

DATA ANALYSIS PROJECT

FINAL REPORT

*The*

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*Team*

BECKY FARMER

TOM KLEINGARN

MICHAEL MOORE

PAUL SANDERSON-CIMINO

BECCA STARK

KATE THORNBERRY

The European Union has invested considerable funding at the regional level and claims to have experienced positive results. The preamble to the Treaty of the European Union makes explicit the goal of increasing economic and social cohesion by reducing disparities between the various regions that comprise the European Union and structural funding is the primary way in which the EU is attempting to address this challenge. In this report we will attempt to determine whether the EU has been successful; in other words, whether EU spending at the regional level has increased subnational prosperity.

Structural funds are broken down into three priorities: Objective 1, 2, and 3 regions. Objective 1 regions—the focus of our study—are regions in which the GDP per capita is under 75% of the EU average measured in PPS terms, and are considered regions that are lagging behind in socio-economic development. Altogether, structural funds receive approximately one-third of the EU budget. For the current budget cycle of 2000 to 2006, this amounts to EUR 195 billion for the EU 15, plus an additional EUR 15 billion for the new member states between 2004 and 2006. To receive funding, member states create concrete program plans and submit these to European Commission. If approved, the EU will provide supplemental funding.

The official stance of the European Union is that structural funds have been quite successful since its practical origin in 1975. According to the third report on economic and social cohesion entitled *A new partnership for cohesion: convergence, competitiveness, cooperation*, in Objective 1 regions, GDP per capita has increased by almost 3% between 1994 and 2001 as opposed to 2% for the majority of the remaining EU regions. However, the rate of growth between regions has varied widely and while growth in labor remained strong in these regions, the increase in employment varied markedly.

Because structural funds are such an enormous component of both the EU budget and the time and resources of individual Member States, their success is truly fundamental to both the practical and the moral obligations of the EU. Further, despite the fact that income disparities and unemployment have decreased between regions over the past decade and productivity in the less prosperous regions has increased, large differences in the levels of economic prosperity and productivity still remain. Cohesion is a particularly challenging goal in the context of the recent accession of so many poor East-Central European states. This only increased when the new Member States joined, as across the board they have lower levels of employment and GDP per capita. As a result, successful regional spending is imperative if the EU is to remain true to its goals as set forth in the Treaty of the European Union. Increased economic prosperity at the subnational level would not only raise the living standards in the individual regions, but also would strengthen the competitiveness and increase the growth of the EU economy as a whole. Given the concern over the Lisbon Agenda, Brussels is under great pressure to prove that structural funds are not a waste of money that could be spent, for example, funding research and development in richer areas. Nevertheless, structural funds are lauded as a successful policy instrument and serve as a highly visible symbol of the EU at the local level.

Our report is structured as follows: first we will explain our research design, including our query, hypotheses and methodology. Next we will explain where we obtained our data on structural funds and economic growth and why we chose to structure our research design as we did. Finally, we will outline our results and indicate conclusions and future implications.

## **BACKGROUND**

In the continuing effort to further unite the European Union, structural funds have become one of the most popular and effective programs of the European Commission. Labeled “regional policy,” and one of the “instruments of solidarity,”<sup>1</sup> what are known as “structural funds” distribute monies to member states with the goal of encouraging economic development in specific regions. We examine European Regional Development Funds (ERDF), one of four types of structural funds.

## **VARIABLES**

### ***Economic Growth***

We chose GDP per capita (as a percentage of the EU average) in Objective 1 regions as our dependent variable. We made this choice primarily because GDP is a well-accepted variable for measuring economic prosperity. It should be emphasized, however, that we did not choose total regional GDP – rather, we chose GDP *per capita* as it controls for income disparity across regions due to population differences.

### ***Receipt of Structural Funds***

“Structural funds” is a broad term that categorizes many types of funding programs, including the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Agricultural Guidance and Guarantee Fund (EAGGF), and others. Our data was a compilation of all these funds, or rather, the total amount of structural funds an objective 1 region received. We chose to analyze only regions receiving Objective 1 funding for several reasons. These are the regions whose development is lagging behind and thus theoretically have the most potential to benefit from EU assistance in the form of structural funds.

For our analysis we compiled data for the total amount of Objective 1 structural funds received by NUTS 2 regions for the periods of 1989-1993, 1994-1999, and 2000-2006 when available. The NUTS 2 level of analysis is appropriate, as regions are split up under the NUTS system based on population criteria. We chose three time periods because analysis of the relationship between structural funds and GDP per capita for regions over a longer period of time will hopefully result in more conclusive findings.

## **RESEARCH DESIGN**

The first source of data was the EuroStat online database. This provided complete data for 1995-2002. However, we decided to search for data over a longer span of time. Substantial sums have been spent on structural funds since about 1975, and many of the most crucial integration efforts in the EU's history - such as Spain, Portugal, Greece, and Italy - occurred in the 1980s. In addition, we sought more data to provide for a more thorough analysis of development patterns.

We located data for earlier years from EIPA's library, which had a selection of regional yearbooks for many—but not all—of the years we needed. However, we decided that it would be adequate to have only every few years and interpolate based on those, since GDP is a reasonably stable measure in the short term. Additionally, many tests could be performed simply by examining the total change from the beginning to the end of the period being studied.

This limited availability of data constrained the scope of our study. Although we found structural funding data through 2006, we were only able to obtain GDP data through 2002. Similarly, we were only able to obtain structural funding data starting in 1989 (even though GDP data was available before this year). Thus, our data was constrained to 1989 through 2002.

The next step in preparing the data for analysis entailed filling in GDP data, when possible, by interpolation. We did this by assuming that the change in GDP was linear. The result of these steps was a data set with only 9% missing values for 1989 through 2002 with annual information on structural funds received and regional GDP per capita as a percentage of the EU average.

We chose as an independent variable the total structural funds received in millions of euros over the period from 1989-2002. This required coding a new variable containing the summed structural funds for the available time period. Producing our dependent variable required calculating this change in GDP depending on the start and end year of receiving structural funds.

Our total data set contained 374 regions, spread across NUTS 0, 1 and 2 categories. To simplify and make more consistent our analysis, we chose to only study NUTS 2 regions – 255 of those in our data set. However, the analysis in this project only studies 34 of these. We opted to only study the effect of different levels of structural funds on GDP and thus excluded cases that did not receive funds. Approximately 78% of the regions fell into this category. Moreover, we excluded those regions whose structural funding constituted a statistical outlier (see Appendix H). Since 75% of fund recipients received less than €1.07 billion, this meant excluding regions which received more than €5 billion, limiting us to 34 regions.

## **FINDINGS**

Our results indicate that a relationship does indeed exist between structural funds and change in GDP per capita. GDP per capita is positively correlated with the total structural funds a region receives at .444. Please refer to Appendices B and D for a graph of this correlation and a model summary. A bivariate linear regression confirms that structural funds positively impacts GDP per capita (B-coefficient = .012, significance = .000, please see

Appendix E). Appendix F contains a graph of the residuals from the regression. Of particular interest were the instances where structural funding did not increase GDP per capita. This could be due, for example, to mismanagement of structural funds, but it might also simply reflect the presence of other hindrances to growth which are not captured by our simple one-variable analysis. We suspect that GDP per capita growth, when on a negative trajectory, is slowed by an economic stimulus in the form of structural funds. When GDP per capita growth is on a positive trajectory, the presence of structural funds enhances that growth. Thus, the net effect of structural funds is positive.

## LIMITATIONS

### *Independent Variable*

The causes and hindrances of development are conceptually complex. Structural funds reflect only in part the resources available to local governments to provide public goods and infrastructure. States provide resources to their own regions, to which structural funds are a supplement. Moreover, regions vary with respect to their "starting positions." For example, some poor regions may have entered this period with a developed infrastructure that merely needed some "cleaning up," while another is entirely lacking in it. Also, structural funds do not directly describe the efficiency of local administration, which can multiply or reduce the effect that funding produces.

The measure of structural funding that we used is not without problems related to funding styles. It describes aggregate funding over an entire budget cycle, and does not describe where the money went, or when particular projects were initiated and completed. Thus, the analysis we have employed lends itself to more general conclusions.

### *Dependent Variable*

We have chosen GDP per capita as a percentage of the EU average. This does not address equity of incomes (as a Gini coefficient would), nor does it describe real living standards (as PPP would). In addition, GDP per capita is not a complete measure of the impact of structural funds as unemployment is neglected along with other standards of prosperity.

Because of new accessions to the Union, GDP per capita as a percentage of the EU average is not a constant measure over the period studied. In 1995, Austria, Sweden, and Finland joined. Sufficient adjustment would require not only obtaining GDP data for the EU and these three countries, but also performing conversions between various currencies. Even so, the data do not seem to have been particularly skewed by the 1995 accession.

A final limitation is that we did not acquire data for every year in this period. This does not affect start and finish comparisons, but does limit the accuracy of year-by-year analysis.

## **CONCLUSIONS AND IMPLICATIONS**

Despite the severe limitations inherent in this attempt to quantitatively measure the impact of structural funding on regional economies, we believe scholars and technocrats need to follow our lead in utilizing quantitative studies to test the efficacy of EU policy. Additional studies could investigate the many relevant variables that our study omitted and more sophisticated statistical analyses could establish causality between important variables. It is vital that the EU use quantitative studies as tools for more effective policy. Specifically, structural funding looms over EU institutions as one of the most important and controversial sets of EU policies. Prudent distribution of structural funding is essential for the future of the EU.

The Cohesion policy is the only official EU policy that explicitly addresses economic and social inequalities between the many states and regions that comprise the EU. As a result, it is the sole policy involving the transfer of resources between Member States via the budget of the EU by investing in people and physical capital to ultimately support economic growth and sustainable development. The enlargement of the EU to 25 Member States has created an unprecedented challenge for this redistribution, greater even than the earlier accession of poor states like Spain and Portugal, or the reunification of Germany. In fact, with the accession of the 10 new member states, socio-economic disparities doubled and the average GDP of the union decreased by 12.5%. However, by anticipating change and facilitating adaptation, cohesion policy has already begun to minimize the negative impacts of expansion. It has therefore become an integral component in the attempts of the EU to meet the Lisbon strategy thus far and will likely become an even more significant element of EU policy in future years.

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# APPENDIX A: CODEBOOK

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The cases included in our analysis are only those countries with NUTS level 3 and structural funds greater than zero and less than 5.1 billion euros. This dataset contains 373 regions. Our study analyzed 34 of these.

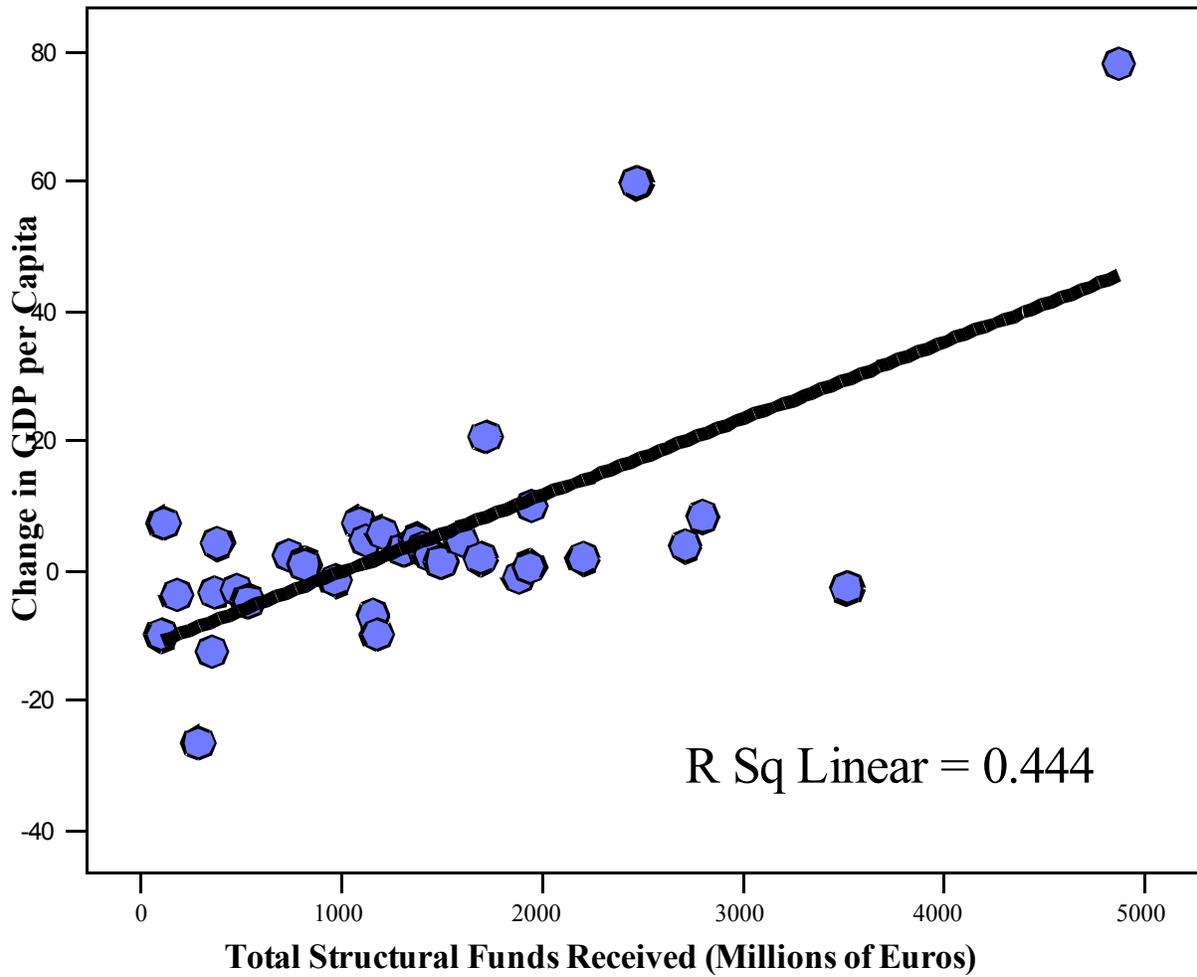
Note that some EU totals are available and are counted as cases (or regions) in this dataset. These have a 'missing data' NUTS entry and their country code is EU.

<b>Variable</b>	<b>Description</b>
<i>Region</i>	Name of the region
<i>Country</i>	EU abbreviation for the country
<i>NUTS</i>	NUTS Level for the given region, if appropriate. Possible values are system missing (5 cases), 1 (25 cases), 2 (88 cases) and 3 (255 cases).
<i>Parent</i>	This data applies to NUTS level three regions (except those in Poland and Ireland) and indicate the corresponding NUTS level 2 regions.
<i>GDP-89 through</i>	These give the GDP per capita for the given region as a percentage <i>GDP-02</i> of the average GDP per capita of the EU. Roughly ten percent of this data is not available. About 34% of it had to be interpolated using the assumption of linear change in GDP when given two data points.
<i>GDP-Delta</i>	Change in GDP for the time period during which structural funds were received. Note that the time period for each of these is <i>not</i> the same, but depends on when funds were received.
<i>Funds-89 through</i>	These give the structural funding given, in millions of euros for the <i>Funds-02</i> given region. Some of this data could not be obtained.
<i>Funds-Total</i>	Total structural funds received over the 1989 to 2002 time period.
<i>FundsTotNoOutliers</i>	This is the variable used for analysis. It includes only NUTS level 3 countries and only regions receiving structural funds between 0 and 5.1 billion euros. All other cases are coded as missing data.
<i>FundsTotNoZeros</i>	The same as <i>Funds-Total</i> , except that regions receiving no structural funding are coded as missing data.

# APPENDIX B

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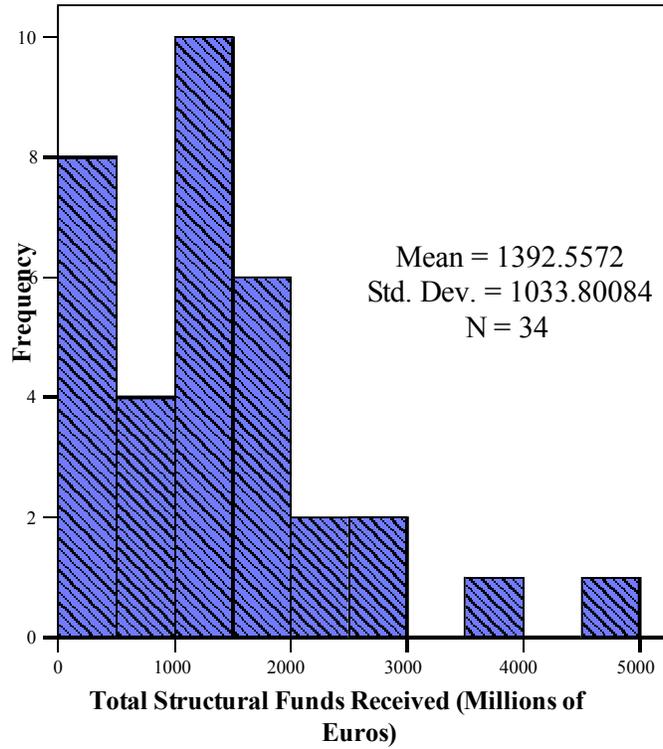
## Correlation: Total Structural Funds Received and Change in GDP per Capita



# APPENDIX C

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## Total Structural Funds Received



# APPENDIX D

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## SUMMARY OF MODEL

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
	.666	.444	.426	13.863

Predictors: Total Structural Funds

Dependent Variable: GDP per Capita

# APPENDIX E

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## COEFFICIENTS

	Unstandardized Coefficients		Standardized Coefficients	t	Significance
	B	Standard Error	Beta		
Constant	-11.928	4.027		-2.962	.006
Total Funds	<b>.012</b>	.002	.666	5.052	<b>.000</b>

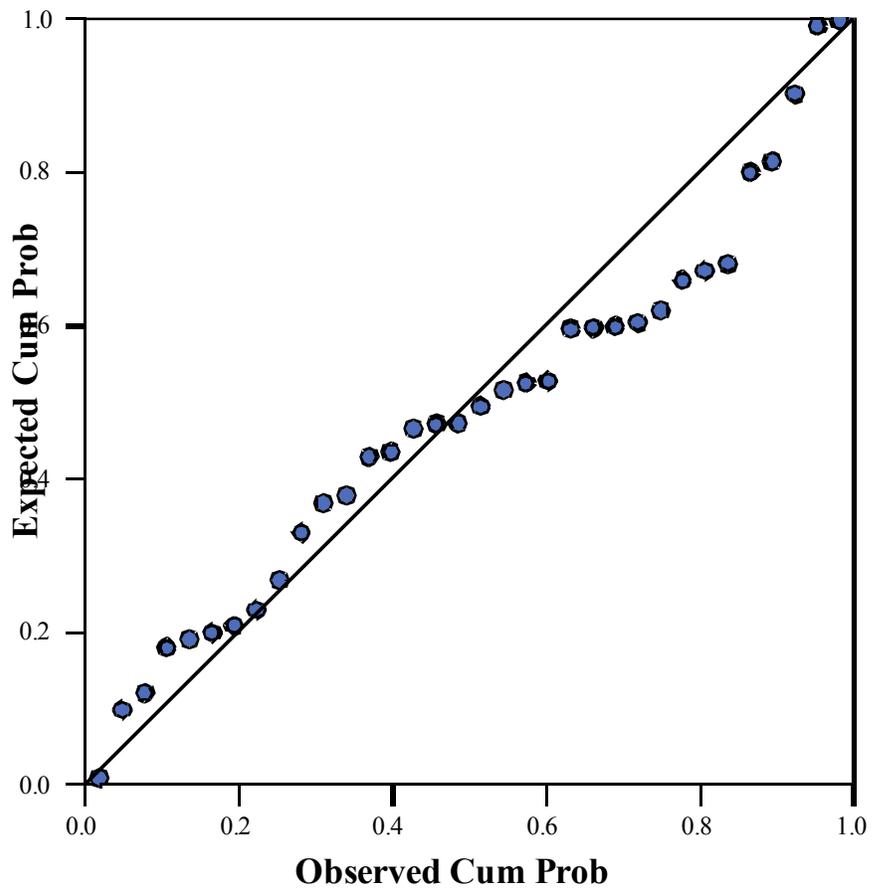
Dependent Variable: GDP per Capita

# APPENDIX F

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## Normal P-P Plot of Regression Standardized Residual

Dependent Variable: GDP – Delta



# APPENDIX G

## CASES INCLUDED IN ANALYSIS

<i>Region</i>	<i>Absolute Change in GDP as a % of the Avg. GDP of the EU (for the Period During Which Funds Were Received)</i>	<i>Total Structural Funds (Millions of Euros)</i>
Bruxelles	-10	99.16
Bratislavský	7	111.48
Prov. Liège	-4	175.14
Ciudad Autónoma de Melilla (ES)	-27	283.2
Ciudad Autónoma de Ceuta (ES)	-12	351.3
Oberösterreich	-3	365.61
Flevoland	4	378
Prov. Hainaut	-3	474.96
Niederösterreich	-5	531.5
Ionia Nisia	2	734.06
Burgenland	1	813
Pohjois-Suomi	-2	964.21
Voreio Aigaio	7	1084.78
Dytiki Makedonia	5	1116.51
Berlin	-7	1153.35
Övre Norrland	-10	1174.2
Border, Midlands and Western	6	1200.75
Ipeiros	3	1307.96
Peloponnisos	5	1371.6
Kriti	3	1403.24
Dytiki Ellada	3	1435.35
Devon	1	1493.53
Stereia Ellada	5	1594.85
Thessalia	2	1690.16
Southern and Eastern	21	1715.21
Itä-Suomi	-1	1879.79
Prov. Brabant Wallon	1	1935
Cantabria	10	1945.51
Anatoliki Makedonia, Thraki	2	2200.05
Guyane (FR)	60	2466.75
Kentriki Makedonia	4	2710.14
Corse	8	2797.82
West Yorkshire	-3	3517.44
Martinique (FR)	78	4871.35

# APPENDIX H

## STATISTICAL OUTLIERS

*Summary: Most outliers fit the conclusions well with a few modifications to account for variances from the study's implicit assumptions. Several were also only outliers due to errors in the dataset (e.g., a blank cell for 1989 GDP) which are corrected here.*

Twenty-two cases were removed from the dataset as outliers. Two of these – Denmark and East Wales – are *prima facie* excludable, as they received structural funds for reasons other than GDP per capita. (Curiously, though, Denmark fits the overall pattern when structural funding as a percentage of GDP is used as the independent variable.) The "Celtic Tiger" phenomenon is reflected in Northern Ireland's remarkable growth, although since it began near 75%, it does not necessarily contradict the study.

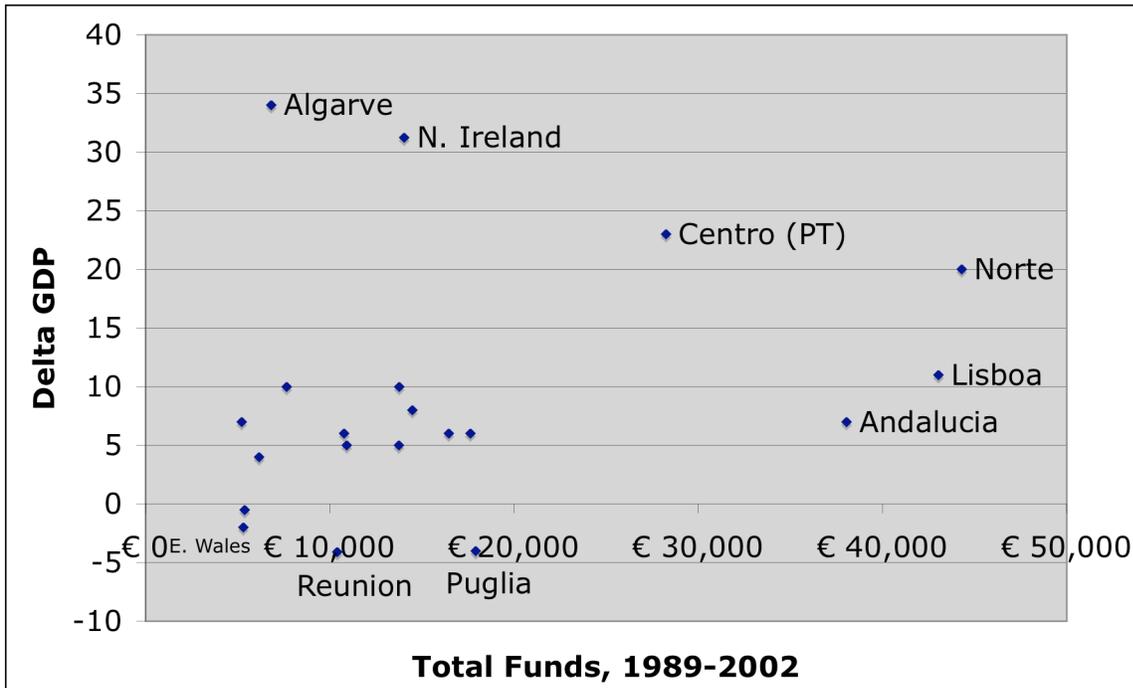
Structural funding as a percentage of GDP is arguably a more accurate measure of investment than raw structural funding, and is in fact the guideline that the Commission employs – 1% GDP being a loose maximum. Using this method actually reveals an abnormality that is concealed by the structural funds approach – Alentejo. Considering that it received structural funds equal to almost 1.7% of its 2002 GDP, its 10% growth rate from 1989-2002 period is strangely low. The next highest recipient, Algarve (1.32%), exhibited growth proportional to the size of its investment.

While the structural fund measure can be enhanced considerably by viewing it as a percentage of 2002 GDP, it is unfortunately not possible to similarly enhance the dependent variable's measurement. The implicit assumption of our study is that other determinants of growth are basically the same amongst these regions. However, regions like Puglia call this into question. It is possible that other regions are similarly distinct, and, like Alentejo, constitute "false confirmations" that would be shown to be inconsistent if more data were available.

	Total Funds	1989 GDP	2002 GDP	Growth	X	Growth/X	Pop. (M)
Región de Murcia	€ 5,212	62.8	69.8	7.0	0.31	22.89	1.01
Guadeloupe (FR)	€ 5,381	70.4	69.9	-0.5	0.83	-0.60	0.38
East Wales	€ 5,300	132.3	130.3	-2.0	0.18	-11.05	0.93
Principado de Asturias	€ 6,165	65.4	69.4	4.0	0.40	10.01	0.92
Algarve	€ 6,824	27.8	61.8	34.0	1.32	25.75	0.35
Basilicata	€ 7,652	63.0	73.0	10.0	0.83	12.06	0.52
Reunion (FR)	€ 10,408	66.8	62.7	-4.1	1.05	-3.91	0.66
Extremadura	€ 10,780	47.0	53.0	6.0	0.89	6.75	0.95
Castilla-la Mancha	€ 10,916	60.4	65.4	5.0	0.46	10.97	1.52
Calabria	€ 13,744	59.7	64.7	5.0	0.50	10.01	1.76
Alentejo	€ 13,774	40.7	50.7	10.0	1.67	5.98	0.67
Northern Ireland	€ 14,034	72.9	104.1	31.2	0.38	83.06	1.49
Comunidad Valenciana	€ 14,473	70.0	78.0	8.0	0.21	37.79	3.63
Castilla y León	€ 16,451	69.5	75.5	6.0	0.42	14.34	2.16
Galicia	€ 17,640	58.3	64.3	6.0	0.47	12.64	2.40
Puglia	€ 17,916	73.2	69.2	-4.0	0.30	-13.16	3.53
Centro (PT)	€ 28,258	25.1	48.1	23.0	1.18	19.44	2.06
Andalucía	€ 38,047	54.2	61.2	7.0	0.40	17.49	6.44
Lisboa	€ 43,040	74.2	85.2	11.0	0.88	12.46	2.37
Norte	€ 44,307	26.9	46.9	20.0	1.21	16.49	3.23
Denmark	€ 165,417	141.9	160.9	19.0	0.90	21.03	4.72

X = Structural funds/2002 GDP, in Euros)

## Outliers – Total Funds versus Delta GDP



## Outliers – Funds versus Delta GDP

