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COMMUNITY EXPENDITURE ON TRANSPORT COMMUNICATION AND REGIONAL INTEGRATION

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Abstract. This aim of this paper is to examine the relationship between transport infrastructure and spatial integration. The bulk of the relative bibliography gives evidence that such a relationship does exist and more precisely that there is a positive relationship between investment in transport infrastructure and spatial integration. This conclusion has some important political implications too. In order to strengthen cohesion and promote development the European Union has given priority to financing large transport infrastructure projects such as the Trans-European networks. In this paper by applying multi regression analysis we try to access quantitatively the impact of Community Structural Fund interventions on spatial integration in the cohesion countries. The paper uses the official statistical data for the cohesion countries and applies the most appropriate statistical analysis in order to test the hypothesis described. In line with the relevant bibliography this paper concludes that there is a positive and statistically significant impact of transport infrastructure on development and integration in the cohesion countries.

1. INTRODUCTION

The aim of this paper is to examine the relationship between transport infrastructure and spatial integration. As far as the spatial level concerns, this research is conducted in two levels: (i) Between the Member States with Objective 1 regions (regions with a GDP per inhabitant of less than 75% of the community average), and (ii.) between the Greek Regions. We point out that all the Greek Regions were Objective 1 regions and therefore, the whole country was eligible for structural support from the Objective 1 EU structural intervention.

However, the fact that the number of spatial entities is very limited (7 countries in the first case and 13 regions in the second accordingly) sets some limitations in the statistical analysis. Despite the limited possibility of having statistically significant results, the paper attempts to perform the analysis and then access the research findings. Then, alternative approaches may also be discussed and theoretical considerations will also be taken into consideration.

2. METHODOLOGICAL AND ANALYTICAL CONSIDERATIONS

One of the explanatory variables that are used in the analysis is the total expenditure of the CSF 1989-1993 for the Objective 1 regions. Such statistical data is available from the European Union statistical services. Furthermore, there are two additional reasons for making this choice. First, because that expenditure for the Objective 1 Regions corresponds to the majority of sources provided through the three Structural Funds of the European Union: (European Regional

Development Fund -ERDF, European Agricultural Guarantee and Guidance Fund - EAGGF, and the European Social Fund - ESF), namely at a rate of 70%. Second, because Objective 1 Regions are the most lagging behind areas in the European Union. If the analysis were to include also the regions of the other Objectives (2,3,4,5a, and 5b), there would be a problem of comparability between the examined regions. For these reasons we have made the choice to measure only the payments that have been channeled through the Community Support Framework to the Objective 1 regions, for the period 1989-1993. We note that these payments also include, some additional amounts in the context of Integrated Mediterranean Programmes.

The impact of community intervention in spatial integration is measured with the GDP growth. We therefore make the hypothesis that there is an interaction between development and integration, in the sense that the more an area is developing, the more it converges, and the more it contributes to the spatial cohesion. On the other hand Community interventions contribute to the GNP growth.

There is also a twofold relationship between spatial cohesion and development. The larger the internal cohesion is the more effective the Community interventions are. This is due to the existence of multiplication effects that are optimized through the inter-sectoral relations. The larger the number of inter-sectorial relations is, resulting from increased integration, the larger the multiplication impact on an originally uni-sectoral economic growth, on a larger number of sectors and businesses that are located in the same area. In the reverse situation, a total increase of the level of economic activity (measured by the increase of GNP), increases local demand and therefore, creates scale economies and agglomeration economies, both at the level of a business

and at the level of a sector. Eventually, the increase of GNP, creates the prerequisites to cover the local service and product market that previously had to be imported.

The above speculation, is based on some theoretical views, and is also generally confirmed by international practice. Similarly, there is a second fact supporting that such a relation does exist between integration and growth, related to geographical and spatial location. The fact that the European Union territorial cohesion objective is currently supported by large infrastructure projects is based on such an assumption. The great importance that has been given to the convergence procedure is actually an outcome of this situation and, similarly, recognizes that a low rate of internal integration has a negative influence on the perspectives of growth both at a community and at a national level.

Based on the above analysis we use as a measure of integration the GNP growth of examined spatial entities (countries or regions).

As far as the analysis at the level of Member States is concerned, the data refer to payments on transport communication only. The corresponding analysis, therefore, does not concern the total of payments of the CSF.

As far as the analysis at the level of Greek regions is concerned, on the contrary, due to availability of the appropriate data, an alternative analysis has employed. More specifically:

- The regional allocation of per capital expenditure of the Regional Programmes to the current 13 administrative regions. These are: (i) expenditure funded through the Regional Operational Programmes (ROP), that refer to the current 13 regions (Regional General Secretariats) and (ii.) expenditure funded through the Integrated

Mediterranean Programmes (IMP). We should note that the IMP's do not refer to these 13 regions, but to the 6 geographic departments that cover more than one region, and the allocation of expenditure was made depending on the population of the regions of each geographic department.

- Within the ROP's it is not possible to indicate funds for transport and communication sector. However, it is estimated that these payments constitute the largest part of the ROP, up to 60-75% on average, with some variations between regions. Therefore, the total payments of the ROP's are used as a variable, only partially expresses finances in transport and communication.

The dependant variable is the GNP growth during the period 1989-1992. As independent variables, apart from the CSF expenditure, we use per capita GNP for the year 1986 and GNP growth during the period 1985-1988. The reason for using these two additional variables is that the growth of GNP during the period 1989-1992 cannot totally be the result of the CSF expenditure only. The use of additional variables allows, therefore, more accurate research of the impact of the latter two. On one hand, per capita GNP for the year 1986, that is to say exactly two years before the beginning of the CSF, allows us to consider the absolute different development level of the various areas, while on the other, GNP growth during the period 1985-1986, allows us to take into consideration the diversity of the relative potential of the areas.

The research of the rate of correlation between GNP during the period 1989-1992 (y, dependent variable) and CSF expenditure 1989-1992 (x1, independent variable), per capita GNP of 1986 (x2, independent variable) and the GNP growth 1985-1988 (x3, independent

variable) was made by using multiple regression analysis.

3. STATISTICAL ANALYSIS

3.1. Multiple regression analysis at Member State level.

In this part of the paper the results of the statistical analysis are presented. The relation between expenditure of CSF '89-'93 for the improvement of communication in Objective 1 Member States of the EC and the GNP growth is examined.

According to the Regulations of the structural Funds, areas eligible to be included in Target 1 of the CSF 1989-1993 were the following:

Greece	:	the whole country
Portugal	:	the whole country
Ireland	:	the whole country
Italy	:	Abruzzi, Basilicata, Calabria, Campania, Molise, Puglia, Sardegna, Sicilia
France	:	French overseas Department (DOM), Corsica.
UK	:	N. Ireland.
Spain	:	Andalusia, Asturias, Castilia y Leon, Castilla-La Mancha, Cauta y Maililla, Comunidad Valenciana. Extremadura, Galicia. Canariaw, Murcia.

In total the Objective 1 regions include 22% of the community population. Available data is shown on the following table 1:

	GNP growth '89-'92	Expenditure of the CSF per capita for the improvement of communications '89-'92	Per Capita GNP '86	GNP growth '85-'88
	%	MECU's	MECU's	%
	y	X1	x2	x3
Greece	6.7	1,456.84	46.8	8.1
Spain	12	3,107.81	77.2	16.3
France	9	145.18	113.3	10.7
Ireland	20.2	668	77.3	12.6
Italy	7.6	801.13	103.8	12.7
Portugal	13.2	899.21	58.1	16.1
U.K.	-0.5	147.8	95.2	16.9

Table 1. Multiple regression analysis at country level for the period 1989-1993

Sources:

y Our calculations, based on the data from CEC 1993, Tab. 65-73

x1 Our calculations based on the total community funding of CSFs (CEC 1992, pg 9, Total(3) in CSFs) and of the percentage of CFS sources provided for the improvement of communications (EEK 1991, Tab. P 19)

x2 CEC 1993, Statistical Annex, Tab. 1 page 30 (EK=100, current prices, PPS)

x3 Our calculations based on the data of CEC 1993, Tab. 65-73.

The processing of these data through multiple regression analysis led to the following equation:

$$y=19.52 + 116.15x1 + 19x2 + 42x3$$

The remaining statistical data are mentioned in the following two tables:

Regression Statistics	
Multiple R	0.83854233
R Square	0.703153239
Adjusted R Square	0.406306478
Standard Error	4.930866657
Observations	7

Analysis of Variance

	df	Sum of Squares	Mean Square	F	Significance
Regression	3	172.7768049	57.5922683	2.368741491	0.24864
Residual	3	72.94033796	24.31344599		
Total	6	245.7171429			

	Coefficients	Standard Error	t Statistics	P-value	Lower 95%	Upper 95%
intercept	-19.5234503	17.96662659	-1.086650863	0.318906506	-76.701	37.6544
x1	116.1541116	47.01708421	2.470466078	0.048427098	-33.475	265.784
x2	0.186649573	0.136945692	1.362945929	0.221830714	-0.2492	0.62247
x3	0.412189542	0.647900471	0.636192687	0.548135726	-1.6497	2.4741

As we can see from the above data, Multiple R is quite high and equal to 0.83. R square is 0.70. Adjusted R square is also high: 0,40. However, F-statistic does not permit us to reject the null hypothesis. The very low degree of freedom is, as we believe and according to what we have already mentioned, the reason for this situation and not the lack of a real correlation between the variable of GNP and the three independent variables.

3.2. Multiple regression analysis in the Greek Regions

Research through multiple regression of the relation between expenditure of the regional portion of the CSF '89-'93 in Greek Regions and the alteration of GNP.

Available data from the 13 Greek regions appear on the following table2. We note that per capita GNP refers to the year 1988 and not 1986 as in the case of the analysis at state level, due to the lack of available data.

	GNP growtl '89-'92	Expenditure of the ROP's+CSFs per capita for '89-92	Per Capita GNP '88	GNP growth '85-'88
	%	Billion GDR	Billion GDR	%
	y	x1	x2	x3
Crete	0.161434978	0.104283054	0.041527002	-0.11969112
C. Macedonia	0.049681529	0.042196532	0.04537523	0.102672293
Thessaly	0.103092784	0.07250342	0.039808482	0.031914894
S. Aegean	0.251908397	0.102661597	0.049809886	0.224299065
N. Aegean	0.125	0.089473684	0.033684211	0.066668687
Epirus	0.135135135	0.112094395	0.032743383	0.373578595
Central Greece	0.065420561	0.08462867	0.055440415	0.077357859 5
Thrace+E. Macedonia	-0.01762115	0.221254355	0.039547038	-0.11969112
Ionian Islands	0.076923077	0.146596859	0.040837696	0.084507042
W. Macedonia	0.353741497	0.096556314	0.036182336	0.0288340081
W. Greece	0.062992126	0.04985755	0.036182336	0.028340081
Peloponnese	0.088353414	0.051155116	0.041089192	-0.008
Attica	0.010783201	0.032074936	0.050014192	0.053892216

Table 2. Multiple regression analysis for the Greek regions: 1989-1993

Sources:

y Our calculations are based on the data provided by Kavvadias 1992, Tab. 1.1-1.13, 1970 constant prices

x1 CEC 1992, Table 3a row 3

x2 Kavvadias 1992, Tab. 1.1-1.13,1970 constants prices

x3 Our calculations are based on data provided by Kavvadias 1992. Tab. 1.1-1.13, 1970 constant prices

The processing of these data through multiple regression analysis led to the following equation:

y=0.08 + 0.3x1 + 0.99x2 + 68x3

The remaining statistical data are mentioned in the following two tables:

Regression Statistics	
Multiple R	0.672812269
R Square	0.45267635
Adjusted R Square	0.2702351333
Standard Error	0.084898811

Analysis of Variance

	df	Sum of Squar	Mean Squar	F	Significance F
Regression	3	0.05365242	0.01788414	2.481217557	0.12728
Residual	9	0.064870273	0.007207808		
Total	12	0.118522694			

	Coefficients	Standard Error	t Statistics	P-value	Lower 95%	Upper 95%
Intercept	0.088129627	0.176511688	0.40038401	0.626606285	-0.03112	0.48743
X1	0.307646353	0.512168809	0.600673738	0.559231861	-0.851	1.46625
X2	-0.98438788	3.929330241	-0.25052307	0.806420744	-9.8732	7.90438
X3	0.681004169	0.26294617	2.589894171	0.02366252	0.08618	1027583

As we can see from the above data, Multiple R is quite high and equal to 0.67. R square is 0.45. Adjusted R square is also high : 0,27. However, as in the case of the previous regression, F-statistic does not permit us to reject the null hypothesis. In this case also the problem is due to the small number of freedom degree.

4. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The most obvious question that has arisen here is, under the findings described above, whether we can support the relationship between infrastructure investment and regional integration, or not. The statistical evidence is poor. By rejecting the null hypothesis in both applications of multiple regression analyses, makes concerns over the central hypothesis of the paper that a positive relationship between expenditure on transport infrastructure and spatial integration does exist. Despite the validity of the results in our opinion the overall analysis of the present paper leads to the conclusion that this relation does exist. Relative bibliography accepts that such a relation does exist. On the other hand the relatively recent decision of the European Union to finance Trans-European Networks with large amounts is indicative. The reasoning of this decision, is based briefly on the following (European

Commission 1993, European Commission 1994: 66-67):

- The direct and indirect contribution of transport infrastructure to regional economic development is commonly accepted. We are led to this conclusion moreover also by the analyses of the current situation. The lagging behind regions also fall short of the basic indices of road infrastructure; the total surface of the network per square kilometer in Greece and Spain reaches only 23% of the community average, while in Portugal the rate is 42%. Further, based on a complex index that provides an equal standard on the grounds of population and size, these three countries are characterized by acute insufficiencies (European Commission 1994: 67-69). As far as their railroad infrastructure is concerned, Greece provides the less developed network (idem, 70).

- By characterizing both of these infrastructures as "utilities", the result is that after they are created, they serve everybody at zero or at a very low fee. The total percentage of economic return on the relevant investments is therefore much higher than the apparent return according to a typical cost-benefit micro-economic approach.

The low levels of investments in infrastructure, due to fiscal difficulties during the recent period, have impeded productivity and employment rates from increasing in the various Member States. More specifically, as far as Greece is concerned, for the largest part of the period 1980-89, investments in the road network were significantly lower than the average community level (0.45% of GNP, compared to 0.73% of GNP) (European Commission 1994, Tab. A12). Similar is the picture concerning the railroad infrastructure (idem, Tab. A 13).

Moreover, the above does not revoke the fact that the relation

under discussion requires a further research. Some basic points that are being discussed today at an international level are, thus, the following:

(a) Which is the cause and which is the effect, between expenditure for infrastructure and development/integration (Biehl et al. 1986, Biehl 1991)? This, by not denying that the first ones support the second, mainly refers to the fact that development permits a secondary increase of expenditure on infrastructure, and as a result a long-term spiral relation of interface between the two incidents.

(b) Which is the required level of investments in order for the cycle of positive multiplication effects to start, or in other words, which is the threshold beyond which external economies start to operate? It is indicative that, according to studies of the European Commission, while during the period 1989-93 from the net contribution of the EROF to the weaker regions that reached the amount of 7.5 billion ECU's, 3.5 billion ECU's concerned parts of networks of inter-European interest; the completion of inter-European transport networks will require 1,000 to 1,500 billion ECU's for the period 1990-2010.

(c) How, given the above mentioned issues, can the private sector increase its participation in funding transport infrastructure?

More specifically, as far as Greece is concerned, the fact that multiple regression analysis does not lead to statistically significant results, apart from the reasons mentioned above and that are valid for the appropriate analysis of the countries of Objective 1, is due also to some Greek particularities. More specifically:

a. The use for Greece of data that is fragmentary and approximate (regional instead of total expenditure, overall expenditure and not specifically that related to transport-communication) blurs the actual impact of the total transport expenditure, more than in the case of

analysis between countries.

b. At a same rate, and eventually even more, in the case of Greece, a significant role is played also by essential reasons related to the efficiency and effectiveness of the use of community funds. As is well known, although Greece received proportionally the greatest percentage of Community funds from the Structural Funds, during the 1st CSF financial perspectives, it was quite behind compared to the other Objective 1 countries, as can be seen in the following table:

Per Capita GNP in APP*, European Union 12=100		
	Per Capita GNP	
	1986	1993
Greece	51	49
Spain	71	78
Ireland	63	78
Portugal	52	80

Table 3. GNP in the 'Cohesion countries' 1986, 1993

* Average Purchasing Power
Source: European Commission 1994, Table 3

This failure is due, among other reasons, also to the low efficiency of the use of community sources, both as a total and more specifically regarding expenditure on transport infrastructure.

c. In the case of the National portion, through the Operational Programme for Major Motorways, 60 km were finally constructed, instead of the 100 km scheduled. Given the level of exonomic development of the country, it is clear that the contribution in the

improvement of intercity road infrastructure is obviously inadequate. Similarly low is the efficiency of sources for transport of the Regional Operational Programmes. Indicative (and representative of the other Regional Programmes of the 1st CSF) is the case of the Thessaly ROP, under the Measure 11.1. of which (Road upgrading works) only 24 km of new roads were constructed (new alignments), representing an increase by 0.7% of the total length of the road network in the Region. Taking into consideration only the roads of the National network, the impact of the ROP is even more limited and actually marginal (YPODOMI 1993).

Based on the total of the above analysis and speculations, the conclusion we come to is that, despite the multiple regression poor results, the impact of transport infrastructure on development and integration is positive and important, naturally under conditions that have already been mentioned (sufficient amounts of provided funds, their efficient use etc.)

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