Fertile Soil for Structural Funds? A panel data analysis of the conditional effectiveness of European cohesion policy

Ederveen, S.; de Groot, H.L.F.; Nahuis, R.

published in
Kyklos
2006

DOI (link to publisher)
10.1111/j.1467-6435.2006.00318.x

document version
Publisher's PDF, also known as Version of record

KYKLOS, Vol. 59 – 2006 – No. 1, 17–42

Fertile Soil for Structural Funds? A Panel Data Analysis of the Conditional Effectiveness of European Cohesion Policy

Sjef Ederveen, Henri L.F. de Groot and Richard Nahuis*

I. INTRODUCTION

Structural Funds are the most important policy instrument used by the European Union (EU) to promote regional development of its member states and to speed up the process of convergence. At present, it covers about a third of the total EU budget[1]. An important question is how effective these funds are in promoting economic growth and reducing welfare differences in the EU. In the light of the recent enlargement of the EU this question becomes even more pressing. This paper aims at empirically investigating this question.

This paper relates to a quickly expanding literature that evaluates the effectiveness of the European cohesion policy. Basically, three evaluation methods are used: model simulation, case studies and econometric evaluation. For a recent review of the different economic evaluation methods, we refer to Ederveen et al. (2002). The econometric evaluations, to which this study belongs, consist of analyses of regional economic growth (see, for example, Boldrin and Canova 2001, Dall'erba and Le Gallo 2003) or studies that examine the impact of cohesion policy within one specific country (see, for example, De la Fuente and Vives 1995, on Spain). This paper complements the

* Sjef Ederveen and Henri de Groot would like to dedicate this article to the memory of Richard Nahuis, who so sadly and unexpectedly passed away during the proof reading stage of this article. Sjef Ederveen is affiliated to the CPB Netherlands Bureau of Economic Policy analysis, P.O. Box 80510, 2508 GM The Hague, The Netherlands, email: ederveen@cpb.nl. Henri L.F. de Groot is affiliated to the Department of Spatial Economics of the Vrije Universiteit Amsterdam, the CPB Netherlands Bureau for Economic Policy analysis and the Tinbergen Institute, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands, email: hgroot@feweb.vu.nl. We acknowledge the referees of this journal and the managing editor, as well as Rob Alessie, Casper van Ewijk, Raymond Florax, Harry Garretsen, Joeri Gorter, Theo van de Klundert, Ruud de Mooij and Miguel Portela for useful comments and discussion. The usual disclaimer applies. Henri de Groot is grateful to NWO for financial support.

1. A short overview of European Cohesion policy and its history is presented in *Appendix A*.

class of econometric evaluations by performing a cross-country panel data analysis[2].

The country-level analysis has important merits. First – compared to regional growth regressions – the analysis is less sensitive to leakage or spillover effects. Spillover effects occur, for example, when a backward region improves its infrastructure, while as a consequence a construction firm in a wealthy neighbouring region experiences a positive demand shock. Second, the allocation of funds across regions might be sensitive to crowding out (that is, national governments changing the allocation of their support to backward regions in response to receipts from the EU). The analysis of the effectiveness of the EU support on a regional level is troubled by such a mechanism; the country-level analysis on the contrary is insensitive for this. Third, a country-level analysis allows one to control for variables that are unavailable at the regional level. Obvious examples are educational attainment rates, which are only reliable on a country level, and institutional quality variables, which are not available on a regional level. Fourth, regional growth analyses suffer from a severe selection problem. A country-level analysis substantially lessens this problem. As Structural Funds are allocated to regions in a non-random way – the funds are allocated to regions that are relatively poor – the regional growth analysis suffers from an endogeneity problem. Given that all countries have regions that are relatively poor, even from a European point of view, this endogeneity problem (which is otherwise hard to solve) is much less of a problem.

In its approach, this paper bears close similarity to that of Burnside and Dollar (2000). They assess the effectiveness of aid on growth with a focus on less developed countries. Their major result is that aid is at best conditionally effective: only countries with relatively solid domestic policies are positively affected by aid. They measure good policies by an openness variable capturing among others the black market premium, inflation and the budget deficit (cf. Sachs and Warner 1995). In a related paper, Gallup et al. (1999) show that locational factors are relevant in explaining growth differences. Their basic argument is that landlocked regions are more vulnerable to policy-induced inefficient allocations of scarce resources as opposed to open regions.

Building on these ideas, this paper aims to assess whether Structural Funds are effective, and what conditions affect the effectiveness. The paper has two major results. First, we show that Structural Funds as such do not explain growth differentials among the member states. Second, however, Structural Funds allocated to economies with 'good' institutions are effective. The quality

2. The only other paper using pooled cross-section analysis that we are aware of is Beugelsdijk and Eijffinger (2005). Compared to our study, their analysis covers a shorter time span and lacks a clear link with theoretically based econometric growth studies.

of institutions will – in the context of this study – be proxied by several quantitative measures, including corruption, inflation and openness. Hence, EU support is conditionally effective.

Apart from assessing the (conditional) effectiveness of Structural Funds and the type of conditions that are important, this paper contributes to the literature on growth more generally. Especially, by focussing on support to countries in the European Union, the paper adds to the literature on the conditionality of aid that has so far focussed on aid to less developed countries (see, for example, Burnside and Dollar 2000, Easterly 2003 and Hudson 2004[3], for recent contributions to this rapidly expanding field of research)[4].

We proceed as follows. Section II presents the theoretical background of the model that we estimate. Section III presents the basic regression results, whereas Section IV explores a wide variety of institutional variables. Section V examines the robustness of the results. The conclusions are contained in Section VI.

II. THEORETICAL CONSIDERATIONS

The aim of this section is to provide the theoretical background for the empirical analysis that will follow. In doing so, we avoid developing a full-fledged theoretical model. For such a model, we refer to Burnside and Dollar (1997), who have shown how aid can straightforwardly be incorporated into an otherwise standard neoclassical growth model.

The major variable of interest for this study is the amount of Structural Funds (SF) received by a country. In analysing the effectiveness of these Structural Funds in stimulating growth, it is important to realize (i) that the Structural Funds can be seen as an income transfer, (ii) that the Structural Funds have to be co-funded by the receiving country, and (iii) that the Funds often have to be spent on pre-specified projects. Given these characteristics, it is impossible to formulate an unambiguous hypothesis on the expected effect of Structural Funds on economic growth. Depending on the circumstances, the effect can be positive, negative or zero. If aid by means of the provision of Structural Funds were seen as an unconditional transfer, the GDP of an economy that is located on the production frontier would not be affected and the expected coefficient would be zero[5]. We can rule this out, however, as the

3. This paper forms the introduction to a feature of *The Economic Journal* on 'Aid and Development', which also contains interesting papers by Dalgaard et al. (2004), Mosley et al. (2004) and Collier and Dollar (2004).
4. In addition, we find that the augmented neoclassical model – the Mankiw, Romer and Weil (1992) version – is well suited to describe European growth. In establishing this result, we make use of the new data on human capital constructed by De la Fuente and Doménech (2000).
5. GNP would be affected immediately.

EU requires the Structural Funds to be invested. The basic hypothesis in a neoclassical framework would hence be that the Structural Funds would foster economic growth as they increase the rate of investments. Three important reservations have to be made, however. First, the Funds are often required to be invested in specific projects. These projects need not be growth promoting, but might – for example – enhance cultural or environmental values. Furthermore, these projects can absorb complementary factors such as human capital that would otherwise be allocated towards potentially more attractive activities in terms of growth. Second, the Structural Funds have to be co-funded by domestic tax revenues. In a case where taxation is highly distortionary, the net growth effect may well be negative. Third, corruption may take Funds away from productive activities.

The bottom line of this discussion is that the Structural Funds are at best conditionally effective. These conditions determine the type of project that is financed by means of the Structural Funds, the distortions resulting from the required co-funding, and the potential distortions in the allocation of production factors. In operationalising these ideas, we assume that the effectiveness of investments depends on the 'institutional quality' of the receiving country. Though the literature on growth convincingly argues that 'institutions matter', the operationalisation of the concept is more controversial. The details of our operationalisation can be found in *Appendix B*, but in this section we discuss the theoretical considerations behind the indicators.

In assuming the Structural Funds to be conditionally effective, the basic idea is that resources can be allocated either toward productive activities or to 'rent-seeking' activities and that the set of rules and institutions in a country determines this allocation. The effectiveness of Structural Funds might thus depend on this allocation and the Structural Funds might even affect this allocation. Let us give three concrete examples of how this could work. First, Structural Funds could provide attractive, profitable options for public officials to obtain private benefits, in case of a lack of accountability. Murphy et al. (1991) show that increased opportunities for rent seeking might induce an allocation of talent that is harmful to economic growth. Second, barriers to international trade cause an inefficient allocation of resources and can provide ample opportunities for diversion activities; extracting part of the duty payments might, for example, raise the net benefit of a customhouse official (see Hall and Jones 1997)[6]. On a similar note, less open economies typically experience less policy competition on politicians and they might therefore be induced to answer the calls of special interest groups. Therefore the institutional quality of closed economies tends to be worse. We can therefore

6. Although it can be optimal to set a positive tariff if a country has market power, setting a tariff could create lucrative opportunities for rent seeking.

hypothesise that economies that are less open face more problems in efficiently allocating the Structural Funds to the most growth-promoting projects, implying – *ceteris paribus* – that the effectiveness of the Structural Funds is conditional on openness. Third, for the allocation of the Structural Funds between productive and unproductive projects, more efficient transactions in the market support productive activities. For efficient market transactions, contract enforcement is crucial. Corruption and low bureaucratic quality undermine this. Alternatively, as Knack and Keefer (1997) argue, trust is important to overcome contractual incompleteness. Building on these theoretical ideas, we will select several proxies that we use as conditioning variables to analyse the effectiveness of Structural Funds in promoting economic growth and convergence.

III. REGRESSION RESULTS

Given the aspects that we have argued to be relevant in analysing the effectiveness of Structural Funds, we estimate the following pooled cross-section regression equation:

$$g_{it} = \beta_0 + \beta_1 \ln(y_{it}) + \beta_2 \ln(s_{k,it}) + \beta_3 \ln(s_{h,it}) + \beta_4 \ln(n_{it} + g_A + \delta) + \beta_5 SF_{it} + \beta_6 COND_{it} SF_{it} + \varepsilon_{it} \quad (1)$$

where the dependent variable g_{it} is the average annual growth rate of real GDP per capita over the period under consideration[7]. As in the standard framework of Mankiw, Romer and Weil (1992; henceforth MRW), we include as explanatory variables initial GDP per capita in constant 1995 dollars (y_{it}), the average gross domestic savings rate ($s_{k,it}$), the rate of human capital accumulation ($s_{h,it}$), the population growth rate (n_{it}), the exogenous rate of technological progress (g_A), and the rate of depreciation (δ). Most of these variables are taken from the World Development Indicators (World Bank 2000). Our proxy for human capital is taken from De la Fuente and Doménech (2000). A more detailed discussion of sources and definitions of all the data is relegated to *Appendix B*. In measuring European aid, we restrict attention to the European Regional Development Fund (ERDF). This is by far the most important of the funds and especially meant to help relatively poor EU members. *Appendix A* provides further information on European cohesion policy and the distribution of Structural Funds over the member states. In the regression equation, we use the natural logarithm of 1 plus the amount of Structural Funds as a fraction of GDP[8], indicated by the variable SF_i. Finally,

7. For a period of T years starting at $t=t_0$, we define the growth rate of x as $g_{t0} = [\ln_{(t0+T)} - \ln(x_{t0})]/T$.
8. We add 1 to the share of Structural Funds as a fraction of GDP because this share can be zero and we want to include the natural logarithm of Structural Funds in the regression equation.

$COND_i$ denotes a conditioning variable capturing aspects of the institutional quality of the country. We will specify this variable later in this section in greater detail.

We use data for thirteen EU countries[9] (Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom). Our panel data set covers seven five-year periods from 1960–1965 through 1990–1995. Following Islam (1995), an observation in our data set thus captures a country's performance averaged over a five-year period.

In a recent review of the convergence literature, Islam (2003) discusses the potential of different methods to study convergence in some detail and concludes that '[o]verall, the panel approach has several advantages in convergence research' (p. 332). That is not to say that it is without problems. One problem is the frequency with which data are considered. The use of five-year spans is defended by Islam (2003).

Another problem is the possibility of small sample bias. Many different estimators have been developed to estimate dynamic panel data models. Theoretical properties of most of these estimators are asymptotic and similar. In most of the remainder, we use pooled OLS to estimate the dynamic panel data model. In Section V we also present estimates obtained with country- and period-specific fixed effects estimators and the GMM estimators of Arellano and Bond (1991) and Blundell and Bond (1998). The results are comparable to those in our basic specifications with respect to the effect of Structural Funds[10].

As is standard in the growth literature, we take $g_A+\delta$ to be equal to 5% for all countries and time periods (see, e.g., MRW). Note that by putting $\beta_5=\beta_6=0$, we have the standard neoclassical growth model as it was introduced and empirically estimated in a cross-country context by MRW (1992) and later extended to a panel-data context by Islam (1995). As a point of reference, we first estimate this basic MRW model. The results are presented in the first column of *Table 1* and are consistent with theoretical predictions[11]. Furthermore, the null hypothesis that the parameters for s_k and s_h sum to the negative of the parameter for the population growth is not rejected. Therefore, in the second column we show the results of the restricted regression. From these

9. We do not include Germany, because of the structural break in the data due to unification, or Luxembourg, because human capital data are unavailable.
10. We have two reasons for not using country- and period-specific fixed effects in our basic specifications. First, we use institutional variables that have no – or at best limited – time-series variation. Second, fixed effects do not 'explain' growth economically but only statistically, and thereby essentially capture merely 'the measure of our ignorance'.
11. We also performed regressions with the Barro-Lee human capital data, but the results were less satisfactory in terms of statistical significance and goodness of fit. We take this as evidence for the superior quality of the data by Doménech and De la Fuente.

Table 1

The conditional effectiveness of Structural Funds: main results
(OLS, dependent variable: growth of GDP per capita)

	Basic	Restricted	Basic with SF	SF and Institutional Quality
Log of initial GDP per capita	−0.028***	−0.026***	−0.028***	−0.028***
	(0.005)	(0.005)	(0.005)	(0.005)
Log of investment rate	0.020**	0.018*	0.018*	0.020**
	(0.009)	(0.009)	(0.009)	(0.009)
Log of human capital	0.023*	0.018*	0.023*	0.022*
	(0.012)	(0.011)	(0.012)	(0.012)
Log of (population growth +0.05)	−0.023		−0.030	−0.024
	(0.019)		(0.021)	(0.020)
Structural Funds			−0.015	−0.141***
			(0.012)	(0.043)
Structural Funds * Institutional Quality				0.018**
				(0.007)
Constant	0.202***	0.158***	0.190***	0.208***
	(0.055)	(0.033)	(0.057)	(0.058)
Adjusted R^2	0.44	0.45	0.46	0.51
Joint significance test *SF* variables				11.91***
# panel observations	91	91	91	91

Notes: White heteroskedasticity-consistent standard errors are reported in parentheses.***, **, and * denote significance at 1, 5 and 10 per cent levels, respectively. The test for the joint significance of the Structural Funds variables is a Wald test, testing the null-hypothesis that the coefficients for the Structural Funds variables (in levels and interacted with institutional quality) are equal to zero. See *Appendix B* for details about the variables and their sources.

results, we can infer the rate of convergence and the production elasticities of physical and human capital (corresponding to the respective capital income shares). These values are 0.027, 0.292 and 0.292[12]. The rate of convergence is slightly higher than the OECD estimates obtained by MRW. The capital income share of 0.29 is fairly close to the common sense value of one-third. The results thus support the validity of the augmented neoclassical growth model in explaining economic growth in EU countries.

To assess the effectiveness of European cohesion policy, we start by including the variable *SF* in the basic regression Section V. The other parameters are hardly influenced by this, as can be seen from the results in the third column of *Table 1*. The impact of the Structural Funds itself is not significant. If anything, Structural Funds are found to have a negative impact on economic growth[13].

12. The rate of convergence (λ) is solved from $-0.026*5=-(1-e^{-5\lambda})$. Solving for α and β requires using the first three estimated coefficients (see Islam 1995).
13. It may take some time for the effects of Structural Funds to show up in countries' growth performance. Although our results are based on periods of five years, one can imagine that time lags are longer than this. For this reason, we have also included Structural Funds one period lagged (viz. a period of five years). This hardly affects the results (see Section V).

Next, we explore the question of conditionality. As explained in Section II, our basic idea is that Structural Funds may only be beneficial if the recipient country uses them in productive projects. However, if they are used to continue intrinsic loss-making activities, they obviously will not have a positive effect. We use a measure for institutional quality to control for this. In the specifications in *Table 1*, the measure that we use is the institutional quality index from Sachs and Warner (1995); see *Appendix B* for details.

Including the interaction term of *SF* and institutional quality, the results become markedly different, as can be seen from comparing the last two columns in *Table 1*. The measure for Structural Funds remains negative and becomes significant, whereas the interaction of Structural Funds with institutional quality is significantly positive[14]. A Wald test confirms that the two coefficients are statistically jointly highly significant. This suggests that economies with good institutional quality benefit from the funds whereas those with bad institutions lower their growth performance. That Structural Funds are only conditionally effective is our basic result. In the next section we will perform a robustness check on our results by using a wide range of alternative measures to proxy for 'institutional quality'.

IV. DIFFERENT MEASURES FOR INSTITUTIONAL QUALITY

The empirical growth literature is frequently plagued by the criticism that 'everything can be shown, provided that 'good' proxies are used'. To avoid this kind of critique this section presents regression results with different variables that proxy for 'institutional quality'. By using a wide range of proxies, we intend to provide a fair, complete and reliable view of the conditional effectiveness of Structural Funds.

We distinguish three broad groups of institutional quality variables that we will use as conditioning variables (*COND*) in estimating our regression model introduced in Section III. First, there are variables directly related to the outcomes of government policy: inflation and the government savings. Although admittedly crude, inflation can be seen as an indication of the degree to which governments give in to certain pressures. Central government savings indicates the extent to which governments absorb financial resources available in a country. Second, we have variables that can be summarized as indicating social cohesion. We report results on trust. This proxy is also used by, for

14. The results are hardly affected when the institutional quality variable is included separately in the regression equation. See Section V for more details. Here, we focus on the specification excluding institutional quality in levels. This choice is based on statistical grounds (institutional quality itself is insignificant) as well as on reasons of presentational clarity.

Table 2

Different measures for institutional quality
(OLS, dependent variable: growth of GDP per capita)

	Institutional conditioning variable			
	Inflation	Trust[a]	Openness	Corruption
Log of initial GDP per capita	−0.027***	−0.024***	−0.025***	−0.027***
	(0.005)	(0.005)	(0.005)	(0.005)
Log of investment rate	0.024**	0.024**	0.020**	0.020**
	(0.009)	(0.010)	(0.009)	(0.009)
Log of human capital	0.018	0.016	0.014	0.019
	(0.012)	(0.013)	(0.012)	(0.012)
Log of (population growth +0.05)	−0.037*	−0.025	−0.034*	−0.028
	(0.020)	(0.020)	(0.019)	(0.020)
Structural Funds	−0.184*	−0.047	−0.285***	−0.112***
	(0.098)	(0.035)	(0.082)	(0.033)
SF * Conditioning variable	0.109	0.002	0.064***	0.016**
(see column header)	(0.066)	(0.001)	(0.021)	(0.006)
Constant	0.170***	0.187***	0.165***	0.193***
	(0.056)	(0.057)	(0.053)	(0.056)
Adjusted R^2	0.49	0.44	0.53	0.51
Joint significance test *SF* variables	5.69***	1.04	13.94***	11.55***
# panel observations	91	84	91	91

Notes: White heteroskedasticity-consistent standard errors are reported in parentheses. ***, **, and * denote significance at 1, 5 and 10 per cent levels, respectively. The test for the joint significance of the Structural Funds variables is a Wald test, testing the null-hypothesis that the coefficients for the Structural Funds variables (in levels and interacted with institutional quality) are equal to zero. Results including the institutional conditioning variable in levels in the regression equation can be found in the Annex to this paper at www.henridegroot.net/downloads.asp. See *Appendix B* for details about the variables and their sources.
[a]The 'trust variable' is not available for Greece.

example, Knack and Keefer (1997)[15]. The third group of indicators aims to measure institutional quality directly by using a corruption perception index, openness or an index for the quality of governance. *Appendix B* discusses the sources and definitions of these indicators in more detail.

Table 2 reports the estimation results when different indicators are used for the conditioning variable $COND_i$ in the basic regression equation (results for other proxies are available in *Appendix C*). A first general remark is that the regression results as far as the effects of savings in physical and human capital and (conditional) convergence are concerned are hardly affected by the use of different proxies for institutional quality.

15. Results using proxies such as norms of civic cooperation and ethnolinguistic fractionalization are comparable and available upon request.

In the first column we report the conditionality of SF aid on inflation[16]. The interaction term is borderline significant at the 10% level (p-value=0.104). Hence, the soil for SF aid is more fertile if inflation is low. For the governmental budget (detailed results can be found in *Appendix C*) we cannot draw an analogous conclusion; budget deficits are not significantly affecting the effectiveness of SF. Of the measures for social cohesion we report only the trust variable (the others basically tell the same story). Although the estimated coefficients have the same signs as with the other indicators, the impact of social cohesion variables for enhancing the effectiveness of SF aid is not significant.

A different proxy for institutional quality is the degree of openness of a country, i.e., the degree in which a country faces foreign competition. Openness is defined as the natural logarithm of exports plus imports divided by GDP[17]. The basic idea is that this openness variable captures the pressure on countries to efficiently use the Structural Funds. Openness is – at best – an imperfect proxy[18], but it has the advantage of greater data availability for the accession countries. Openness seems to be a good proxy, as it gives results comparable to the institutional quality measure in *Table 1*.

The last column reports the results for another fairly direct measure of institutional quality, viz. corruption. This also gives rise to a roughly similar and highly significant result. The same conclusions are reached when we use the Governance Indicators constructed by Kaufmann et al. (2002). The results for some of these regressions are relegated to *Appendix C* as these indicators are less widely used than the ones we discuss here. The evidence therefore clearly suggests that SF aid is more effective in countries with high-quality institutions or with low perceived corruption.

In the remainder of this paper, we consider the specifications with institutional quality and corruption as our most preferred specifications. As said before, we also use the openness specification as the data availability for openness is better. In order to give some more feeling for the economic significance of our results we report in *Table 3* for illustrational purposes – for our three preferred specifications – the implied semi-elasticity of the SF for

16. For comparability with the other institutional variables we use four minus the log of average inflation. In that case the resulting variable is positive and a higher value reflects higher institutional quality.
17. We could alternatively use imports (or exports) divided by GDP, but these measures are highly correlated and the results are hardly affected by the choice for a particular proxy.
18. Openness is a 'catchall' variable. It, for example, depends on the size of the country. To assess its validity in a simple way, we have determined the correlation of our openness variable with the more generally accepted openness variable that was constructed by Sachs and Warner (1995) for a much more extensive cross-section of countries (we did not use the Sachs and Warner index itself in our analysis for EU countries, because then almost all EU countries would be labelled as open). The correlation between these two measures of openness is obtained from a simple linear regression equation and equals 0.28 (p-value=0.002). Details are available upon request.

Table 3

Implied semi-elasticities for three specifications for EU–15

SF and institutional quality		SF and corruption		SF and openness	
Greece	−1.58	Greece	−1.56	Italy	−2.90
Spain	−0.31	Italy	−1.43	France	−2.84
Portugal	−0.16	Belgium	−0.33	Germany	−2.55
Italy	0.20	Portugal	−0.31	Spain	−2.25
Ireland	0.24	France	−0.21	United Kingdom	−2.16
France	1.49	Spain	0.08	Finland	−1.90
United Kingdom	1.58	Ireland	0.44	Greece	−1.55
Austria	1.71	Germany	0.56	Sweden	−1.49
Germany	1.87	Austria	1.01	Denmark	−1.04
Sweden	1.96	United Kingdom	1.56	Portugal	−0.45
Finland	1.98	Luxembourg	1.95	Austria	−0.40
Denmark	2.01	The Netherlands	2.14	The Netherlands	0.76
Belgium	2.03	Sweden	2.35	Ireland	0.93
The Netherlands	2.17	Denmark	2.93	Belgium	1.84
Luxembourg	2.30	Finland	3.32	Luxembourg	3.53

different countries discussed above. These implied semi-elasticities measure the predicted increase in the growth rate (in percentage points) in response to a 1%-point increase in the share of Structural Funds in GDP, taking into account the institutional quality of the country in question. For example, an increase in the amount of Structural Funds of 1% of GDP to be received by Greece results in a reduction of the growth rate of 1.58 percentage points (based on the results taking institutional quality as the conditioning variable). The countries are ordered by the size of the elasticity[19]. A few results stand out. First, in Greece and Portugal the elasticity is negative in all specifications. Second, the southern EU members tend to be clustered around the low and negative values of the elasticity whereas the northern EU members are clustered around the high and positive elasticities, representing relatively aid-conducive institutions. Third, the current allocation of the ERDF is largely focussed on the countries with negative elasticities[20]. Another way of illustrating the economic meaning of our results is to determine the contribution of the actually received amount of Structural Funds to the explained part of the growth rate (viz. $\beta_5 \cdot SF + \beta_6 \cdot COND \cdot SF$ in equation (1)). If we take Spain, Ireland and the Netherlands as examples, the results reveal that the actually received amount of Structural Funds to the explained part of the growth rate for these three countries equals, respectively, −0.36%-points, 0.31%-points and 0.03%-points (derived

19. The elasticities are calculated for all EU countries. We use the observations for the last 5-year period for the conditioning variables to calculate the elasticity.
20. See *Appendix A* for a brief account of the allocation of the ERDF and Ederveen et al. (2002) for more details.

Table 4

Implied semi-elasticities for accession countries

SF and institutional quality		SF and corruption		SF and openness	
Malta	−3.85	Romania	−4.62	Turkey	−4.08
Turkey	−3.35	Latvia	−3.95	Poland	−2.76
Cyprus	−2.49	Turkey	−3.72	Romania	−2.32
		Slovak Republic	−3.61	Hungary	−1.28
		Bulgaria	−3.38	Bulgaria	0.09
		Czech Republic	−3.38	Lithuania	0.76
		Poland	−3.16	Czech Republic	0.86
		Lithuania	−2.37	Cyprus	0.91
		Slovenia	−1.91	Latvia	1.05
		Hungary	−1.80	Slovak Republic	1.27
		Estonia	−1.46	Slovenia	1.87
				Estonia	2.41
				Malta	3.72

from the regression equation using institutional quality as the conditioning variable) [21].

In order to assess the implications of these results for the countries that recently joined the European Union or that intend to enter in the (near) future, we have calculated the implied semi-elasticities for these countries (note that for institutional quality and corruption, we do not have data for all accession countries). In interpreting these results, one has to keep in mind that these results are based on out-of-sample predictions. Care is therefore required in the interpretation. The results are presented in *Table 4*. Based on the semi-elasticities for the institutional indicators, one has to conclude that the prospects for effective use of Structural Funds in the accession countries are limited. This reflects the fact that the institutional quality and perceived corruption in most of these countries are worse than in Greece, which featured the lowest values among the EU countries included in our analysis (see *Table 3*). When considering the semi-elasticities based on openness, the picture is more positive. However, here we have to take into account that openness catches more than the institutional quality alone. It is well known that small countries tend to be more open; hence the relative size of the countries affects the results, as is clear from *Table 4*.

V. ROBUSTNESS ANALYSIS

The results presented so far strongly suggest that the Structural Funds are only conditionally effective. However, it may be institutional quality as such, instead of the interaction with Structural Funds, that enhances growth. Or the results

21. Details on these growth effects for all countries and conditioning variables are available upon request.

might simply reflect the extraordinary economic performance of Ireland. This section deals with a number of these issues by performing an extensive robustness analysis. *Table 5* summarizes the results. We start from the basic equation with Structural Funds conditioned on institutional quality. The results are repeated in the first column of *Table 5*. For this specification we add different variables, include Structural Funds one period lagged, change the sample, use different data sources, account for country- and period-specific fixed effects and apply more advanced estimation techniques in the form of GMM estimators. The results reveal that our major result – Structural Funds are conditionally effective – is robust to these changes. Furthermore, this conclusion is not affected by using different conditioning variables. This is shown in *Appendix C*, where the analysis of this section is repeated with openness instead of institutional quality as the conditioning variable.

The first variation that we consider is the inclusion of the conditioning variable itself as it is possible that institutional quality as such is the driving force behind growth. The results, reported in the second column of the table, clearly show that it is not institutional quality itself that matters. The estimated coefficient is not statistically significant. The other coefficients do still support the hypothesis of conditional effectiveness of Structural Funds (the *p*-value corresponding to the conditionality term is 0.06). A more detailed account of the effects of including institutional quality in levels can be found in the Annex to this paper, in which we have added institutional quality to all the regression models that we have estimated.

Second, we have investigated the potential importance of lagged effects. Structural Funds are often used to finance infrastructural types of projects. For such projects, it may take some time for the growth effects to materialise. Although we have alleviated this concern by using five-year periods in our estimates, we have additionally estimated models in which Structural Funds have been included one period lagged (viz. 5 years). As can be seen from *Table 5*, this hardly affects the results.

Third, we analysed whether the exceptional growth record of Ireland is driving the results. This is investigated in the third column in *Table 5* by leaving out Ireland. Again the results are not very sensitive for this change.

Fourth, we disentangle the influence of joining the EU and the receipt of cohesion support. Therefore we constructed a period dummy variable that equals one when a country was a member of the EU in that period, and zero otherwise. Including this dummy variable does not weaken the strength of the conditional effectiveness, but nevertheless shows that European integration itself tends to contribute to growth (though the estimate is not significant at the 10%-level). This result suggests that two separate effects are at stake (see Crespo-Cuaresma et al. 2001, for a more detailed discussion and empirical analysis of the returns to EU membership).

Table 5

Robustness of results with effectiveness of Structural Funds conditional on institutional quality
(different panel data techniques, samples and specifications. Dependent variable: growth of GDP per capita)

	Basic	Institut. Quality as such	SF one period lagged	Excluding Ireland	With EU dummy	Country Specific Fixed Effects	Period Specific Fixed Effects	Period 1975–1995	With PWT data	Arellano Bond[a]	Blundell Bond[a]
Log of Initial GDP per capita	−0.028*** (0.005)	−0.029*** (0.005)	−0.028*** (0.006)	−0.033*** (0.006)	−0.030*** (0.005)	−0.052*** (0.011)	−0.013** (0.005)	−0.025** (0.010)	−0.032*** (0.006)	−0.076** (0.030)	−0.069*** (0.016)
Log of investment rate	0.020** (0.009)	0.020** (0.009)	0.019** (0.009)	0.021** (0.009)	0.023** (0.009)	−0.002 (0.012)	0.013 (0.009)	0.013 (0.012)	0.029*** (0.007)	0.006 (0.029)	0.006 (0.016)
Log of human capital	0.022* (0.012)	0.017 (0.013)	0.025* (0.013)	0.029** (0.013)	0.024* (0.012)	0.026 (0.037)	0.002 (0.010)	0.034** (0.016)	0.000 (0.011)	0.051 (0.056)	0.101** (0.040)
Log of (population growth +0.05)	−0.024 (0.020)	−0.024 (0.020)	−0.039* (0.021)	−0.018 (0.020)	−0.027 (0.021)	−0.026 (0.023)	−0.028* (0.015)	−0.053* (0.029)	−0.036* (0.021)	−0.039** (0.018)	−0.046* (0.027)
Structural Funds	−0.141*** (0.043)	−0.109** (0.049)	−0.144*** (0.046)	−0.120*** (0.035)	−0.140*** (0.046)	−0.196*** (0.042)	−0.133*** (0.043)	−0.124*** (0.034)	−0.168*** (0.056)	−0.155 (0.103)	−0.139* (0.078)
Structural Funds * Institutional Quality	0.018** (0.007)	0.014* (0.007)	0.018** (0.007)	0.014** (0.005)	0.017** (0.007)	0.029*** (0.007)	0.019*** (0.007)	0.017*** (0.006)	0.023*** (0.008)	0.023* (0.013)	0.017* (0.010)
Institutional Quality itself		0.002 (0.002)									
EU dummy					0.004 (0.003)						
Constant	0.208*** (0.058)	0.212*** (0.057)	0.154** (0.059)	0.255*** (0.061)	0.214*** (0.058)			0.056 (0.083)	0.266*** (0.064)		
Adjusted R^2	0.51	0.51	0.43	0.57	0.51	0.64	0.68	0.27	0.45		
Joint sign. test *SF*-variables	11.91***	3.38**	10.40***	14.50**	12.82***	12.28***	5.03***	8.64***	4.62**		
# panel observations	91	91	78	84	91	91	91	52	91	78	91

Note: White heteroskedasticity-consistent standard errors are reported in parentheses. ***, **, and * denote significance at 1, 5 and 10 per cent levels, respectively. The test for the joint significance of the Structural Funds variables is a Wald test, testing the null-hypothesis that the coefficients for the Structural Funds variables (in levels and interacted with institutional quality) are equal to zero. Results including the institutional conditioning variable in levels in the regression equation can be found in an Annex to this paper at www.henridegroot.net/downloads.asp. See *Appendix B* for details about the variables and their sources.

[a]The results of the last two specifications are based on a regression equation with the natural logarithm of GDP per capita as dependent variable and are subsequently transformed for reasons of comparability with the other equations (using the fact that the growth rate in all specifications in this paper is defined as the dlog divided by five). We report the two-step GMM estimates. Instruments used in the Arellano-Bond approach are the log of initial income two periods lagged. All other right-hand-side variables are assumed to be exogenous and are instrumented with their own value. The additional instrument used in the Blundell-Bond approach is the dlog of initial income one period lagged. The Sargan test does not reject the null-hypothesis of a valid specification. Further details are available upon request.

Fifth, we have tested whether the results are driven either by the distinct performance of some of the countries under consideration or by different behaviour in different periods of our sample, for example because of business cycle effects. These options are tested by including country- and period-specific fixed effects in the sixth and seventh column of *Table 5*, respectively. The results further reinforce the idea of the Structural Funds being only conditionally effective. In the specification with country-specific fixed effects, we see that the coefficient of the log of investments becomes smaller and statistically insignificant. This reflects the fact that variation over time of investments is limited. The effect of investments is therefore mainly picked up by the fixed effects. For human capital the coefficient remains stable but is no longer significant. In the specification with period-specific fixed effects, we see that the coefficient of the log of human capital becomes very small (and insignificant). This reflects the fact that human capital develops similarly in all the countries in the sample over time. The effect is therefore picked up by the period-specific fixed effects[22].

Sixth, we have analysed the sensitivity of the results for the period used in the regression analysis. For most countries, the Structural Funds only started to be obtained in the late 1970s. In the years before, we have set the Structural Funds at zero in our dataset. To check the sensitivity of our results for this, we have restricted the time span to 1975–1995. The results are reported in the seventh column of *Table 5*. Apart from the reduced statistical significance of investments, both the qualitative as well as the quantitative results are hardly affected[23].

Seventh, we have re-estimated our basic regression equation with data from the Penn World Tables, Mark 6.1 (instead of using the data from the World Development Indicators). The results again confirm our major result: Structural Funds as such are not effective in enhancing growth, but they are if they are seeded in fertile soil.

Finally, the last two specifications are based on the application of recently developed GMM estimators (Arellano and Bond 1991 and Blundell and Bond 1998)[24]. We refer to Bond et al. (2001) for an application to the estimation of empirical growth models and a discussion of the various estimation techniques. In the Arellano-Bond approach, the regression equation is written in the form

22. These results obtained by including country- and period-specific fixed effects basically illustrate that the variation in investments and human capital over time and across countries in the sample of countries that we consider in this study is limited.
23. We have done the entire analysis in this paper for both the period 1975–1995 as well as 1980–1995. Both qualitative as well as quantitative results are reasonably robust for changes in the time period. Details are available upon request.
24. All the GMM estimations were performed with OX version 3.30 and the DPD package version 1.2 (available as freeware at www.nuff.ox.ac.uk/Users/Doornik).

of a dynamic model. By taking first-differences, time-invariant country-specific effects are removed. The right-hand-side variables in the first-differenced equation are instrumented. In doing so, one solves the problem of omitted variable biases that are constant over time, parameters are estimated consistently despite the endogeneity of right-hand-side variables and it allows for consistent estimation in the presence of measurement error. This approach was subsequently refined by Blundell and Bond (1998). They introduced a system GMM estimator that is highly recommended for empirical growth research (cf. Bond et al. 2001). Both the Arellano-Bond-specification and the Blundell-Bond-specification are reported in *Table 5*. The results reveal the well-known fact that the estimated speed of convergence is substantially larger in the GMM estimates. The effect of Structural Funds becomes statistically less significant, but remains similar in quantitative terms[25].

VI. CONCLUSIONS

How effective are Structural Funds in promoting economic growth and convergence in the member states of the European Union? Building on a standard neoclassical growth framework, we find that European support as such did not improve the countries' growth performance. However, we find evidence that it enhances growth in countries with the 'right' institutions. This conclusion is in line with the recent empirical findings on the effectiveness of aid to less developed countries by Burnside and Dollar (2000).

The analysis reveals which type of institution matters, as institutions are measured in several ways. Social cohesion is not an important conditioning factor. The government policy indicators are not significant at the 5% level in determining the effectiveness of the Structural Funds. However, when conditioning for openness and the direct measures for institutional quality, we find robust and significant conditional effectiveness of the Structural Funds. So, the European policy to promote regional growth is only conditionally effective. This finding bears considerable consequences for the (re-)design of the EU cohesion policy in light of the enlargement of the EU: the funds are to be allocated toward institution building in the first instance. Once the institutions are of a sufficient quality, the funds may be effective in stimulating (catching-up) growth.

25. The implied semi-elasticities range from −1.02 (−1.70) for Greece to 4.96 (2.23) for Luxembourg in the Arelano-Bond (Blundell-Bond) specification.

REFERENCES

Arellano, M. and S.R. Bond (1991). Some Specification Tests for Panel Data: Monte Carlo Evidence and an Application to Employment Equations, *Review of Economic Studies*. 58: 277–298.

Beugelsdijk, M. and S.C.W. Eijffinger (2005). The Effectiveness of Structural Policy in the European Union: An Empirical Analysis for the EU-15 during the Period 1995–2001, *Journal of Common Market Studies*. 43: 37–51.

Blundell, R. and S.R. Bond (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models, *Journal of Econometrics*. 87: 115–144.

Boldrin, M. and F. Canova (2001). Inequality and Convergence in Europe's Regions: Reconsidering European Regional Policies, *Economic Policy*. 32: 205–245.

Burnside, C. and D. Dollar (1997). Aid, Policies, and Growth. World Bank Working Paper No. 1777.

Burnside, C. and D. Dollar (2000). Aid, Policies and Growth, *American Economic Review*. 90: 847–868.

Collier, P. and D. Dollar (2004). Development Effectiveness: What have we Learnt?, *Economic Journal*. 114: F244–F271.

Crespo-Cuaresma, J., M.A. Dimitz and D. Ritzberger-Grünwald (2001). Growth, Convergence and EU-Membership, unpublished manuscript (Vienna).

Dalgaard, C.-J., H. Hansen and F. Tarp (2004). On the Empirics of Foreign Aid and Growth, *Economic Journal*. 114: F191–F216.

Dall'erba, S. and J. Le Gallo (2003). Regional Convergence and the Impact of European Structural Funds over 1989–1999: A Spatial Econometric Analysis, REAL Discussion Paper No. 03-T-14.

De la Fuente, A. and R. Doménech (2000). Human Capital in Growth Regressions: How Much Difference Does Data Quality Make? Available at fuster.iei.uv.es/∼rdomenec/human.html.

De la Fuente, A. and R. Doménech (2001). Schooling Data, Technological Diffusion and the Neoclassical Model, *American Economic Review*. 91: 323–327.

De la Fuente, A. and X. Vives (1995). Infrastructure and Education as Instruments of Regional Policy: Evidence from Spain, *Economic Policy*. 20: 11–40.

Doménech, R., A. Maudes and J. Varela (2000). Fiscal Flows in Europe: The Redistributive Effects of the EU Budget, *Weltwirtschaftliches Archiv*. 136: 631–656.

Easterly, W. (2003). Can Foreign Aid Buy Growth?, *Journal of Economic Perspectives*. 17: 23–48.

Ederveen, S., J. Gorter, R. de Mooij and R. Nahuis (2002). Funds and Games: The Economics of European Cohesion Policy. CPB Special Publication No. 41.

Gallup, J.L., J.D. Sachs and A.D. Mellinger (1999). Geography and Economic Development, *International Regional Science Review*. 22: 179–232.

Hall, R.E. and C.I. Jones (1997). Levels of Economic Activity Across Countries, *American Economic Review*. 87: 173–177.

Hudson, J. (2004). Introduction: Aid and Development, *Economic Journal*. 114: F185–F190.

Islam, N. (1995). Growth Empirics: A Panel Data Approach, *Quarterly Journal of Economics*. 110: 1127–1170.

Islam, N. (2003). What Have We Learnt from the Convergence Debate?, *Journal of Economic Surveys*. 17: 309–362.

Kaufmann, D., A. Kraay and P. Zoido-Lobaton (2002). Governance Matters II: Updated Indicators for 2000/01. World Bank Policy Research Department Working Paper, available (with data) at www.worldbank.org/wbi/governance/wp-governance.htm.

Knack, S. and P. Keefer (1997). Does Social Capital Have an Economic Payoff? A Cross-Country Investigation, *Quarterly Journal of Economics*. 112: 1252–1288.

Lambsdorff, J.G. (2001). How Precise are Perceived Levels of Corruption. Background paper to the 2001 Corruption Perceptions Index, Transparency International, available (with the data) at www.transparency.org/cpi/index.html.

Mankiw, N.G., D. Romer and D.N. Weil (1992). A Contribution to the Empirics of Economic Growth, *Quarterly Journal of Economics*. 107: 407–437.
Mosley, P., J. Hudson and A. Verschoor (2004). Aid, Poverty Reduction and the 'New Conditionality', *Economic Journal*. 114: F217–F243.
Murphy, K.M., A. Shleifer and R.W. Vishny (1991). The Allocation of Talent: Implications for Growth, *Quarterly Journal of Economics*. 106: 503–530.
Pelkmans, J. (1997). *European Integration. Methods and Economic Analysis*. Longman: Harlow UK.
Sachs, J.D. and A.M. Warner (1995). Economic Reform and the Process of Global Integration, *Brookings Papers on Economic Activity*. 1: 1–95.
Vanhove, N. (1999). Regional Disparities in the European Union, in: N. Vanhove (ed.), *Regional Policy: A European Approach*. Aldershot (UK): Brookfield, Vt. and Sydney: Ashgate: Chapter 2.
World Bank (2000). World Development Indicators 2000. Taken from World Bank CD-Rom.

APPENDICES

A. A Brief History of EU Cohesion Policy

The first serious mention of cohesion policy can be found in the 1957 EEC treaty of Rome. This treaty did not yet, however, provide for substantial instruments by which this policy could be implemented. Only from 1975 onwards did cohesion policy take off with the introduction of the European Regional Development Fund (ERDF). Its share of the EU budget was then about 5%. Subsequently, numerous other funds have been introduced. Their combined share is now about 40% (corresponding to 0.35% of EU GDP). This makes cohesion policy the second most important budget item (after the Common Agricultural Policy). Below, we present a brief overview of European Cohesion policy and its evolution throughout the years.

Structural Funds before 1989

In the early days of the EEC, exemption for state aid aimed at reducing regional disparities came closest to the present cohesion policy. At the 1974 Paris summit, the European Regional Development Fund (ERDF) was introduced. The first enlargement of the Union with the accession of the UK, Ireland and Denmark worked as a catalyst: the UK expected no substantial benefit from the Common Agricultural Policy, and sought some form of compensation. For the period 1975–1977, an ERDF of 1300 million ECU was decided upon.

In subsequent years, the size of the Fund increased rapidly. The amount that was yearly allocated to the ERDF reached 1 billion ECU in 1980, 2 billion in 1983 and 3 billion in 1986. The ERDF therefore soon represented a substantial instrument of Community regional policy. Meanwhile, the ERDF was revised twice, in 1979 and in 1984. Originally the Fund was not subdivided. The European Summit allocated the most important shares of the Fund to those countries which had the most serious regional problems in terms of both size and intensity. In the first five years of the ERDF, the main beneficiaries of the

Fund were Italy, the UK and France, with respectively about 40%, 28% and 16% of the total Fund. With the accession of Greece in 1981, it also received a substantial part of the pie, viz. about 13%.

The enlargement with Spain and Portugal induced a revision and extension of the ERDF in 1984. Worries, notably on the part of France and Italy, about the impact of the Iberian enlargement caused an expansion of the funds with Integrated Mediterranean Programmes. Also the management of the ERDF was made more flexible. Instead of assigning every member state a fixed part of the Fund, a system of lower and upper limits was introduced. Italy, for instance, received between 32 and 43% of the ERDF in 1985. Many of the characteristics and principles of the ERDF have been retained in the reform of the Structural Funds in 1989, to which we turn now.

Reform of the Structural Funds in 1988

The Single European Act (1986) recognized regional policy for the first time officially as a Community task. This recognition, together with the accession of Spain and Portugal in 1986, induced a major reform and extension of the Structural Funds in 1988. The reforms of the Structural Funds were – being part of the Delors I package – intimately related to the establishment of the Internal Market. From the Single European Act onwards, Structural Funds were allocated within 'operational periods', the first running from 1989 to 1993, the second from 1994 to 1999. In these periods, several allocation rules were introduced.

The central guiding principles that were established were: concentration (geographically as well as with respect to objectives), programming (not only separate projects, but larger programmes, such as those that already existed in the Integrated Mediterranean Programmes), partnership (between the EU, Member states and regional authorities) and additionality (prevention of crowding out of national regional policy). Importantly, the explicit purpose of cohesion policy was established, namely to enhance cohesion and to reduce welfare differences among the regions of EU.

Since 1989, European cohesion policy addresses regional problems under different Objectives and with different Funds. By far the most important objective is focussed on regions where development is lagging behind (viz. Objective 1 regions which are regions with a per capita GDP of less than 75% of the Community average). It accounts for about two-thirds of total resources in the two operational periods 1989–994 and 1994–999. The other objectives are targeted at areas affected by industrial decline (Objective 2), fighting long-term unemployment (Objective 3), adaptation to industrial change (Objective 4), reform of agricultural sectors (Objective 5a), rural areas (Objective 5b) and sparsely populated areas (Objective 6). Objective 1 and other objectives are mutually exclusive. People in a region receive either

support under Objective I or under other objectives or receive nothing at all. Objective 6 was introduced only in 1994 with the accession of Finland, Sweden and Austria.

Besides the ERDF, the EU also introduced a number of other financial instruments to implement the structural policies. The most important of these are the European Social Fund (ESF), the Guidance Section of the European Agricultural Guidance and Guarantee Fund (EAGGF) and the Cohesion Fund (CF). However, the European Regional Development Fund remained by far the largest of the Structural Funds. It accounts for more than half of the total European Cohesion policy.

Just as in the years before the reform, the EU-wide regional policy has continued to grow. The share of the total EU budget increased from under 30% for the period 1989–1993 to over 35% for the second planning period (1994–1999). As can be expected from the focus on less developed regions, the Funds are unevenly spread across the member states of the European

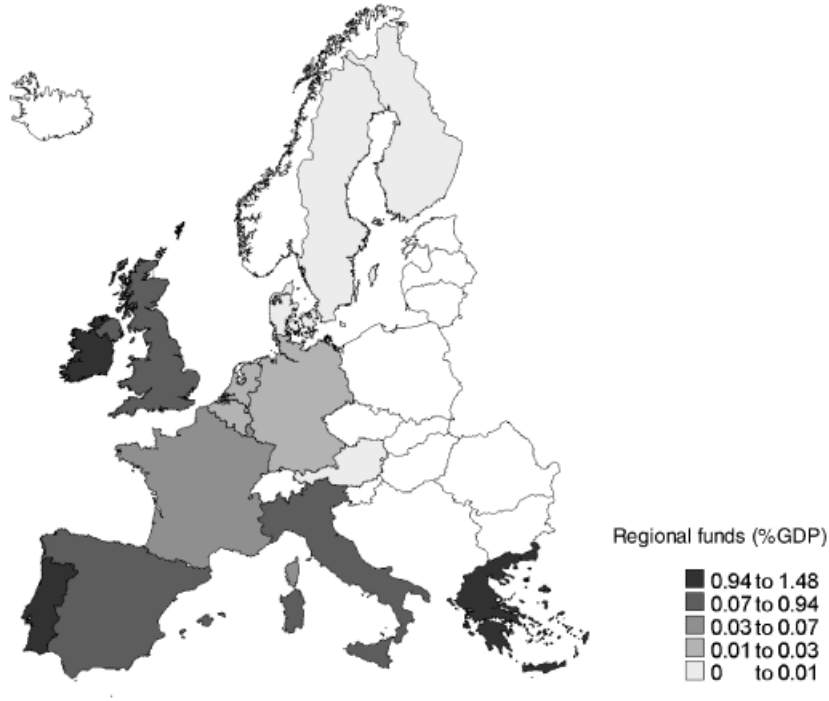

Figure A1

Distribution of the European Regional Development Fund over member states (as percentage of GDP)

Union. The figure below shows the division of the ERDF as a percentage of GDP over the member states for the last five-year period in our sample (1990–1995). As is clear from the figure, Portugal, Greece and Ireland get relatively most support.

The current cohesion policy, 2000–2006

Since the Berlin meeting of the European Council, the Agenda 2000 agreement has called for a further revision of European cohesion policy. It spells out that the Funds should address problems under three, rather than six Objectives:

Objective 1: for regions whose development is lagging behind
Objective 2: for economic and social conversion of areas facing structural difficulties
Objective 3: for adaptation and modernization of policies and systems of education, training and employment.

The sizes of the Structural Funds and the Cohesion Fund are respectively 190 and 18 billion EURO, available for the period 2000–2006. Annual expenditure in the early 1990s was only 14 billion. This implies a tripling of the budget during the last decade.

B. Description of Data and Sources[26]

Data in the basic regressions reported in Section III:

- The average annual growth rate of GDP per capita over the respective 5-year interval (the dependent variable) is taken from the World Development Indicators (World Bank 2000, CD-Rom). Recently, the newest version of the Penn World Table – Mark 6.1 – has become available, in which a different method is used to construct purchasing power parities. We report a robustness check with these data in Section V.
- Initial GDP per capita (in constant 1995 dollars) is taken from the World Development Indicators.
- Average gross domestic savings is taken from the World Development Indicators.
- The human capital variable is taken from De la Fuente and Doménech (2000) and is available via the Internet. For a discussion on the quality of these data, see De la Fuente and Doménech (2001). We have also experimented with the more commonly used proxies provided by Barro and Lee. Details are available upon request.
- Population growth is taken from the World Development Indicators.

26. The dataset is available at www.henridegroot.net/downloads.asp

Table B1

Summary statistics of the most important data

	Per capita GDP in 1960 (1995 US $)	Per capita GDP growth (% per year)	Structural Funds (1990; % of GDP)
Mean	8623	2.9	0.32
Median	9587	2.7	0.04
Standard Deviation	3830	1.7	0.51

- In measuring European aid, we restrict attention to the European Regional Development Fund (ERDF). This is by far the most important of the funds and especially meant to help relatively poor EU members (see *Appendix A* for more details). Up to 1986, we rely on Vanhove (1999) for ERDF data (source: Official Journal of the EC). For the period 1986 onwards, we use data from the Commission Accounting System (SINCOM)[27]. We divided the amount of SF aid by the level of GDP in the country. Furthermore, we added one to this share before taking the natural logarithm to avoid negative numbers and to avoid problems with countries that received no structural funds. We treated the period before countries entered the EU as if they did not receive any cohesion support[28].
- Institutional quality is proxied by the institutional quality index (ICRG) taken from Sachs and Warner (1995). It ranges from 5.5 to 10 in our sample.
- The EU dummy equals one if the country is a EU-member, and zero otherwise. For countries that entered during the period under consideration, the dummy represents the fraction of the time that the country was a member. The years of entry are based on Pelkmans (1997, p. 27).

We use data for thirteen EU countries (Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom) for the period from 1960–1995. *Table B1* shows summary statistics for some of the main variables of interest in the study.

Alternative proxies for institutional quality used in Section IV and *Appendix C*:

- The inflation rate that we use is from Sachs and Warner (1995). It measures the average inflation rate over the period 1965–1990 and ranges from 1.4% to 2.6% in our sample.

27. See Doménech et al. (2000). We are grateful to Rafael Doménech for making them available to us.
28. The results presented in the main text are not sensitive for this. Details are available upon request.

- The variable trust measures the percentage of people that replies 'most people can be trusted' to the question 'Generally speaking, would you say that most people can be trusted, or that you cannot be too careful in dealing with people?'. This proxy is used by, for example, Knack and Keefer (1997) and derived from the World Value Survey. It ranges from 21.4 to 57.2 in our sample.
- Openness is derived from variables in the World Development Indicators. It is defined as exports plus imports divided by GDP. In the regressions, we use the natural logarithm of openness. To assess its validity as a proxy for institutional quality, we have confronted this openness variable with the openness variable from Sachs and Warner (1995) for a more extensive set of countries (see footnote 18).
- The corruption perception index (CPI) is constructed by Transparency International and documented in a background paper (Lambsdorff 2001). It ranges from 4.2 to 9.9 in our sample.
- Central government savings (measured as current revenues minus current expenditures of the central government as a fraction of GDP) are taken from World Data CD–ROM, 1995. We added 10 to this variable to ensure positive values and comparable outcomes in our regressions. The savings range from −4.1% to 5.9% in our sample.
- We used a number of Governance Indicators from the World Bank's Composite Indicator Dataset Research Project by Kaufmann et al. (2002). The indicators that we used are (with the ranges over which they vary in our sample in brackets): Political Stability (0.8−1.6), Government Effectiveness (0.6−1.9) and Rule of Law (0.6−1.9). Higher values correspond to better governance outcomes.

C. Alternative Specifications and Tests for Robustness

In *Table C1* we provide results for alternative measures of institutional quality. The first regression complements the first specification in *Table 2*. The latter three specifications use WorldBank Governance Indicators to condition for institutional quality. These specifications confirm that SF are conditionally effective and illustrate the robustness of the results reported in the main text.

Table C1

Different measures for institutional quality (OLS, dependent variable: growth of GDP per capita)

	Central Government Savings	World Bank Governance Indicator 'Political Stability'	World Bank Governance Indicator 'Government Effectiveness'	World Bank Governance Indicator 'Rule of Law'
Log of initial GDP per capita	−0.029***	−0.028***	−0.026***	−0.025***
	(0.005)	(0.005)	(0.005)	(0.005)
Log of investment rate	0.019*	0.016	0.022**	0.022**
	(0.009)	(0.010)	(0.009)	(0.009)
Log of human capital	0.024*	0.022*	0.016	0.015
	(0.012)	(0.012)	(0.012)	(0.012)
Log of (population growth +0.05)	−0.026	−0.024	−0.036*	−0.034*
	(0.021)	(0.020)	(0.020)	(0.020)
Structural Funds	0.008	−0.088***	−0.064***	−0.078***
	(0.029)	(0.029)	(0.018)	(0.021)
Structural Funds * Conditioning variable (see column header)	0.007	0.064**	0.044**	0.063**
	(0.008)	(0.032)	(0.020)	(0.026)
Constant	0.203***	0.203***	0.167***	0.169***
	(0.058)	(0.056)	(0.055)	(0.054)
Adjusted R^2	0.46	0.49	0.51	0.51
Joint significance test *SF* variables	1.42	9.80***	13.28***	13.93***
# panel observations	91	91	91	91

Note: White heteroskedasticity-consistent standard errors are reported in parentheses. ***, **, and * denote significance at 1, 5 and 10 per cent levels, respectively. The test for the joint significance of the Structural Funds variables is a Wald test, testing the null-hypothesis that the coefficients for the Structural Funds variables (in levels and interacted with institutional quality) are equal to zero. See *Appendix B* for details about the variables and their sources.

In *Table C2*, we repeat the robustness analysis performed in Section V, but now with openness as the conditioning variable instead of institutional quality. The results confirm our main conclusions.

Table C2

Robustness of results with effectiveness of Structural Funds conditional on openness (different panel data techniques, samples and specifications. Dependent variable: growth of GDP per capita)

	Basic: SF and Openness	Including Openness separately	SF one period lagged	Excluding Ireland	With EU dummy	Country Fixed Effects	Period Fixed Effects	Period 1975–1995	With PWT data	Arellano Bond	Blundell Bond
Log of initial GDP per capita	−0.025***	−0.025***	−0.024***	−0.031***	−0.027***	−0.060***	−0.010*	−0.020**	−0.027***	−0.079**	−0.067***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.011)	(0.005)	(0.009)	(0.006)	(0.031)	(0.016)
Log of investment rate	0.020**	0.018**	0.019**	0.019**	0.023***	0.006	0.015	0.014	0.027***	0.008	0.006
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.012)	(0.009)	(0.011)	(0.006)	(0.028)	(0.016)
Log of human capital	0.014	0.020	0.015	0.026*	0.017	0.064*	−0.006	0.020	−0.007	0.068	0.098**
	(0.012)	(0.013)	(0.013)	(0.013)	(0.012)	(0.037)	(0.011)	(0.015)	(0.012)	(0.063)	(0.043)
Log of (population growth +0.05)	−0.034*	−0.038**	−0.050***	−0.023	−0.038**	−0.043**	−0.041***	−0.068**	−0.047**	−0.042**	−0.055**
	(0.019)	(0.018)	(0.018)	(0.020)	(0.019)	(0.020)	(0.014)	(0.027)	(0.020)	(0.017)	(0.026)
Structural Funds	−0.285***	−0.336***	−0.302***	−0.282***	−0.296***	−0.416***	−0.285***	−0.253***	−0.290***	−0.346*	−0.278
	(0.082)	(0.081)	(0.083)	(0.106)	(0.090)	(0.070)	(0.074)	(0.066)	(0.082)	(0.207)	(0.298)
Structural Funds * Openness	0.064***	0.077***	0.068***	0.064**	0.065***	0.102***	0.068***	0.060***	0.068***	0.086*	0.063
	(0.021)	(0.020)	(0.021)	(0.027)	(0.022)	(0.017)	(0.018)	(0.017)	(0.019)	(0.049)	(0.071)
Openness itself		−0.007									
		(0.004)									
EU dummy					0.005**						
					(0.003)						
Constant	0.165***	0.165***	0.104**	0.232***	0.173***			−0.008(0	0.201***		
	(0.053)	(0.050)	(0.050)	(0.059)	(0.052)			.078)	(0.066)		
Adjusted R^2	0.53	0.54	0.47	0.57	0.54	0.67	0.70	0.31	0.44		
Joint significance test *SF* variables	13.94***	15.52***	12.17***	15.05***	15.49***	17.90***	7.49***	8.26***	6.22***		
# panel observations	91	91	78	84	91	91	91	52	91	78	91

See *Table 5* for notes.

SUMMARY

Structural Funds are the most intensively used policy instrument by the European Union to promote economic growth in its member states and to speed up the process of convergence. This paper empirically explores the effectiveness of European Structural Funds by means of a panel data analysis for 13 countries in the European Union. We show that – on average – Structural Funds are ineffective. For countries with a 'proper' institutional framework, however, Structural Funds are effective. The latter result is obtained for a wide range of conditioning variables, such as openness, institutional quality, corruption and indicators for good governance. It is robust to a wide range of robustness tests.