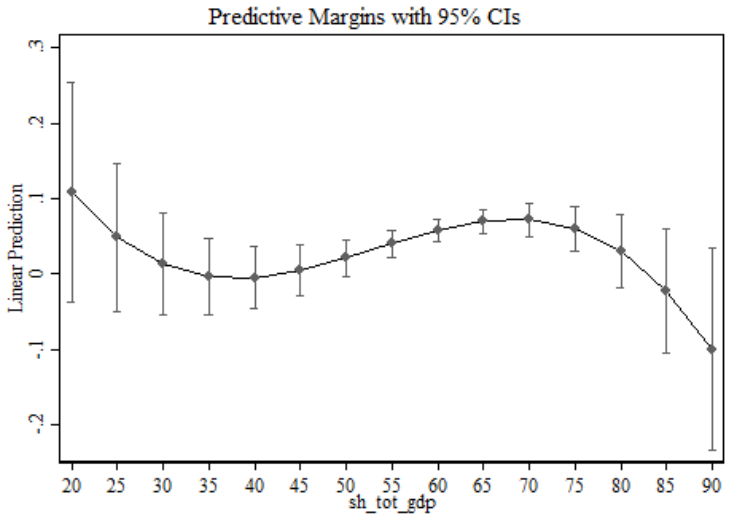
	(1) gwb	(2) gwb	(3) gwb	(4) gwb	(5) gwb2	(6) gwb2	(7) gwb2	(8) gwb2
intensity_tot_gdp	0.00197	0.00261	-0.0199*	-0.0226*	0.00742*	0.00840*	-0.0375**	-0.0430**
	(0.00224)	(0.00264)	(0.0120)	(0.0130)	(0.00400)	(0.00439)	(0.0164)	(0.0167)
intensity_tot_gdp^2	-1.11e-05	-1.94e-05	0.000389*	0.000440*	-5.24e-05	-6.61e-05*	0.000775**	0.000880***
	(2.12e-05)	(2.51e-05)	(0.000225)	(0.000244)	(3.56e-05)	(3.89e-05)	(0.000312)	(0.000312)
intensity_tot_gdp^3			-2.32e-06*	-2.66e-06*			-4.82e-06**	-5.51e-06***
			(1.35e-06)	(1.46e-06)			(1.90e-06)	(1.88e-06)
Controls	no	yes	no	yes	no	yes	no	yes
Constant	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional trends	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,597	1,469	1,597	1,469	1,417	1,326	1,417	1,326
R^2	0.239	0.250	0.241	0.253	0.354	0.388	0.361	0.397
Number of codenuts	195	193	195	193	195	193	195	193

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Treatment based on total transfers normalised by GDP



Quadratic Function on bi-annual growth



Cubic Function on bi-annual growth

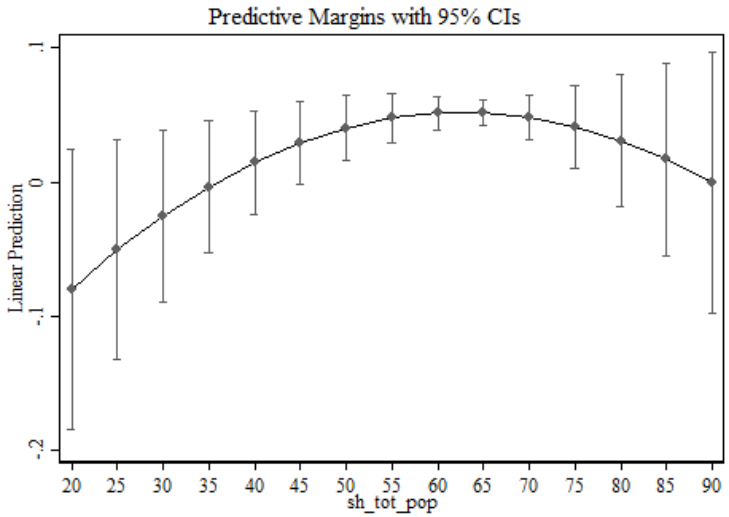
Treatment based on total transfers normalised by population

	(1) gwb	(2) gwb	(3) gwb	(4) gwb	(5) gwb2	(6) gwb2	(7) gwb2	(8) gwb2
intensity_tot_pop	0.000941	0.00152	-0.0179	-0.0213*	0.00772**	0.00900**	-0.0356**	-0.0429***
	(0.00214)	(0.00251)	(0.0112)	(0.0122)	(0.00382)	(0.00426)	(0.0143)	(0.0146)
intensity_tot_pop^2	-1.30e-06	-8.89e-06	0.000348	0.000416*	-5.54e-05	-7.16e-05*	0.000758***	0.000905***
	(2.06e-05)	(2.42e-05)	(0.000213)	(0.000233)	(3.48e-05)	(3.84e-05)	(0.000277)	(0.000280)
intensity_tot_pop^3			-2.05e-06	-2.50e-06*			-4.81e-06***	-5.80e-06***
			(1.29e-06)	(1.42e-06)			(1.72e-06)	(1.73e-06)
Controls	no	yes	no	yes	no	yes	no	yes
Constant	yes	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional FE	yes	yes	yes	yes	yes	yes	yes	yes
Regional trends	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,597	1,470	1,597	1,470	1,418	1,327	1,418	1,327
R^2	0.228	0.245	0.230	0.248	0.354	0.383	0.362	0.395
Number of codenuts	195	193	195	193	195	193	195	193

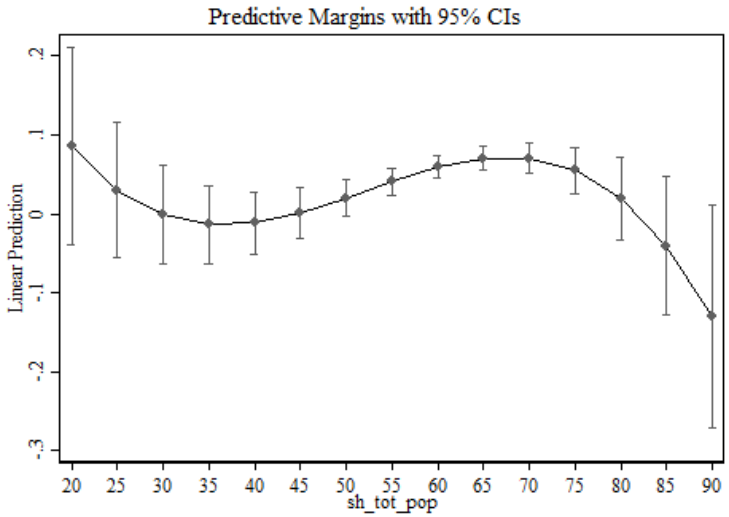
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Treatment based on total transfers normalised by population



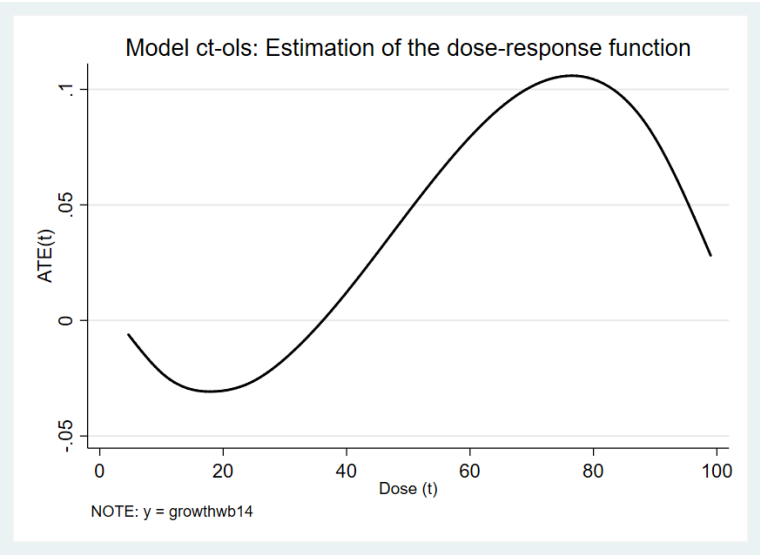
Quadratic Function on bi-annual growth



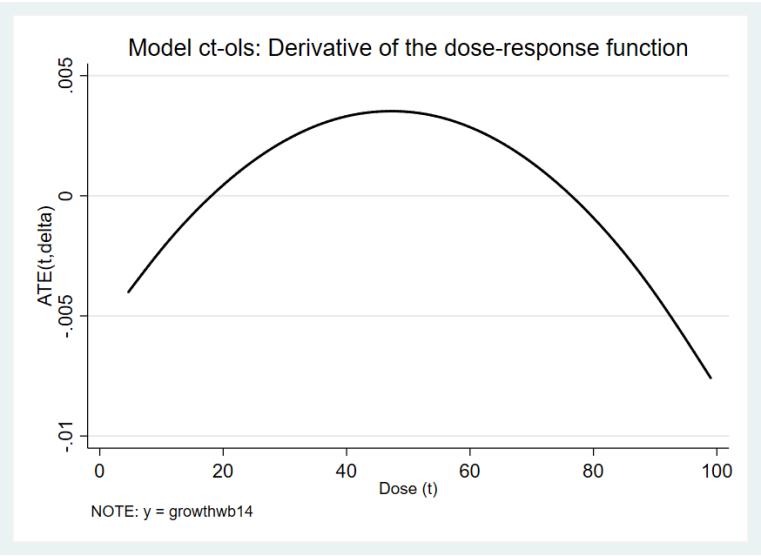
Cubic Function on bi-annual growth

Dose Response Function: ATE

A different methodological approach (Cerulli, 2014):



Cubic Function on the whole period growth rate



Derivative of the DRF

Concluding remarks

- The identification of the shape of the dose-response function yields to important policy implications:
  - optimal levels of transfers
  - expenditure efficiency
  - policy effectiveness
- Results are in line with the existing literature (Cerqua and Pellegrini 2018, Becker et al 2012) when using Gdp as an outcome variable and applying a continuous RDD and a GPS respectively.

Thanks

Questions?

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