

# **Types of public investment and the regions: a spatial economic analysis of government spending on Greek prefectures over the period 1976-2005**

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## **Abstract**

This paper utilizes a large database on public investment at the prefecture (NUTS-3) level in Greece for the period 1976-2005 to examine a series of questions that have to do with the allocation of public investment in the country. We focus on five aggregate expenditure categories (productive, social, transport, urban and local expenditures). We start by examining the spatial distribution of these types of public investments for the 30-year period of our sample, seeking to describe the main patterns of spatial concentration and identify significant temporal structural breaks. We then examine the extent to which expenditures in different types of public investment appear to be complementary across space and over time. We also examine the redistributive character of each of these types of expenditures and try to relate the regional allocation of investments to specific economic, locational and political characteristics of the Greek regions. Finally, we perform a large set of complementary exploratory spatial data analyses to examine the extent of geographical clustering of public investment and identify possible spillovers across the Greek regions. Although much of this analysis is predominantly descriptive, the results of our analysis are directly used to inform a number of geographical, political and economic research questions that future research on the topic should focus on.

## **1. Introduction**

Public investment constitutes an important element for upgrading the productive environment of the economy and improving the welfare conditions at different regions and localities. Classical writers (Buchanan, 1949, 1950, 1952; Scott, 1952; Musgrave, 1959; Oates, 1972, 1998; Samuelson, 1954; Tiebout, 1956; Hirschman, 1957) and

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more recent advances in empirical work have given prominent position to the role of public investment in economic development (Bennett, 1980; Heald, 1994; Aschauer, 1989). Today, public investment has come again at the forefront in economic policy debates since it constitutes an important element for confronting economic downturn and provides vital support for employment creation. Whereas current focus on public investment is non-spatial, it is clear that the spatial allocation of investments plays an important role not only for local or regional development but also for the effectiveness of public investment in tackling problems of national development and growth. In this sense, the current interest in public investment as a stimulant of economic activity links directly to the bulk of research of the last two decades that has explicitly related to the geography of public spending.

This paper examines the regional distribution of public investment in Greece during a 30-year period between 1976 and 2005. Our objective is to provide a full account of the regional distribution of public investment in the country and unveil its key characteristics. Specifically, we examine continuity and change concerning regional disparities in public investment; regional specialisations and geographical concentrations for specific types of public investment; the temporal persistence of regional allocations within and across the political cycle; the complementarity or substitutability between different types of expenditures; their redistributive capacity; as well as the extent of spatial clustering and/or diffusion. We tackle these issues mainly in a descriptive fashion, but we consciously try to derive specific conclusions and possible research questions concerning the determinants, political, social and economic, of the observed patterns. Although the interpretation of these is left for future work, we consider this holistic representation and analysis of the spatial and functional patterns of public investment in Greece as an important first step in understanding the allocation of public investment in the country and thus also evaluating its effectiveness. In this sense, we follow the important works of Bennett (1980), Johnston (1980), Mas et al (2003), McLean (2005) and others, who have analysed the geographical patterns of government spending in a variety of countries; and we add to this literature by employing spatial economic analysis methods in order to shed additional light into the geographical patterns of government spending in Greece.

Tracing the regional allocation of public investment is not at all a straightforward issue. Scarcity of statistical data has been traditionally the main constrain for analysing fiscal issues at regional level. This study draws on one of the largest and most consistent sub-national datasets for public investment internationally, constructed through the painstaking collection of publicly and under-licence available data relating to payments made through the Public Investment Programme (PIP) of the annual Greek State Budget (for more details see Psycharis, 2008). The data used in this study include all payments realised by different tiers of public administration; national (ministerial), regional, prefectural, and local, which are financed both by domestic resources and through the structural funds of the European Union. Such data include public investment in infrastructure for the economy's primary and secondary sectors, payments for infrastructure in the form of roads, bridges, ports, airports and tourist facilities, urban infrastructure (primarily water and sewage facilities and housing), social infrastructure (education and health), etc. Total amount of public investment has been disaggregated into different types of public investment namely productive, social, transport, urban, local and miscellaneous. To obtain a measure of public investment at constant prices, sectoral deflators were used for the different categories of infrastructure investment. All variables are expressed in EURO and at constant 2000 prices. For every variable there are 1650 observations, fifty-one cross-section observations per year. Finally, the entire period has been split into separate sub-periods, which coincide broadly with different political and economic cycles in Greece.

Specifically, we aggregate our annual data into six periods, which correspond to distinctive phases of Greece's political and economic development post-1974. The first period (1976-1981) covers the first democratic governments after the restoration of democracy, where the main policy objectives concerned the stabilisation and development of the economy and the democratisation of governance, naturally with less attention paid to issues of spatial cohesion and redistribution (Kazakos, 2001; Pagoulatos, 2003). In the second period (1982-1989) the policy priorities were significantly altered, as the first socialist governments undertook a relatively large state expansion programme and committed to at least some degree of redistribution (in political and economic terms) to less well-off regions and segments of the society. The period 1990-1993 was a period of significant political turbulence in the country,

with a number of changes in government and ultimately a centre-right government which undertook the first (but largely unsuccessful) privatisation and economic reform programme. The third and fourth periods cover the centre-left governments that eventually led the country to EMU membership and the successful organisation of the 2004 Olympics, with both events having significant implications for the size and allocation of public investments, as we shall see below. Finally, the last period is a residual period covering the first year in office of the centre-right government which again had to re-prioritise its public investment programme partly due to a deterioration of public finances and the entrance of Greece into the Excessive Deficit Procedure under the SGP.

Two caveats should be noted about this data. First, national experiences have shown that a large amount of public investment remains unallocated and cannot be attributed to a specific region (Heald 1994; Mackay 2001: 566; Heald and Short 2002; McLean and McMillan 2003; Anton, 1982). The regionally identifiable public investment for Greece over the period 1976-05 was only 55% of the total (this includes interregional projects or projects that affect the entire population of the country). In comparison, in 2000/01 regionally identifiable public investment in the UK was 87% of total expenditure (Begg et al, 2003) while before 1990 it was around 81% (Heald, 1994, p.150). Despite the fact that the unallocated amount has important spatial implications, this study is based only on the regionally allocated part of the expenditures.<sup>1</sup> The same applies to different types of public investment. Second, even for the regionally identifiable public investment it is open to question whether these expenditures that are made *in* a region are expenditures made *in and for* the region (Short 1978:501). The spillover affects and externalities are also important issues deriving from the regional public finance literature. We try to control for this possibility in our analysis of the spatial clustering/dependence of public investment.

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<sup>1</sup> In this sense, we fall foul of the critique of Gripiaios and Bishop (2005), who rightly argue that ‘all types of government expenditure can have a significant spatial impact [and thus] an appraisal of the spatial impact of the state requires an examination of government spending in its entirety, not simply that part explicitly intended for regional purposes’ (p. 806 – see also Short 1981, MacCay 2001, Heald and Short 2002). We are aware that the unallocated amount has important spatial implications; however analysing regionally identified public spending is a good starting point for policy analysis and in empirical terms the only available strategy.

The structure of the paper is as follows. In section 2 we provide a brief overview of the scale, temporal evolution and regional variation of public investment in the country. Section 3 examines three key characteristics of the regional allocation of public investment, namely its temporal persistence, its functional complementarity and its redistributive capacity. In section 4 we look at the geographical characteristics of public investment, examining the extent of regional specialisations, geographical concentrations and spatial clustering. The last section summarises our results and considers the research and policy questions that derive from them.

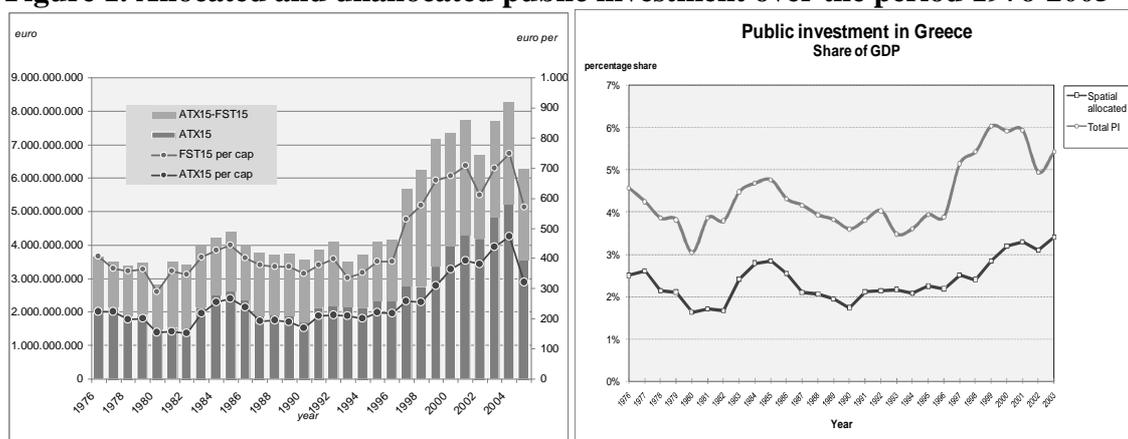
## **2. Public investment data for Greece – some stylized facts**

As is well documented elsewhere (Psycharis, 2008) in the course of the 30-year period the volume of public investment in Greece has increased in current prices by 64 times, from €117m in 1976 to €7524m in 2005. However, at constant prices, increases were much less intense; in the year 2005 the volume of public investment was 1.7 times higher than that of the year 1976. As a result, in per capita terms or as a share of GDP public investment has changed little over the period (indeed, total public investment remained at around 4% of GDP throughout the years 1976-1997, while the regionally identified element remained almost constant at just above 2% of GDP until 1998. Nevertheless, some important temporal patterns are present.

Figure 1 demonstrates the annual evolution of spatially allocated and unallocated public investment in Greece over the period 1976-2005. Annual public investments are split between those that are spatially allocated (dark grey) and those that are not (light grey). The share of unallocated to spatially identifiable remains relatively stable over time. Similar is the picture concerning the per capital public investment, which is depicted by the continuous lines in the figure (again, dark and light grey for spatially allocated and unallocated investments, respectively). As can be seen, public investment has remained rather constant in the first twenty years of our analysis, although a notable increase in the early 1980s (when the first socialist government took office) and a relative decline afterwards are clearly identifiable. A turning point for the evolution of public investment is however observed in the year 1997, where a sharp increase has taken place. This was due to a multiple of reasons: first, structural

funding from the EU was increased<sup>2</sup>; second, following the implementation of new legislation, projects for human capital (e.g., training) which initially were registered in the Ordinary Budget were now transferred to the Public Investment Budget<sup>3</sup>; finally, Olympic Games projects played also a role in the sharp increase of public investment after 2000. Indeed, the largest public investment programme ever implemented in Greece was that at the year 2004, with public investment being at that year 2.3 times higher compared to 1976.

**Figure 1. Allocated and unallocated public investment over the period 1976-2005**



Despite this picture of relative stability, as should be expected perhaps, the functional allocation of regionally identifiable public investment has changed notably over the course of our sample-period. On average, Local expenditures (i.e., public investment for Local Projects channelled through the Prefectural and Regional Programmes), have covered on average 31% of the total volume of public investments.<sup>4</sup> Thus, in per capita terms, €73.6 was given by Local programmes and €163.8 was driven by Central State decisions. However, the share of Local expenditures increased from a

<sup>2</sup> Public investment in EU-15 has fallen markedly since 1993. While the general trend has been downwards, there were considerable variations between countries. In Greece, as well as in the other EU-15 Cohesion countries, public investment is not only around 50% higher than in other EU-15 countries, but has risen slightly since 1995. The higher level of public investment in the Cohesion countries and the growth over the period 1996-2003 is almost certainly due in part to the substantial EU support for investment under cohesion policy (European Communities 2007:139).

<sup>3</sup> Some other administrative changes are also worth mentioning. Between 1979 and 1989 part of interest rates and debts were registered and paid through the Public Investment Budget, leading to a misleading picture for the evolution of public investment in Greece. In 1981 and 1982 a percentage of 27.7% and 23.4% respectively were made for such type of payments. Payments for the nationalization of private industries in the 1980s were also made through the public investment budget (this represented 15.6% of total spending in 1986 and 22.2% in 1987 – see Psycharis, 1990).

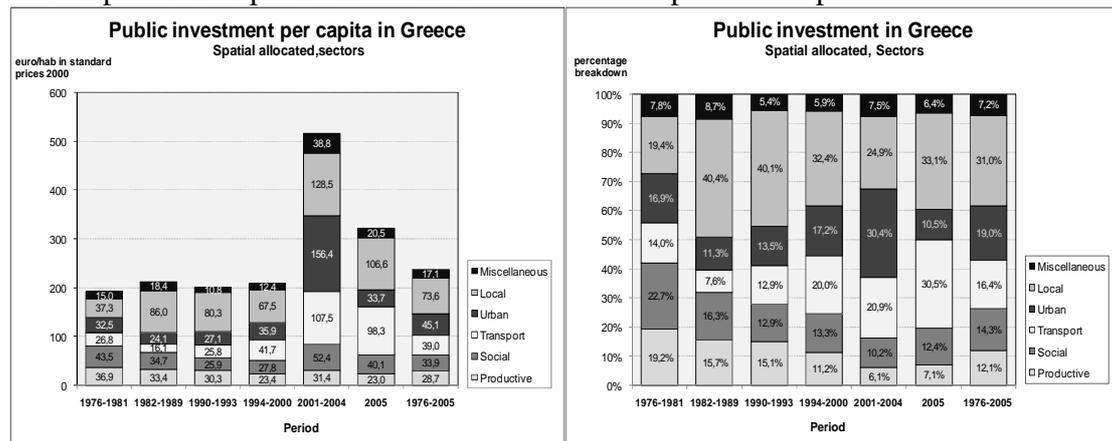
<sup>4</sup> It should be noted however that decentralization of fiscal responsibility in Greece is limited and the level of responsibility of regional and local agents over total spending for Greece is half the EU average.

'low' 19.4% in the 1970s to a 'high' 40.4% in the 1980s, clearly reflecting the different prioritising of the respective governments with regard to the functional allocation of public investment. Since then, the share of this category has followed a declining path, partly due to a shift of expenditures towards the Urban and Transport categories, especially in the pre-Olympics period (2001-2004). Transport expenditures were relatively neglected in the 1980s but have since been increasing steadily, reaching 20.5% by 2005. If we take into consideration that the largest part of local public investment includes transport investment then this category is the dominant type of public investment in Greece. Urban investment experienced a steady increase during the 1990s and culminated during the period 2000-04 due to the Athens 2004 Olympic Games. However, this increase has affected primarily Athens in the expense of the rest of the country.

**Figure 2: Public investment per capita by type and period**

a. Composition of public investment

b. Composition in percent of the total



Quite strikingly, the share of Productive and Social investments has been almost continuously declining over time, occupying since the early 2000s less than 20% of total public investments jointly. Especially for the Productive category, this represents an absolute decline, as the per capital expenditure in 2005 was only two-thirds of the corresponding figure in 1976. Figure 2 depicts these patterns (for more detailed information about these shares see Table A1 in the Appendix). The two panels of the figure depict clearly the vast increase in public spending (in per capita terms) in the pre-Olympics period (panel (a)) and the drastic change in the functional allocation of public investment in the 1980s. They also show how the Urban and Transport expenditures have been squeezing the Local and Productive expenditures, respectively, almost continuously since the 1980s. The result of this has been the

dismal performance, recently, of the Productive category in both relative and absolute terms.

Perhaps more important, for the purposes of our work in this paper, is the extent and evolution of regional disparities in the allocation of public investment and its sub-categories. Although the scale and scope (e.g., in relation to regional income disparities) of regionally identified public investment varies significantly across countries, rendering any cross-country comparisons of regional disparities in the allocation of public investment effectively meaningless, it appears that regional disparities in the allocation of public investment in Greece are quite sizeable. For example, the coefficient of variation in per capital public expenditure across the 12 Standard Statistical Regions of the UK has been quite stable at around 0.15 for the period 1987-2001 (Begg et al, 2003). In contrast, the corresponding figure for the 13 NUTS2 regions of Greece has oscillated around 0.4, representing an almost threefold magnitude of regional disparities in Greece compared to the UK.

Clearly, the extent of geographical dispersion in public investment should not be taken as evidence of an inequitable distribution of resources. Instead, higher dispersion may be reflecting a wider dispersion in regional infrastructural and other needs. Thus, while reducing inequalities in infrastructures is one of the main goals of state intervention in the economy in order to achieve balanced development of the country and provide equal opportunities for all citizens and enterprises, to achieve this it may be necessary to allocate its public investment unequally across space.<sup>5</sup>

Figure 3 depicts the evolution of the coefficient of variation of public investment by function, providing evidence partly in support of this hypothesis.<sup>6</sup> As should be expected, regional disparities in total public investment are lower than dispersion in any of the sub-categories, suggesting at least some degree of substitution across types

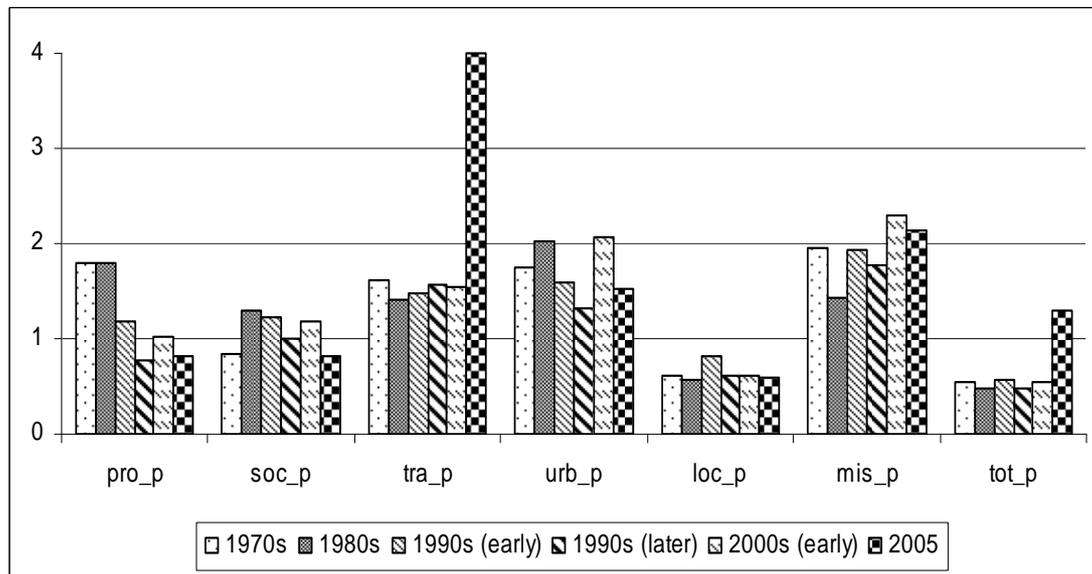
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<sup>5</sup> Our objective here is not to evaluate the scope and effectiveness of public investment in doing so; we review the dispersion in the geographical allocation of public investment as a means to identifying regional gaps and structural breaks in the different types of public investment, as well as the extent of regional differentiation by type of investment and by historical period, so as to inform the subsequent analysis concerning the patterns of complementarity, substitutability and geographical concentration that are examined in the subsequent parts of this paper.

<sup>6</sup> Figure 3 presents annual average values for the coefficient of variation by period. See Figure A1 in Appendix for a more detailed picture of the dispersion in the allocation of public investments by function.

of investments. Moreover, with the exception of the year 2005, our residual period, they have remained rather constant. This seems to us to suggest that the geographical allocation of public investment is not directly linked to regional dispersions in incomes or needs, as the last 30 years have seen episodes of regional economic convergence (Asteriou and Siriopoulos, 1997), despite the fact that the overall economic geography of the country (e.g., the ‘underdevelopment arc’ – see Monastiriotis, 2005) has not changed significantly. Interestingly, however, regional disparities in the sub-categorical measures are as much as four times larger than for total expenditures – which we consider to be surprisingly large.

**Figure 3: Geographical dispersion of public investment by period and function**



Of all categories, local expenditures (see loc\_p) are the most evenly distributed over space. This type of expenditure, which represents the transfers of national budget to the prefectures and municipalities, constitutes an important element for local economic development policies; it highlights the benchmark level of public investment that has been secured for the implementation of public policy at the local level. The administration and implementation of such a policy relies upon the discretionary power of local government and determines the level of fiscal and administrative decentralization in Greece. Historically, these ‘local stabilizers’ have played an important role in local economic policy and politics, namely in the geography of political power. It appears that allocation of these is rather uniform in per capita terms, by implication prioritising redistribution across people than across

regional economies. This is perhaps an important feature of public investment policy in Greece, signifying its designation as primarily a social, rather than regional, policy.

In contrast, the highest dispersion is observed consistently for the Miscellaneous category. It has to be noted that this category sums up different kinds of payments varying from administrative expenditures –which can hardly be considered as public investment– to urgent works as well as compensations to people and enterprises due to natural disasters or calamities such as earthquakes, flood damage, snow and ice destruction and crop damage. In addition *ad hoc* payments for specific purposes are also channelled through this category. This goes a long way in explaining why it is so unevenly dispersed across space. In this sense, its not systematic incidence and broadly defined context make it difficult to interpret.

Of the other categories, which as we saw earlier constitute some 69% of total regionally identifiable public investment, Urban and Transport expenditures show the greatest regional variability. Disparities in Urban expenditures have been declining during the 1990s but they increased sharply in the pre-Olympics period, apparently due to the shift of geographical prioritising towards Athens and the other large urban centres. In contrast, disparities in Transport expenditures have been relatively constant, with the exception of 2005, where we observe a substantial spike which is largely due to an extraordinary increase in transport expenditure in one of the prefectures of the Western Macedonia region (Grevena).<sup>7</sup>

Disparities in the Productive and Social categories have been declining continuously until the late 1990s (with the exception of a significant rise for Social expenditures in the 1980s, which was arguably of a redistributive character), although for both categories disparities increased in the pre-Olympics period. As should be expected, inequalities in Productive investments are for most of the period significantly higher

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<sup>7</sup> In 2005 two large infrastructure programmes were implemented in Grevena. The first concerned the local part of the new east-west road axis in northern Greece (Egnatia Road), with a payment of €12m in 2005 alone. The second was a new programme, launched by the then Minister of Finance (who is elected in Grevena), for various infrastructure works in the prefecture, of total budget €4.3m, 93% of which was paid in 2005. Obviously, these investments influence dramatically the inequality index for the whole country in this year – especially given that this year constitutes our one-year residual period.

than inequalities in Social investments<sup>8</sup> – especially in the 1970s and 1980s. Nevertheless, since the 1990s we observe a surprising change of this pattern, with disparities in Productive investments converging fast to those for Social investments, presumably reflecting a unification of local needs in productive and social infrastructures.

Overall, regional inequality in the dispersion of total public investment in Greek prefectures is considerably high and has remained relatively stable over time. Also stable has been the volume of public investment nationally, with per capita public investment remaining quite constant until the late 1990s and perhaps even declining as a share of GDP – although since the early 2000s public investment increased significantly. The largest part of public investment has been channelled through the Local expenditures category. This, together with the Urban and Transport categories, constitute the largest part of public investment in Greece. In contrast, expenditures for Productive and Social investments are much lower and even declining more recently. The geographical dispersion of these types of public investment has been declining over time, although for Urban and Transport it shows a small upward trend. In the remainder of this paper we keep this information in the background, as we move on to examine in turn (a) the link between different types of expenditures (with one another and with regional incomes); and (b) the geographical patterns of clustering, specialisation and concentration in public investment nationally.

### **3. Patterns of persistence, substitutability and redistribution**

A first question that we want to address is the extent to which the regional allocation of public investment persists over time (across periods). Persistence in the ranking of regions for specific expenditure categories can be taken to suggest continuity in the geography of regional needs for the particular type of investment, such as chronic problems of underdevelopment in the case of productive investment or urbanisation in the case of the urban category. However, persistence in the allocation of total

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<sup>8</sup> Inequality in productive infrastructures is usually higher than inequality in social infrastructure, as geographical specialisation and thus the corresponding infrastructural needs for productive activities are highly differentiated across regions. In contrast, social needs are almost the same in every territory. Health care and education affect all people equally regardless the place they live. It is therefore consistent with that need the higher dispersion of spending aiming at fulfilling local needs of populations.

expenditures, if coupled with low degrees of persistence in any of the sub-categories, would rather seem to suggest a different function for public investment, i.e., a redistributive character irrespective of specific regional attributes or needs. Inversely, very low persistence across periods could be taken to indicate a change in government priorities, especially to the extent that the (regional) business cycles do not coincide with the political cycles.

**Figure 4. Persistence in the regional allocation of public investment, by category.**

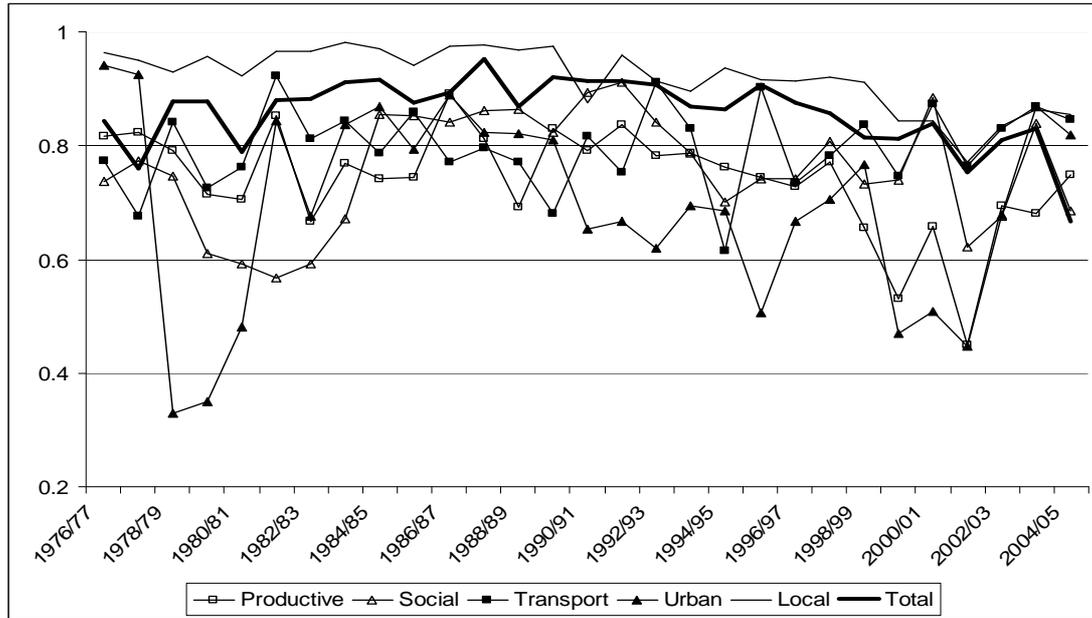


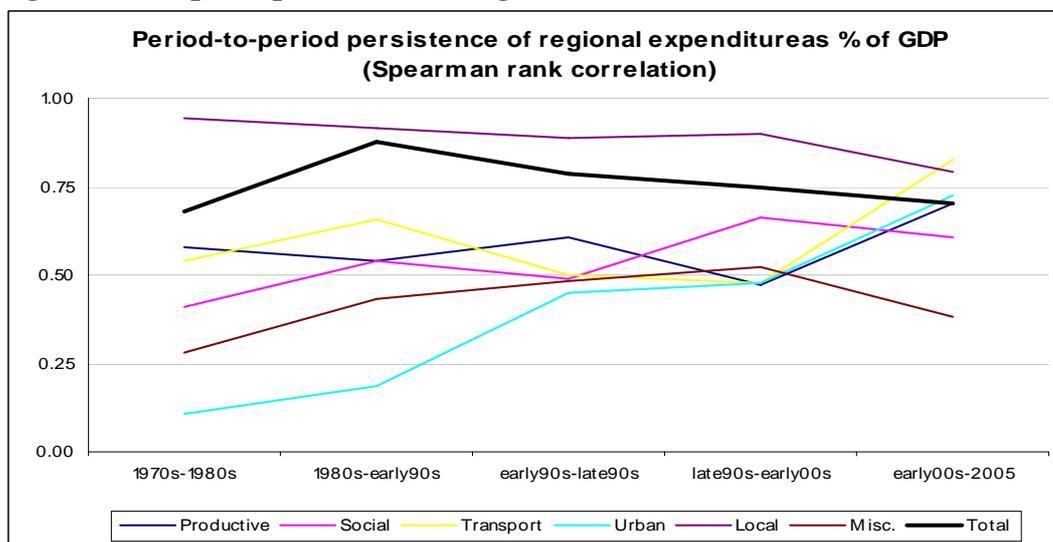
Figure 4 depicts the evolution of the persistence coefficient for the regional allocation of public investment, by category. As can be seen, the year-to-year persistence is particularly high, ranging for most of the period and for most categories between 70%-90%.<sup>9</sup> This suggests a high continuity in the regional allocation of public investment, without significant structural breaks – notably with the exception of the urban category in the late 1970s / early 1980s. On the other hand, the persistence coefficient for total expenditures is higher than for most of the sub-categories, suggesting some prioritising which is region-based rather than need-based.<sup>10</sup> This is also consistent with the fact that local expenditures (which are effectively a locally

<sup>9</sup> This is consistent for both per-capita and share-to-GDP measures; only the latter are presented here.

<sup>10</sup> The argument here is that if a region is always first in the rank in terms of total expenditures but its rank in different sub-categories varies (e.g., in one year it is first in ‘social’ but lower down in ‘productive’ whereas in another year it is first in ‘productive’ but lower down in ‘social’), then it is plausible to conclude that policy targets the region generally, than a particular regional need.

allocated total category) show the highest persistence of all variables (although declining over time).

**Figure 5. Temporal persistence of regional investment**



In Figure 5 we examine the persistence of the regional allocation by political period. Naturally, persistence appears substantially lower for most expenditure categories, ranging for most of the period around 50%. Nevertheless, persistence is still rather high: in 2005, 35% of the regional allocation of (total) public investment was still accounted for by the distribution in the late 1970s – although this is to a large extent due to continuity in the ‘local’ category, which shows a persistence coefficient of over or about 90% for most of the period (70% cumulatively between 1976-2005). It is worth noticing that, with this exception, the persistence coefficient for total expenditures is higher than for any other sub-category. We interpret this as evidence in favour of our observation that public expenditure has a regional-targeting role over and above what would be expected based on specific regional needs. We return to this point later, when examining the question of complementarity in the regional allocation of expenditures.

The other point arising from Figure 5 is that, in contrast to the year-to-year analysis, evidence of structural breaks in the regional allocation of expenditures across periods is much stronger. The case of the transition to the first socialist government (1970s/1980s) may be to some extent expected, although the strong discontinuity observed there concerns mainly expenditures under the ‘urban’ category and does not

generalise to the same extent to the other categories. Indeed, besides this, the persistence coefficients for social, productive and transport-infrastructure investments have been consistently around 50%, even in periods that have exhibited political continuity (i.e., late 1990 / early 2000s). This suggests that transport, social and productive expenditures are shifted over time from one geographical area to another. For transport investment this is consistent with the observation that Greece has been very slow to develop nationally its transport infrastructure and that this development has been happening gradually in different parts of the country. For social and productive investment, however, the finding is less intuitive as, despite some convergence, the economic geography of the country, and thus the relative developmental needs of its regions, has not changed significantly over the last 30 years. Thus, there seems that some shift of prioritising, across regions and expenditure categories, has taken place.

One implication of this observation is that there may be some substitutability between categories of public investment: at any point in time, a region may attract disproportionately more of one type of investment, but this may be largely happening at the expense of its allocation for other types of investment. We examine formally this hypothesis by looking at the complementarity of regional allocations across types of expenditures. Table 1 presents the results from this analysis. As can be seen, contrary to our expectation, overall there is very little complementarity between categories. The geographical allocation of productive investments exhibits practically no resemblance to that of social, transport, or any other type of expenditures. This is clearly the case for all periods and all possible pairs of expenditures, with the exception of social and productive expenditures in 2005 and some pairs of local expenditures in various periods (local and social in the 1970s; local and transport in the 1980s; and local and productive in the late 1990s). On the other hand, the hypothesis of substitutability across expenditure categories is also not supported by the data: very few coefficients are negative and in all cases they are not statistically different from zero. Thus, it appears from this piece of evidence that the geographical allocation of each type of expenditure is independent from that of other types of expenditures. This does not necessarily imply that the allocation of expenditures is on the basis of need. Indeed, the conclusion stands that overall expenditures have a function of equalising financial flows across regions.

**Table 1. Complementarity of regional expenditures by pair of types and period**

	Productive	Social	Transport	Urban	Local	Misc.
<b>1974-1981</b>						
<b>Productive</b>		-0.024	-0.029	-0.021	-0.221	0.201
<b>Social</b>	-0.011		0.073	0.088	0.050	0.122
<b>Transport</b>	0.018	0.153		0.113	0.050	0.335
<b>Urban</b>	0.001	0.075	0.118		-0.076	0.540
<b>Local</b>	-0.178	0.383	0.170	0.190		-0.050
<b>Misc.</b>	0.275	0.192	0.335	0.498	0.162	
<b>1982-1989</b>						
<b>Productive</b>		-0.036	-0.101	-0.088	-0.005	-0.127
<b>Social</b>	-0.003		0.214	0.132	-0.116	0.009
<b>Transport</b>	-0.032	0.233		0.016	0.346	0.121
<b>Urban</b>	-0.124	0.122	-0.008		-0.208	0.054
<b>Local</b>	0.002	-0.027	0.359	-0.107		0.082
<b>Misc.</b>	-0.126	0.001	0.065	0.051	0.261	
<b>1990-1993</b>						
<b>Productive</b>		-0.051	-0.068	0.048	0.161	0.032
<b>Social</b>	-0.109		0.133	0.006	0.084	0.032
<b>Transport</b>	-0.014	0.178		-0.116	0.025	0.140
<b>Urban</b>	0.009	-0.006	-0.069		-0.087	-0.017
<b>Local</b>	0.217	0.177	0.100	-0.011		0.423
<b>Misc.</b>	0.078	0.061	0.117	-0.029	0.435	
<b>1994-2000</b>						
<b>Productive</b>		0.102	0.138	-0.140	0.396	0.219
<b>Social</b>	0.211		0.045	-0.008	-0.088	-0.092
<b>Transport</b>	0.196	0.048		0.020	-0.019	-0.004
<b>Urban</b>	-0.042	-0.012	0.065		-0.211	0.105
<b>Local</b>	0.494	0.085	0.023	-0.099		0.105
<b>Misc.</b>	0.128	-0.086	0.011	0.040	0.071	
<b>2001-2004</b>						
<b>Productive</b>		-0.066	-0.064	0.048	0.144	0.017
<b>Social</b>	-0.031		0.152	0.139	0.133	0.142
<b>Transport</b>	0.005	0.186		0.098	-0.002	-0.037
<b>Urban</b>	0.084	0.112	0.126		0.019	0.249
<b>Local</b>	0.222	0.206	0.107	-0.044		0.211
<b>Misc.</b>	-0.023	0.108	0.001	0.235	0.201	
<b>2005</b>						
<b>Productive</b>		0.356	-0.107	-0.117	0.166	-0.085
<b>Social</b>	0.396		-0.146	-0.070	-0.103	0.252
<b>Transport</b>	-0.088	-0.143		-0.069	0.344	-0.028
<b>Urban</b>	-0.116	-0.097	-0.069		0.073	-0.024
<b>Local</b>	0.166	-0.032	0.454	0.006		-0.117
<b>Misc.</b>	-0.078	0.207	-0.024	-0.037	0.001	

**Notes:** Grey cells show significance at 1%, 5% and 10% (respectively, from lighter to darker shade). Top-right panels show correlations for expenditures per capita while bottom-left panels show correlations for expenditures as a percentage of GDP.

An interesting extension of this analysis concerns the examination of the complementarity / substitutability relationship for different *types* of regions. To examine this, we have split our sample into poor/rich and large/small regions (using the median regional GDPpc and median regional population as the respective thresholds – results not shown but available upon request). Some interesting patterns emerge. For high-income regions a clear substitutability relationship is present between local and urban expenditures for all periods up to the late 1990s. In contrast, no relationship is found between these two types of expenditures for low-income regions or when splitting between large and small regions. Some substitutability is also found between productive and local expenditures in the 1970s but only for small regions and between transport and local expenditures in the early 2000s for high-income regions. In all other cases, if anything, the complementarity relationship is strengthened. Strong complementarities are now found, among others, in high-income regions for local-social (in the early 1990s) and local-productive (in the late 1990s); in low-income regions in the 1970s (for transport-productive, transport-social and social-local); in large regions for local-productive (for almost all periods), social-productive (in the late 1990s), transport-social (in the early 1990s) and local-social (in the early 2000s); and in small regions for local-social (in the 1970s and since the mid-1990s), transport-social (in the 1980s) and transport-productive (in the late 1990s). Complementarity is found more often than not in large regions (compared to small ones), while the local-productive (local-social) relationship tends to be positive in large (poor) regions and negative in small (high-income) regions.

Given the limited evidence of a systematic relationship in the geographical allocation of public investment between expenditure categories, we now turn our attention to another key question concerning the geography of public investment, namely the redistributive character of these expenditures. We examine how different types of expenditures correlate with regional incomes (GDPpc) in different periods. Expenditures that serve a redistributive objective should correlate negatively with the latter. A positive correlation would signal a regressive effect, with expenditure concentrating disproportionately to high-income regions.

**Table 2. Redistributive capacity of public investment by category and period**

	Productive	Social	Transport	Urban	Local	Misc.	Total
<b>Expenditure per capita</b>							
<b>1976-2005</b>	0.32*	-0.07	-0.05	0.12	-0.22	0.08	-0.09
<b>1976-1981</b>	0.23	-0.04	0.11	-0.13	-0.47*	-0.03	-0.07
<b>1982-1989</b>	0.49*	-0.04	0.03	0.10	-0.33*	-0.19	-0.06
<b>1990-1993</b>	0.00	-0.03	-0.18	0.31*	-0.28*	-0.02	-0.21
<b>1994-2000</b>	-0.04	-0.08	-0.04	0.01	-0.18	0.30*	-0.14
<b>2001-2004</b>	-0.03	0.01	0.01	0.10	0.03	0.06	0.07
<b>2005</b>	0.10	-0.06	-0.04	0.17	0.09	-0.06	-0.01
<b>Expenditure as % of GDP</b>							
<b>1976-2005</b>	-0.06	-0.24*	-0.16	-0.10	-0.39*	-0.11	-0.41*
<b>1976-1981</b>	0.03	-0.27*	-0.04	-0.27*	-0.59*	-0.17	-0.45*
<b>1982-1989</b>	0.25*	-0.14	-0.06	-0.02	-0.51*	-0.32*	-0.44*
<b>1990-1993</b>	-0.18	-0.20	-0.26*	0.02	-0.46*	-0.10	-0.50*
<b>1994-2000</b>	-0.31*	-0.24*	-0.12	-0.13	-0.37*	0.12	-0.42*
<b>2001-2004</b>	-0.24*	-0.14	-0.10	0.02	-0.25*	0.00	-0.24*
<b>2005</b>	-0.14	-0.22	-0.06	0.03	-0.24*	-0.14	-0.11

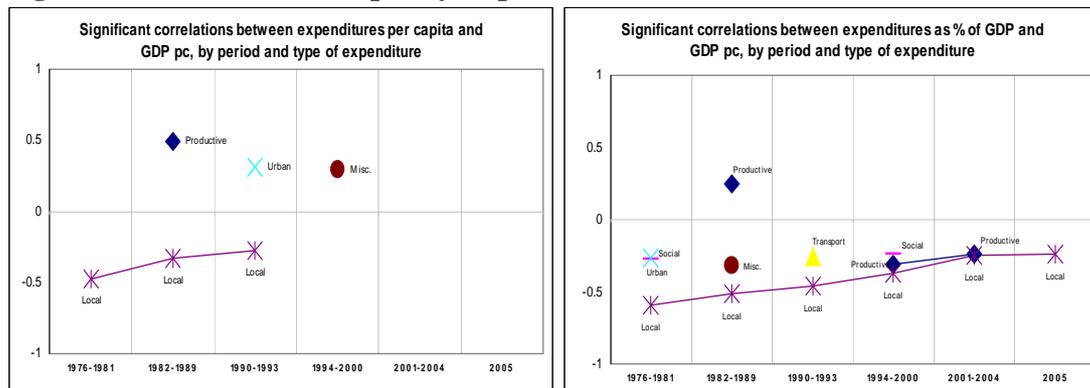
Notes: Pearson correlation coefficients between the named variable and regional GDP per capita. \* shows significance at 10% or lower. Shaded areas depict cases of regressive redistribution persisting for at least two consecutive periods (with at least one statistically significant case included).

Table 2 presents the results of this analysis, for two measures of public investment (per capita and as a share of regional GDP). Throughout the period and for all types of expenditures the redistributive role of public expenditures has been very limited, if at all present (with many cases of inverse redistribution). Productive expenditures are found to have been regressively redistributive, especially in the 1980s, although under the Simitis premiership (mid-1990s to mid-2000s) they seem to have been targeting more low-income regions.<sup>11</sup> Interestingly, social expenditures have never obtained a redistributive character, with the exception of the 1970s and the late 1990s, where low-income regions seem to have benefited slightly (but only in relative terms, due to the small size of their economies). Similarly, transport expenditures have shown very little redistributive capacity, a finding which is perhaps not surprising given the prioritising, throughout the period, on national transport infrastructure. The only expenditure category for which we obtain consistent evidence of redistribution is the local category. Interestingly, however, its redistributive capacity has been declining steadily since the late 1970s and, in absolute terms, this category had also become

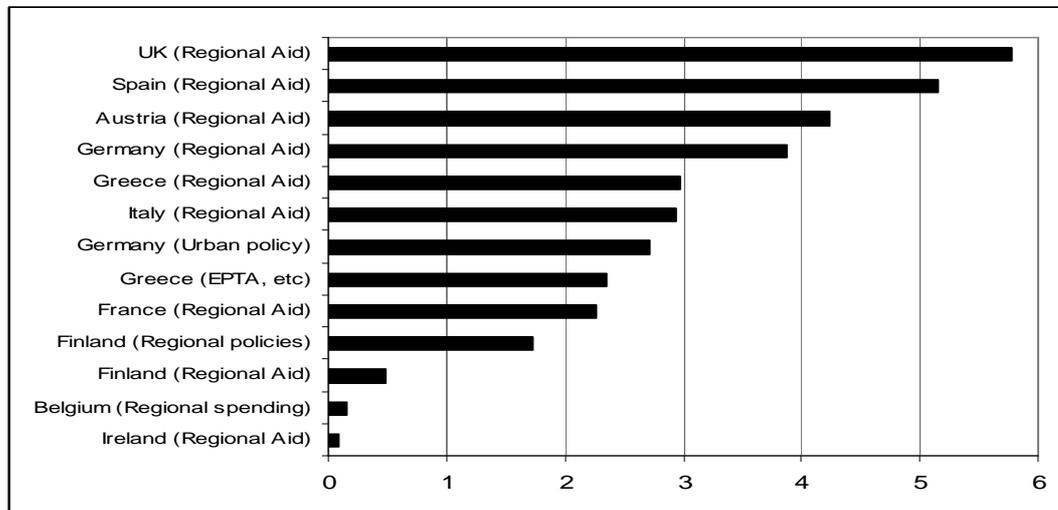
<sup>11</sup> This was only in relative terms (second panel of Table 2). In absolute terms (in per capita terms), there was no redistribution of productive expenditures to poorer regions.

regressively redistributive by the early 2000s. Finally, as should be expected, urban expenditures are on the main regressively redistributive (especially so in the 1990-1993 period, under the Mitsotakis premiership, which has nevertheless been otherwise the most redistributive period). The subset of these patterns which are statistically significant is depicted in the two panels of Figure 6. What we see is very little evidence of absolute redistribution (in per capita terms) and a slightly better picture, albeit very scattered, for relative redistribution (as a share of regional GDP).

**Figure 6. Redistributive capacity of public investment in Greece**



**Figure 7. Redistributive capacity of national regional policies (weighted range)**



Source: Begg et al (2003).

The overall lack of strong redistributive patterns is consistent with the view that public expenditures in Greece have been mainly targeting national development over regional convergence. Nevertheless, *total* public investment (when measured as a share of regional GDP) appears to have been reasonably redistributive (although, still, not sufficiently, at least in comparison with other EU countries – see Figure 7) throughout the period, although with a steep decline in redistributive capacity since

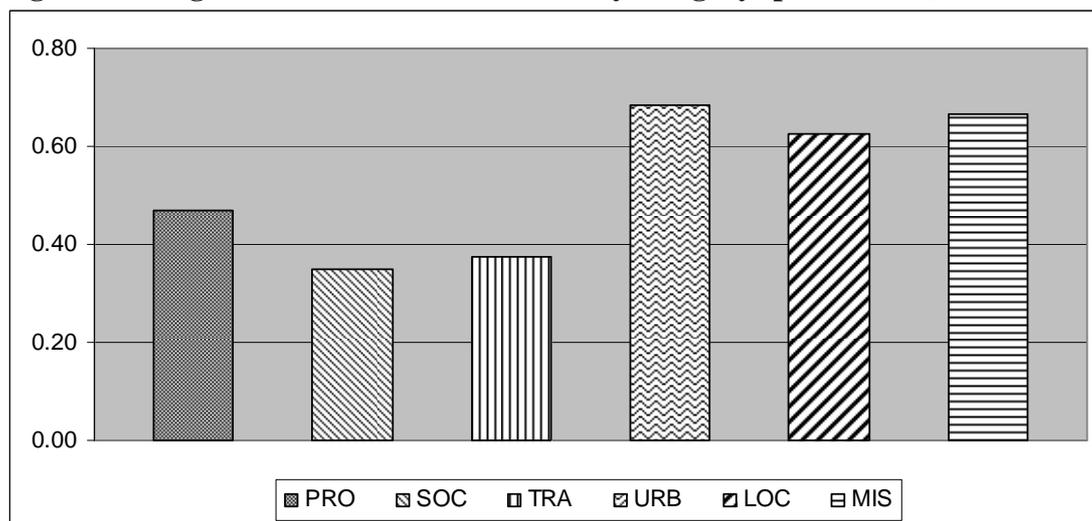
the turn of the century. This shows two facts. On the one hand, that the different categories of public expenditure are allocated in such ways so as to redistribute resources *on aggregate* to the low-income regions, even if none of the expenditure categories is redistributive by itself. On the other hand, the fact that the bulk of evidence of redistribution concerns mainly the relative measure (expenditures as percentage of GDP) suggests that, strictly speaking, public expenditures have not been directing more resources to people living in poorer regions – rather, public spending in poorer regions has been occasionally more significant due to the small size of these economies.

Overall, the combined evidence we have reviewed in this section suggests an interesting pattern for Greek public investment. There is some surprising randomness in the allocation of public investment across regions: there are no clearly identifiable structural breaks, that would suggest political differences in the motives and criteria for the regional allocations, and no clear relationship, positive or negative, between the allocations of different types of expenditures; continuity in the regional allocations is reasonably high but their redistributive capacity is at best low. How can we interpret these patterns? On the basis of the evidence derived from the persistence and redistribution analyses, it would appear to us that public expenditures are allocated to regions based on broader criteria rather than simply their particular sectoral needs. This is how we explain two rather counter-intuitive findings: that total public expenditures appear redistributive when none of the sub-categories is individually redistributive; and that the regional allocation of total expenditures shows more continuity than any given sub-category (apart from the local category). On the other hand, specific evidence of substitutability among categories is particularly hard to unearth, suggesting that there is very little of a systematic relationship connecting the regional allocation of different types of expenditures. Given that the political cycles, according to which we have selected our sub-periods, also show very little relation to changes in the allocation of regional expenditures, we now turn our focus to examining more closely the geographical allocation of public expenditures. The next section examines the extent of geographical concentration and spatial clustering of different types of expenditures as well as the differences across regions in functional specialisations.

#### 4. Geographical concentration and functional specialisation

In this section we ask whether there are any significant geographical patterns in the allocation of public investment across the Greek regions. We consider three aspects of the geography of public investment: geographical concentration, regional specialisation and spatial clustering. Each of these measures corresponds to a different spatial scale and process. Geographical concentration measures at the national level the extent to which the allocation of resources is disproportionately directed to only a few regions; functional specialisation measures the incidence of over-representation of a specific expenditure category at the regional level; while spatial concentration measures the extent of clustering or dispersion at the inter-regional level.

**Figure 8. Krugman Concentration Indexes by category (period total)**



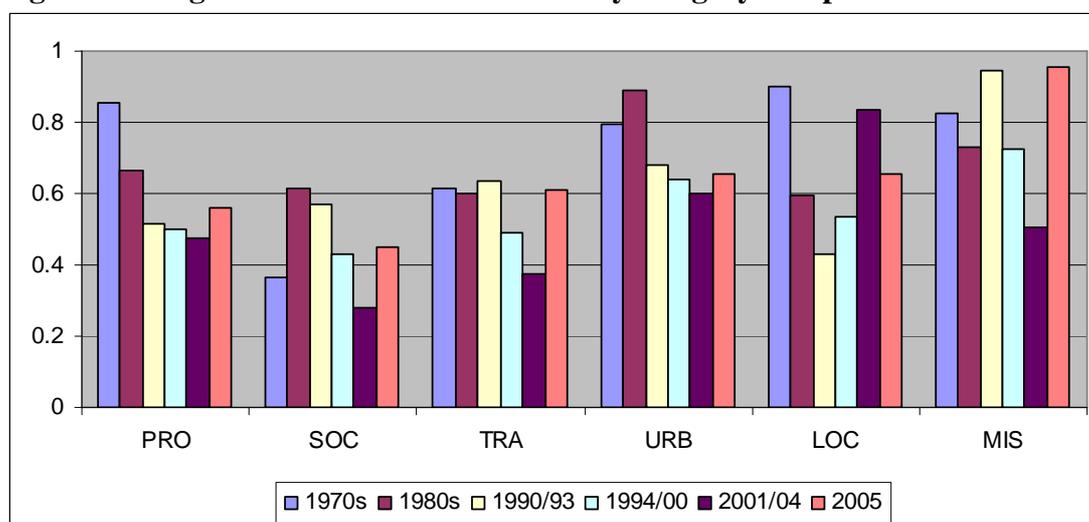
We measure geographical concentration with the Krugman concentration index. Higher values show greater geographical concentration<sup>12</sup>, with extreme concentration suggesting that the given type of expenditure is directed to one single prefecture only. As can be seen, and as should be expected, the ‘urban’, ‘local’ and ‘miscellaneous’ categories appear to have the highest concentration scores. Interestingly, the ‘social’ category is the least concentrated, a finding which is in line with the evidence of no redistributive role for this type of expenditure (at the regional level – this does not

<sup>12</sup> It should be noted that geographical concentration does not necessarily imply spatial concentration, in the sense of clustering. Instead, the notion here concerns the (dis)proportionality in the allocation of regional shares.

mean that social expenditures do not affect the distribution at the individual or household level).

Concerning the temporal evolution of the indexes (see Figure 9), most of the spending categories appear to become less concentrated over time, with a stabilisation more recently (the reversal for 2005 may be misleading as it only relates to allocations for one single year). This temporal development shows that public expenditures tend to be allocated increasingly evenly across the Greek regions. Whether this is due to the consolidation of a process of ‘convergence in the regional needs’, due to a steady decline in pork-barrel politics which could concentrate resources disproportionately to ‘favoured’ regions, or whether, instead, it reflects an increasingly weakening regional targeting from the side of policy, is an open research question that we do not seek to answer here. Nevertheless, it appears that, in combination with the evidence presented earlier concerning the redistributive capacity of public investment, there is some excessive ‘randomness’ in its geographical allocation.

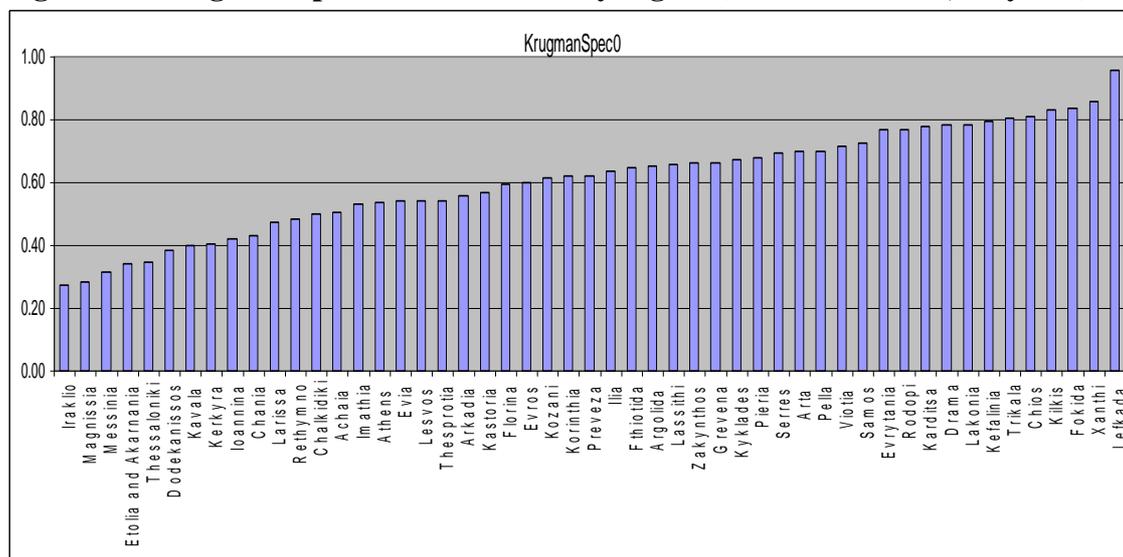
**Figure 9. Krugman Concentration Indexes by category and period**



Similar to the analysis of geographical concentration, we have calculated the extent of regions’ specialisation in specific types of expenditures. Figure 10 ranks the Greek prefectures according to their extent of specialisation for the full 1976-2005 period. Table 3 shows the persistence in the ranking across periods, while the set of maps that follows shows the geography of specialisations by period. Extreme specialisation corresponds to a pattern of ‘monoculture’, where one region only receives the whole

of one type of expenditure. As can be seen, the high-specialisation regions constitute a rather diverse group: islands (Lefkada, Kefalonia, Chios), remote/northern regions (Kilkis, Drama, Ksanthi, Rodopi), and other relatively remote regions (Fokida, Lakonia, Eurytania, Karditsa, Trikala). On the other extreme, the regions of low-specialisation appear also rather diverse. Last, with regards to the temporal evolution of the patterns of specialisation, the table reporting persistence coefficients suggests that there is very little continuity in these specialisations: the regions that appear highly specialised in the 1970s are not the same with those appearing specialised in the 1990s. This is also evidenced in the maps of Figure 11, where one observes frequent shifts in the geography of specialisations across periods.

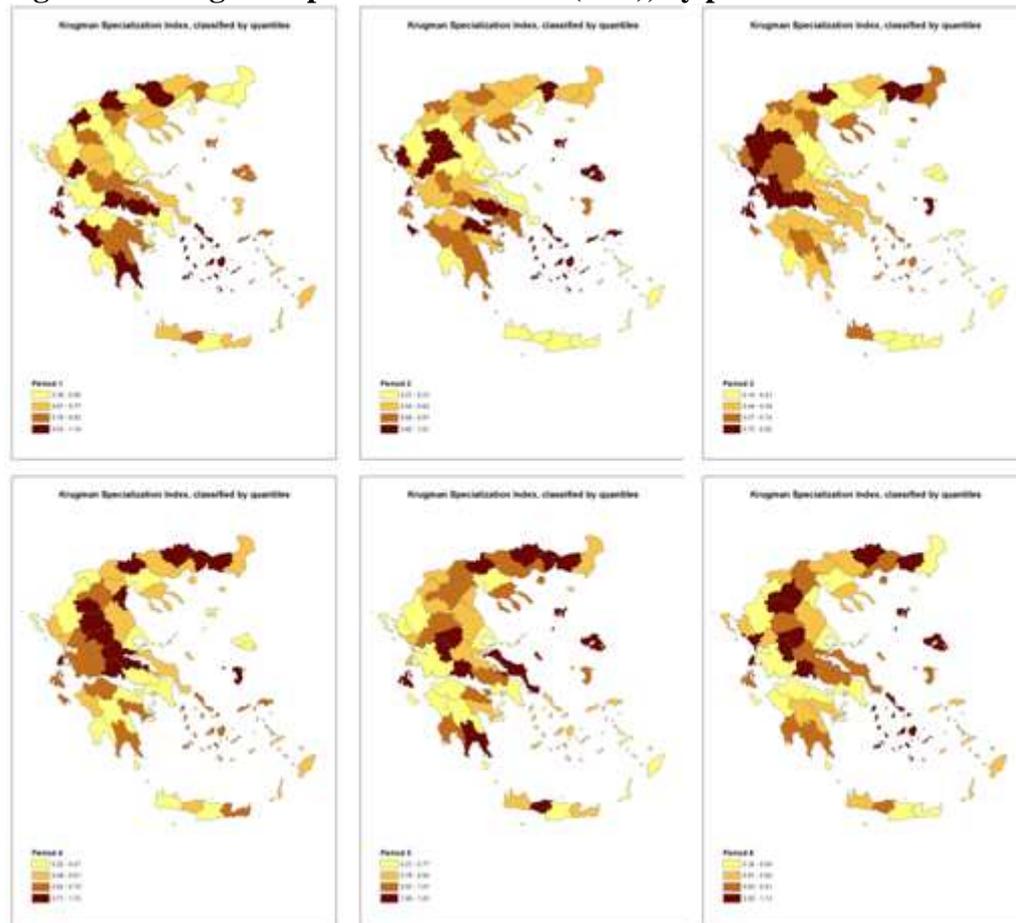
**Figure 10. Krugman Specialisation Index by region (total investment, all years)**



Whether these patterns reflect the gradual change of geographical targeting of specific types of expenditures (as discussed above with regards to transport expenditures) or rather some general randomness in the geographical allocation of public investment (as also discussed above with regards to the geographical concentration indexes), is a question that we cannot answer at this stage. We only treat it here as another piece of evidence suggesting a curious lack of systematicity (randomness) in the regional allocation of public investment in the country. Of the very few patterns that can be identified, is the observation that on average regional specialisation has been declining until the early 1990s but has been increasing ever since (see Figure 12). Again, we would consider it too premature to speculate on the particular factors explaining this pattern.

**Table 3. Persistence of regional functional specialisations, by period**

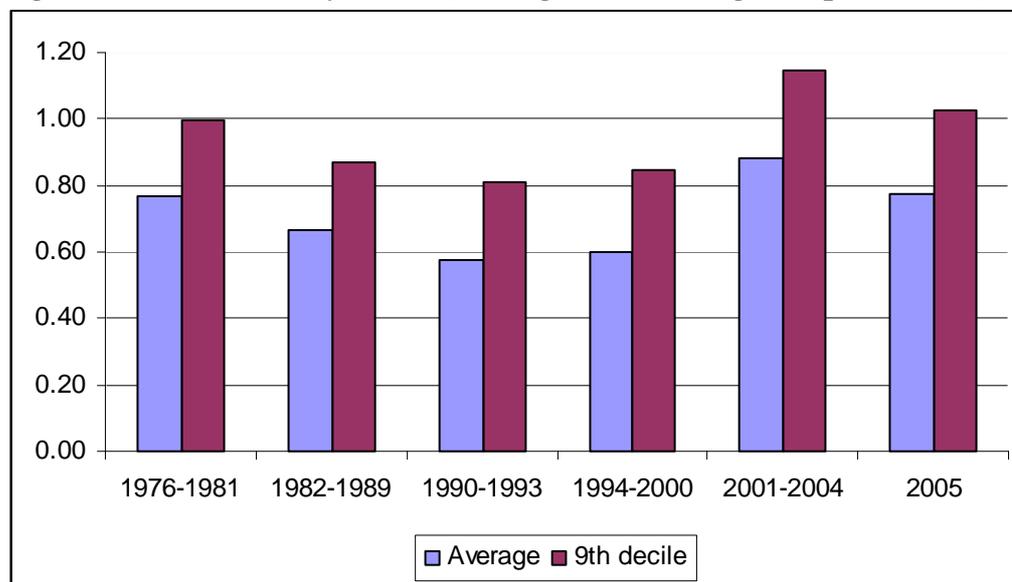
	1976-1981	1982-1989	1990-1993	1994-2000	2001-2004
<b>1982-1989</b>	0.610				
<b>1990-1993</b>	0.175	0.309			
<b>1994-2000</b>	0.244	0.276	0.556		
<b>2001-2004</b>	0.211	0.039	0.253	0.345	
<b>2005</b>	0.242	0.192	0.258	0.356	0.689

**Figure 11. Krugman specialisation index (KSI), by period**

A final aspect that we want to examine here concerns the incidence of spatial clustering. We do this by examining the extent of spatial association in the variables of our interest, using the Moran's I statistic (for global spatial autocorrelation). To obtain as complete a picture as possible, we look at various definitions of neighbourliness and different spatial scales. Specifically, we derive spatial dependence statistics for definitions of neighbourliness based on four standard criteria, namely threshold distance (distance cut-off points), number of neighbours (k-nearest neighbour criterion), contiguity (queen contiguity criterion) and distance

decay (without cut-off thresholds). For each of these, we have used a number of parameters to allow for a different scale and discounting of space. For the threshold distance criterion we have used the 5%, 10%, 20% 30%, 40% and 50% of the distribution of bilateral distances across the Greek regions. For distance decay we used the steepness parameters of -1, -2, -3 and -4 (with the first two corresponding to the inverse distance and the standard distance decay models and the latter two capturing increasingly extremely localised effects). For the nearest neighbour criterion we used a k-parameter equal to 2, 4, 6, 8 and 10, progressively. Finally, for the queen contiguity criterion we used the first, second and third order contiguity (adjacent neighbours, neighbours' neighbours, and third-order neighbours, respectively).

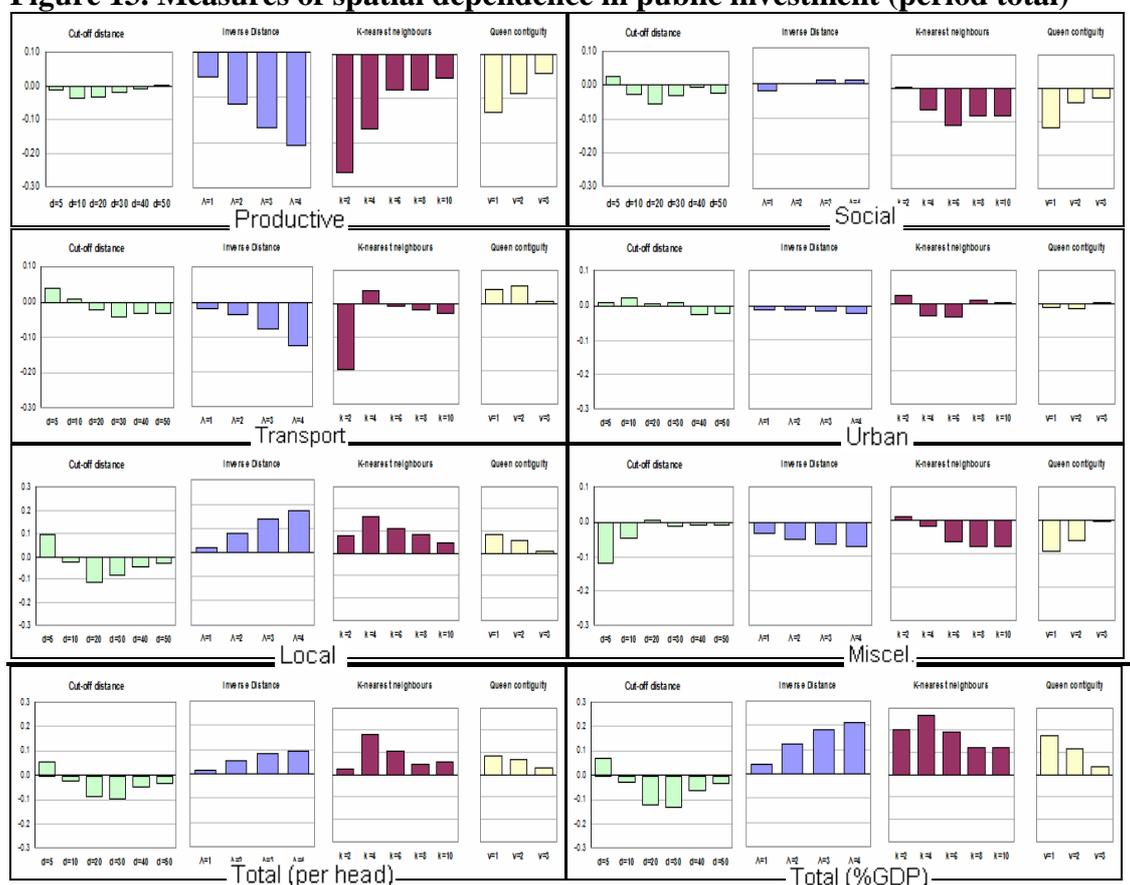
**Figure 12. KSI summary values (unweighted cross-regional parameters)**



As can be seen in Figure 13, evidence of spatial clustering is extremely limited, at least in the sub-categories of public investment. Moreover, spatial dependence appears particularly localised: in the case of the distance decay measure, which is designed to capture extreme localisation, spatial dependence appears to increase monotonically with the steepness of the distance discount coefficient; while in at least half of the cases maximum spatial dependence is obtained when we restrict neighbourliness to the 2-nearest neighbours and/or 1<sup>st</sup>-order contiguity. Overall, the evidence concerning spatial association is mixed. For total investments there is some statistically significant evidence of spatial clustering (especially when investment is measured as a share of regional GDP), which is maximised at the level of the

immediate (adjacent) neighbours (4-nearest neighbours / 1<sup>st</sup>-order contiguity), but which however turns into spatial repulsion at wider geographical scales (see the cut-off distance criterion).<sup>13</sup>

**Figure 13. Measures of spatial dependence in public investment (period total)**



Interestingly, spatial dependence is consistently negative also in shorter distances in two categories where it would be perhaps least expected, those of productive and transport investment. Despite the expectation that these investments tend to cluster in space, the results reveal a clear tendency for spatial competition, meaning that the immediate neighbours of a beneficiary region tend to lose-out. In the cases of social and miscellaneous investments the evidence is similar, albeit somewhat weaker, while even weaker is the case of urban expenditures. In contrast, the picture obtained for the local category is much different, suggesting strong positive association of this type of investment in space. In other words, regions that benefit from high shares of public investments under the local category tend to be clustered with similar regions. Although this may be capturing to an extent an exogenous attribute of Greece's geography,

<sup>13</sup> The 20% distance cut-off criterion represents some 300km in straight-line distance.

namely that sparsely populated regions, for which local expenditures appear disproportionately high, tend to be clustered especially in the west of the country, it is certainly also a feature unique to the allocation of this type of expenditure. Again, we treat this as an observation that can inform future research than as a question that we can confidently address in this paper. The same applies to another observation that can be made on the basis of Figure 13, namely that although most of the categories-specific evidence is for localised negative spatial association, the evidence for total investment (especially in the case of investment as a share of regional GDP) shows positive spatial association (clustering). The extent to which this is due to the arithmetic influence of the local category or, perhaps more interestingly, due to cross-category complementarities in the spatial allocation of investments (i.e., that neighbouring regions which lose out in one type of investment, say transport, are compensated with another type of investment, say productive<sup>14</sup>), is another of the issues that we leave for future research.

**Table 4. Spatial dependence by period and category (simple queen contiguity)**

Period	1976-1981	1982-1989	1990-1993	1994-2000	2001-2004	2005
<b>Productive</b>	-0.099*	-0.077	0.025	-0.051	0.031	0.154**
<b>Social</b>	-0.036	-0.137***	0.093	-0.05	0.01	0.028
<b>Transport</b>	0.145**	0.037	0.003	0.029	0.025	0.003
<b>Urban</b>	0.102*	-0.147***	0.02	0.115**	-0.048	0.014
<b>Local</b>	0.093	0.110*	0.121*	0.191***	0.121***	0.160***
<b>Miscellaneous</b>	-0.082	0.022	-0.029	-0.022	-0.082	-0.091
<b>Total</b>	0.003	0.118*	0.210**	0.270***	0.013	0.007

Before closing this section, however, it is worth mentioning that these patterns are far from stable over time. In fact, the examination of the patterns of spatial dependence by period reveals a series of interesting findings. For example, the urban category, which was not found to be associated to any significant pattern of spatial dependence, has in fact oscillated a lot, moving from a significantly positive spatial association in the 1970s to a significantly negative in the 1980s and then back to a significantly positive association in the late 1990s. In contrast, social expenditures, which did show some evidence of negative spatial association in the full-period sample, do not seem

<sup>14</sup> We saw earlier that there is very little evidence of such a process at the national level. The added insights offered by Figure 13 have to do with the realisation that complementarity may be operating at smaller spatial scales, so that overall transport and productive expenditures may not correlate negatively, but they may do so when discounted by distance.

to be characterised by any deterministic spatial pattern after 1990. Productive investments have exhibited negative spatial dependence for most of the period, but they have been becoming more positively associated more recently and in 2005 they exhibited an intensity of spatial clustering similar to that observed for local investments, which is the category with the highest and more consistent over time pattern of spatial clustering. Finally, total investment has been spatially clustered in the period 1982-2000, but clustering has vanished after 2001. There is much more detail in these patterns (e.g., concerning the geographical scale of these effects), which however we cannot cover in the limited space of this paper.<sup>15</sup> In any case, the evidence reviewed so far clearly makes a number of points about the geography of public investment in Greece over the last four decades. We summarise these points in the concluding section.

## 5. Discussion

Despite the obvious interest on the issue, spatial economic analysis of public investment is rather limited, not only in Greece, but in the international literature more generally. Much of the attention in the existing, primarily Anglo-saxon, literature concerns the governance of public finance, linking to issues covering from the financing of locally delivered public services (local taxation, allocation formulas, etc) to the wider question of the organisation of the State (decentralisation and devolution). In Greece, research on such issues is further hindered by the lack of available data. Data on the regional allocation of public investment are held centrally (by the Ministry of the Interior) but are not published by the National Statistical Service and are not readily available to the research and policy communities. Moreover, the data that do exist, are of questionable quality: the share of regionally identifiable expenditure in Greece is a relatively small fraction of the corresponding figure in the UK (55% and 85%, respectively), while this also includes aggregations of questionable validity, as little attention is paid to the in/on (or at/for) distinction.

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<sup>15</sup> As an example, for transport investments we get an almost linear decline over time of the spatial association coefficient calculated on the basis of the 2-nearest neighbours criterion, with dependence starting at 0.15 in the 1970s and reaching -0.12 in the early 2000s (both values statistically significant at 5%) – something which is not captured by the measures based on the contiguity criterion.

Keeping all these problems and limitations in mind, in this paper we utilised a unique database on public investment in Greece, collated by one of us over years of painstaking research, seeking to provide a general but informative descriptive examination of the spatial patterns characterising public investment in the country. Although our analysis is not complete, such an examination is to our knowledge unique in the international literature and we believe it provides an interesting blueprint for subsequent research on the field. Although we have not attempted – and have not been able – to provide definitive answers to any questions that public/regional policy may have wished to enquire, our analysis has unveiled a number of as yet unidentified aspects of the geography of public investment in Greece. These aspects, their corresponding underlying patterns and the socio-economic dynamics that they generate, constitute part of a longer-run research project that we hope to undertake in the future. Of particular interest to us is the manifestation of these patterns and dynamics at smaller spatial scales, at the local level, and thus the examination of local indicators of spatial association, which would help us unearth specific hotspots and clusters of public investment in the country. Such hotspots, to the extent that they exist, are associated to the key factors influencing the allocation of public investment in Greece. The identification of such hotspots should thus help us identify the most important of these factors. Without prejudice, but informed from Greece's modern history, we expect that these factors will include, together with standard determinants related to (regional and national) needs and capacities, characteristics such as pork-barrel politics, political exchange, clientalism and cronyism – i.e., characteristics that have been shown to characterise the political process in Greece in a variety of levels.

Our analysis has provided evidence that is at least not inconsistent with such an expectation. Public investment across the Greek regions shows many features of randomness, beyond what would be expected. Despite the significant political changes that the country has seen over the period of our analysis, we were unable to locate significant and specific structural breaks in the allocation of public investment. For example, the move from the first democratic governments of the 1970s to the socialist governments of the 1980s exhibits a continuity not dissimilar to that observed between the much more cohesive period of 1994-2004. Further, the allocation of public investment does not appear to be on strong redistributive grounds

and this conclusion does not seem to be altered when examining specific sub-periods: for example, there is very little evidence that redistribution is stronger during political periods when the centre-left is in power. Instead, we observe that a low level of redistributive capacity characterises more or less the whole period and, interestingly, this capacity is not attributable to one or another investment category but is rather the outcome of the sum of a set of strictly non-redistributive sectoral policies. Still, evidence of substitutability among functional expenditures, which could be taken as an implication of the above observation, is very difficult to locate: regions that are under-represented in the allocation of one specific expenditure category are not compensated by above-average expenditures in some other category. A possible exception to this is in the case of relatively localised substitutability, some evidence for which, was found in the geographical analysis of section 4.

Besides this, however, the geographical analysis also provided evidence in favour of the ‘randomness’ hypothesis. Spatial clustering appears very limited and oscillates between negative and positive values, suggesting that a clear pattern of clustering/diffusion or repulsion/competition does not exist. Moreover, clustering or repulsion are not specific to any political period, as different categories show both positive and negative spatial association values in different periods. Concerning the functional specialisation of the regions, we were also unable to find any significant pattern: diversified regions include both rural and urban, large and small, central and remote regions; moreover, the geography of specialisation appears to have been changing continuously throughout the period and across all sub-periods. Finally, the geographical concentration of public investment showed little evidence in support of standard explanations, that would have to do for example with the concentration of economic deprivation and backwardness (e.g., Greece’s dual east-west and core-periphery divide – see Monastiriotis, 2008) or with specific national objectives and priorities (e.g., the development of road infrastructure in parts of northern Greece since the late 1990s). A declining degree of concentration was found for the case of total investment, but our analysis was unable to reveal whether this was due to regional economic convergence or due to a weakening of regional targeting from the side of policy.

Despite these ambiguities, our analysis was able to shed light to a number of issues that have been up until recently neglected in empirical research. Public investment in Greece does not seem disproportionately concentrated in the wider Athens region, which is often seen as attracting disproportionate resources due to its primacy as a political, economic and demographic centre in the country. Public investment is not inversely redistributive nor does it happen in a mechanistic way that allocates a fixed share of resources to each location for every function. However, this does not by any means imply that the regional allocation of public investment is done in a way that reflects with any degree of clarity a specific prioritising, be it national or other. Productive investments do not seem to be directed necessarily to the most needy (for regional convergence) nor the most dynamic regions (for national growth). Similar is the conclusion for social investments, for which our analysis in this paper seems to suggest that they are more redistributive across people than across regions. This finding is particularly surprising, because a clear stated objective of regional public investment is regional convergence in the form of the development of the peripheral and backward regions. Despite our extensive analysis of a large set of characteristics of the regional allocation of public investment in Greece, we were unable to find sufficient and consistent evidence in favour of such an objective being followed by policy. This clearly calls for further research to be undertaken in order for a better understanding to be developed concerning, on the one hand, the specificities of the geography of public investment in the country and, on the other, the set of political, economic, and social factors that explain these specificities, at both the national and regional levels. We aim to undertake this investigation in future research.

## Appendix

Table A.1: Regionally allocated public investment per capita by type of public investment and period

<b>SECTOR/ PERIOD</b>		<b>1976- 1981</b>	<b>1982- 1989</b>	<b>1990- 1993</b>	<b>1994- 2000</b>	<b>2001- 2004</b>	<b>2005</b>	<b>1976- 2005</b>
<b>Productive</b>	billions Euro	2.115	2.658	1.243	1.766	1.376	0.254	9.413
	Euro/inhabitant	<b>36.9</b>	<b>33.4</b>	<b>30.3</b>	<b>23.4</b>	<b>31.4</b>	<b>23.0</b>	<b>28.7</b>
	% share of PI	<i>19.2%</i>	<i>15.7%</i>	<i>15.1%</i>	<i>11.2%</i>	<i>6.1%</i>	<i>7.1%</i>	<i>12.1%</i>
<b>Social</b>	billions Euro	2.492	2.756	1.063	2.094	2.296	0.443	11.144
	Euro/inhabitant	<b>43.5</b>	<b>34.7</b>	<b>25.9</b>	<b>27.8</b>	<b>52.4</b>	<b>40.1</b>	<b>33.9</b>
	% share of PI	<i>22.7%</i>	<i>16.3%</i>	<i>12.9%</i>	<i>13.3%</i>	<i>10.2%</i>	<i>12.4%</i>	<i>14.3%</i>
<b>Transport</b>	billions Euro	1.535	1.280	1.060	3.147	4.707	1.087	12.817
	Euro/inhabitant	<b>26.8</b>	<b>16.1</b>	<b>25.8</b>	<b>41.7</b>	<b>107.5</b>	<b>98.3</b>	<b>39.0</b>
	% share of PI	<i>14.0%</i>	<i>7.6%</i>	<i>12.9%</i>	<i>20.0%</i>	<i>20.9%</i>	<i>30.5%</i>	<i>16.4%</i>
<b>Urban</b>	billions Euro	1.861	1.915	1.114	2.708	6.851	0.373	14.822
	Euro/inhabitant	<b>32.5</b>	<b>24.1</b>	<b>27.1</b>	<b>35.9</b>	<b>156.4</b>	<b>33.7</b>	<b>45.1</b>
	% share of PI	<i>16.9%</i>	<i>11.3%</i>	<i>13.5%</i>	<i>17.2%</i>	<i>30.4%</i>	<i>10.5%</i>	<i>19.0%</i>
<b>Local</b>	billions Euro	2.136	6.834	3.295	5.095	5.627	1.180	24.167
	Euro/inhabitant	<b>37.3</b>	<b>86.0</b>	<b>80.3</b>	<b>67.5</b>	<b>128.5</b>	<b>106.6</b>	<b>73.6</b>
	% share of PI	<i>19.4%</i>	<i>40.4%</i>	<i>40.1%</i>	<i>32.4%</i>	<i>24.9%</i>	<i>33.1%</i>	<i>31.0%</i>
<b>Miscellaneous</b>	billions Euro	0.857	1.463	0.444	0.935	1.701	0.227	5.628
	Euro/inhabitant	<b>15.0</b>	<b>18.4</b>	<b>10.8</b>	<b>12.4</b>	<b>38.8</b>	<b>20.5</b>	<b>17.1</b>
	% share of PI	<i>7.8%</i>	<i>8.7%</i>	<i>5.4%</i>	<i>5.9%</i>	<i>7.5%</i>	<i>6.4%</i>	<i>7.2%</i>
<b>TOTAL PI</b>	billions Euro	10.997	16.907	8.220	15.745	22.559	3.565	77.991
	Euro/inhabitant	<b>191.9</b>	<b>212.7</b>	<b>200.4</b>	<b>208.7</b>	<b>515.0</b>	<b>322.3</b>	<b>237.4</b>
	% share of PI	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>	<i>100.0%</i>

Source: Greek Ministry of Economics and Finance – authors' elaborations

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