Testing, not modelling, the impact of Cohesion support: a theoretical framework and some preliminary results for the Spanish regions

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1. INTRODUCTION

• Most existing estimates of the impact of Cohesion policies will not convince a skeptic

because they *assume* assisted projects are "just as good" as unassisted ones, and that is precisely what should be tested.

• A convincing test of the effectiveness of these policies has to be *falsifiable*,

i.e. based on a statistical model that could conceivably tell us that cohesion support has had little or no effect.

• This paper develops such a test and applies it to the case of infrastructure investment in the Spanish regions.

2. A *falsifiable* test of the effectiveness of cohesion support

• We need to allow assisted projects to be less (or more) effective than other projects of a similar nature.

• Let K^a and K^n denote the stocks of EU-assisted and non-assisted capital. I will assume that the *effective stock of capital* is given by

$$K_{it}^e = K_{it}^n + (1+\phi)K_{it}^a = \frac{K_{it}^n + (1+\phi)K_{it}^a}{K_{it}} K_{it} = \left[(1-\omega_{it}) + (1+\phi)\omega_{it}\right]K_{it} = \left(1+\phi\omega_{it}\right)K_{it}$$

where $K_{it} = K_{it}^n + K_{it}^a$ is the total stock of capital calculated in the usual way and ω_{it} the weight of assisted capital.

The parameter ϕ measures the *relative effectiveness of assisted capital*: if $\phi < 0$, subsidized projects are, on average, less productive than the rest.

• To complete the model, assume a Cobb-Douglas aggregate production function

$$(2)\quad Y_{it} = A_{it}\left((1+\phi\omega_{it})K_{it}\right)^{\theta_k} L_{it}^{\theta_l}$$

where Y is output, L employment, and A the level of technical efficiency.

Taking logs and then first differences of (2), and noting that

$$(3)\quad \ln(1+\phi\omega_{it}) \simeq \phi\omega_{it}$$

we have

$$(4)\quad \Delta \ln Y_{it} \simeq \Delta \ln A_{it} + \phi\theta_k \Delta\omega_{it} + \theta_k \Delta \ln K_{it} + \theta_l \Delta \ln L_{it}$$

where the symbol "Δ" denotes time differences (i.e. for any variable X, ΔX is defined as $\Delta X_{it} = X_{it+1} - X_{it}$).

- Equation (4) can be used to estimate ϕ and the remaining parameters of the model: assisted projects will be at least as good as other projects ($\phi \geq 0$) if, other things equal, output growth is not slower in times and places when the weight of assisted capital in the total stock (ω)is rising.

- The main problem in practice is *getting the right data*.

We need to know when EU grants get into the capital stock, i.e. when the money is actually spent (and on what).

Most available data are not very useful because they refer to budget commitments or to reimbursements, not to actual expenditure on the ground.

3. An extended model

- I extend the previous model to distinguish between infrastructures *(P)* and other capital *(K)* and to control for two other determinants of output growth: increases in human capital *(H)* and technological diffusion.

- The production function is of the form

$$(5)\quad Y_{it} = A_{it} K_{it}^{\theta_K} \left(P_{it}^{e}\right)^{\theta_p} L_{it}^{\theta_l} H_{it}^{\theta_h}$$

with CRTS in K, P and L for given H, i.e. $\theta_l = 1 - \theta_k - \theta_p$ and

$$(6)\quad P_{it}^{e} = P_{it}^{n} + (1+\phi) P_{it}^{a} = \left(1 + \phi\omega_{it}\right) P_{it}$$

- Putting things in per-worker terms and proceeding as above

$$(10)\quad \Delta q_{it} = \Delta a_{it} + \theta_k \Delta z_{it} + \theta_p \Delta x_{it} + \phi\theta_p \Delta \omega_{it} + \theta_h \Delta h_{it}$$

where

$$z = ln\ K/K, \quad x = ln\ P/L \quad \text{and} \quad q = ln\ Y/L$$

It is also assumed that

$$(11)\quad \Delta a_{it} = \eta_t + \lambda b_{it}$$

where η_t is a fixed period effect and b_{it} is a measure of the technological gap with the leading region (Madrid, *M*)

$$(12)\quad \begin{aligned} b_{it} = a_{Mt} - a_{it} = (q_{Mt} - \theta_k k_{Mt} - \theta_p x_{Mt} - \phi\theta_p \omega_{Mt} - \theta_h h_{Mt}) \\ - (q_{it} - \theta_k k_{it} - \theta_p x_{it} - \phi\theta_p \omega_{it} - \theta_h h_{it}) \end{aligned}$$

4. Data

• Thanks to the collaboration of the Spanish Ministry of Finance, I have been able to collect annual data (on *expenditure certifications*) that should approximate actual expenditure quite closely.

• The data include the Structural and Cohesion Funds (but not the Initiatives) and are broken down by year, region and function.

• *Problem*: (so far) I have data only for 2000-06. Hence, the number of observations is small and what we are really testing is whether assisted expenditure in this period is different from all other expenditure (non-assisted expenditure in this period and all other expenditure in previous years). Both things make it more likely that we may fail to detect differences.

- I will concentrate on infrastructure expenditure.

This is the largest expenditure category in Spain. For 2000-06 it adds up to 35 billion euros (including national co-financing),

and absorbs 44% of total EU-assisted expenditure.

- Deflated flows of assisted expenditure are accumulated using a perpetual inventory procedure to construct stocks of assisted infrastructure capital and to calculate its weight in the total stock (ω).

5. Results

• Output elasticities are within the range of previous studies and seem reasonable overall. Infrastructure coefficient implies large social returns to investment.

• Estimates of the *relative effectiveness parameter*

- Never significantly different from zero: no evidence that assisted projects are more or less effective than unassisted ones.

- Point estimate is large and positive when we don't control for the technological gap, but most likely due to an omitted variable bias.

- When we control for the gap, sign varies depending on details of the specification, but *t* ratios are extremely low.

Table 1: Estimation results

	[1a]	*[1b]*	*[2a]*	*[2b]*	*[3a]*	*[3b]*
infrastructure	*0.0793*	*0.0794*	*0.0764*	*0.0765*	*0.0868*	*0.0868*
	(4.06)	(4.06)	(4.26)	(4.26)	(4.89)	(4.87)
other capital	0.2513	0.2519	0.2201	0.2199	0.2249	0.2250
	(6.52)	(6.51)	(5.73)	(5.70)	(5.83)	(5.81)
schooling	0.9200	0.8871	0.8669	0.8715	0.8614	0.8604
	(3.70)	(3.25)	(4.02)	(3.94)	(4.40)	(4.33)
gap at 00 prices			0.0281	0.0281		
			(7.32)	(7.25)		
gap at av. prices					0.0341	0.0341
					(6.87)	(6.81)
ϕ		***0.940***		***-0.299***		***0.093***
		(0.29)		***(0.11)***		***(0.04)***

- *Note:* all equations contain a full set of period fixed effects. *t* values are shown in parentheses below coefficient estimates.

6. Conclusion

- The results are encouraging but still tentative:

- No evidence that cohesion aid results in the funding of low-quality projects or translates into increases in unit costs

- But estimates are not as precise as we would like, most likely due to the small number of observations available.

- It is very important to collect the right kind of data if we want to be able to perform serious evaluations. Data collection needs to be built into program design and the management system if we want to learn what works and what doesn't.