

Prodromidis, Prodromos

Conference Paper

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52nd Congress of the European Regional Science Association: "Regions in Motion - Breaking the Path", 21-25 August 2012, Bratislava, Slovakia

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Prodromidis, Prodromos (2012) : The spatial and temporal patterns of declared personal income across Greece: 2001-8, 52nd Congress of the European Regional Science Association: "Regions in Motion - Breaking the Path", 21-25 August 2012, Bratislava, Slovakia, European Regional Science Association (ERSA), Louvain-la-Neuve

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**THE SPATIAL AND TEMPORAL PATTERNS OF
DECLARED PERSONAL INCOME ACROSS GREECE: 2001-2008 ♦**

Pródromos Prodromídis

Centre for Planning and Economic Research and
Athens University of Economics and Business
pjprodr@kepe.gr

ABSTRACT

The paper studies the evolution of personal income across localities during 2001-08, and (a) empirically explains the initial levels and growth rates of average income and of the income-filing population in terms of demographic, educational, geographic, and other known (available) factors; (b) isolates from overall income the average income and population size components, along with the annual effects, and (c) brings to light sub-regional and cross-regional patterns that might otherwise go undetected. It also explains the number of times (years) that local incomes exceed the level predicted by the available factors. To the extent the residuals are produced from unknown (missing) variables, their sub-regional and cross-regional patterns offer clues in the direction of formulating better, spatially targeted interventions. In order to explain the steady or not-so-steady evolution of the seemingly unexplained element and treat the common, yet often overlooked, regression misspecification problem, the paper resorts to the use of fresh spatial arguments inferred from the territorial patterns of the residuals. Conventional sub-regional regressors are inadequate in this respect. By estimating the impact of spatial factors, alongside non-spatial factors, the paper provides a better understanding of the internal heterogeneity of the country. This facilitates the formulation of better-targeted policy interventions aiming to reduce disparities and stimulate economic growth.

Keywords: personal income, disaggregated data, delineation of micro-regional policy areas, urban and rural development, regression misspecification.

JEL Codes: C23, D31, R12.

♦ The study has benefited from comments and suggestions made by N. Kanellopoulos, seminar participants at KEPE, and participants in the 17th Conference of the Greek Society of Regional Scientists, the 25th Annual Conference of the Greek Statistical Institute, the 4th Ioannina Meeting on Applied Economics and Finance. Thanks are due to E. Karagiannidou for matching the disaggregated annual revenue datasets. The usual disclaimer applies.

1. INTRODUCTION

The paper analyzes the personal income mosaic of Greece from the time the country joined the EU's Economic and Monetary Union (in 2001) to the advent of the international crisis (in 2008), at the disaggregated level. The intention is to: (a) empirically explain the patterns; (b) identify the territorial zones in which the underlying conditions suggest they are disposed to steadily perform better than expected, as well as the zones which seem to be in chronic need of development policies; and (c) demonstrate how space may be utilized as a means to correct empirical analyses suffering from incomplete model specification. To that end the paper matches: (i) the declared personal incomes earned between 2001 and 2008, supplied by the General Secretariat for Information Systems of the Hellenic Ministry of Finance (HMF) at the postcode level, against (ii) the *2001 Census* populations statistics and geographic data provided by the National Statistical Service of Greece (NSSG) at either the urban borough or rural municipal ward (or commune) level. Hence, it advances our understanding regarding the spatial distribution and temporal evolution of personal income in Greece in a rather original way.

Up until now by-and-large local analysts relied on either (a) the annual figures obtained from the individual and family tax statements collected by the HMF, in order to examine the evolution of inequality over time, look at correlations, and in one instance probe the spatial dimension as well (Prodromidis, 1975); or (b) data solicited via household surveys conducted from time to time on representative samples of the population by the NSSG, in order to examine inequality over time and across space, and look at correlations. In addition, as the cross-sectional nature of the household surveys data permitted the econometric isolation of various effects (including spatial effects), the opportunity was seized right from the start (Crockett, 1967), with Kanellopoulos (1986) producing the first sophisticated treatment at the regional (NUTS II) level.¹

Against this background, breakthroughs in providing more detailed pictures at the sub-regional level, came from (a) Voloudakis and Panourgias (1980, 1984), who, by matching the population data from three censuses to personal income estimates obtained from the national accounts at the prefectural (NUTS III) level, were able to provide an alternative glimpse into the evolution of inequality across time and space; and (b) Prodromidis (2006), who matched

¹ The *Nomenclature des Unités Territoriales Statistiques* (NUTS) is the multi-tier hierarchical structure used in the EU to standardize territorial units. In Greece, the administrative regions (*periferies*) correspond to NUTS level II sized-districts; prefectures (*nomoi*) correspond to NUTS level III sized-districts; and municipalities (*demos/koinotites*) to upper level Local Administrative Units (LAU 1, occasionally termed NUTS level IV).

the *2001 Census* population statistics obtained at the urban borough or rural sub-municipal ward level against the household income data obtained from the 2002-tax reports (relating incomes earned in 2001) at the postcode level. The amalgamation yielded a large number of observations (over nine hundred spatial units (hereinafter: revenue districts or districts)) which, in turn, allowed the econometric explanation of income formation in terms of population density, household composition, occupational, educational and other factors. This way, the spatial analysis of personal income, which for about forty years had been conducted in terms of two or three spatial states (e.g., Athens and the rest of Greece; urban, rural and intermediate areas), and for about twenty years in terms of regions (twice in terms of prefectures), was eventually carried out at the local community level.

At first sight, the piece provided a fresh look at the economy as a collection of clusters and communities, without preconceptions that certain units or sub-regions should fit in the inherited regional or prefectural framework. A closer look at the findings revealed that income disparities were larger within rather than across these conventional territorial formations. Drawn on the basis of historical, geographic, gerrymandering, geometric or other considerations, these formations are used by the national and EU authorities, policy-makers, advisers and analysts as the grid within which convergence and prosperity plans are devised, implemented, and assessed. Indeed, it is not unreasonable to theorize that classifying observations or organizing the information in accordance with conventional divisions may provide a blurred if not distorted, potentially misleading view of micro-reality (Amrhein, 1995). In view of the above, it might make sense if the economic development and social cohesion policies were conducted at a rezoned or functional-area framework.

As additional series of disaggregated declared income data have been collected since then, in the pages that follow we attempt to explore the patterns of personal (individual taxpayer, not household) income,² not only across space (the country's 932 revenue districts) but also time.

2. THE COUNTRY'S GEOGRAPHIC AND ECONOMIC LANDSCAPE IN 2001

Situated at the edge of southeastern Europe, Greece spans an area of 132 thousand square kilometers. The terrain is dominated by high mountain-chains, small valleys traversed by rivers or inlaid with lakes, narrow coastal strips, a multitude of islands, and a very jagged coastline extending for 15 thousand kilometers. These natural features greatly fragment the

² Quite often there is more than one income-filer in the household.

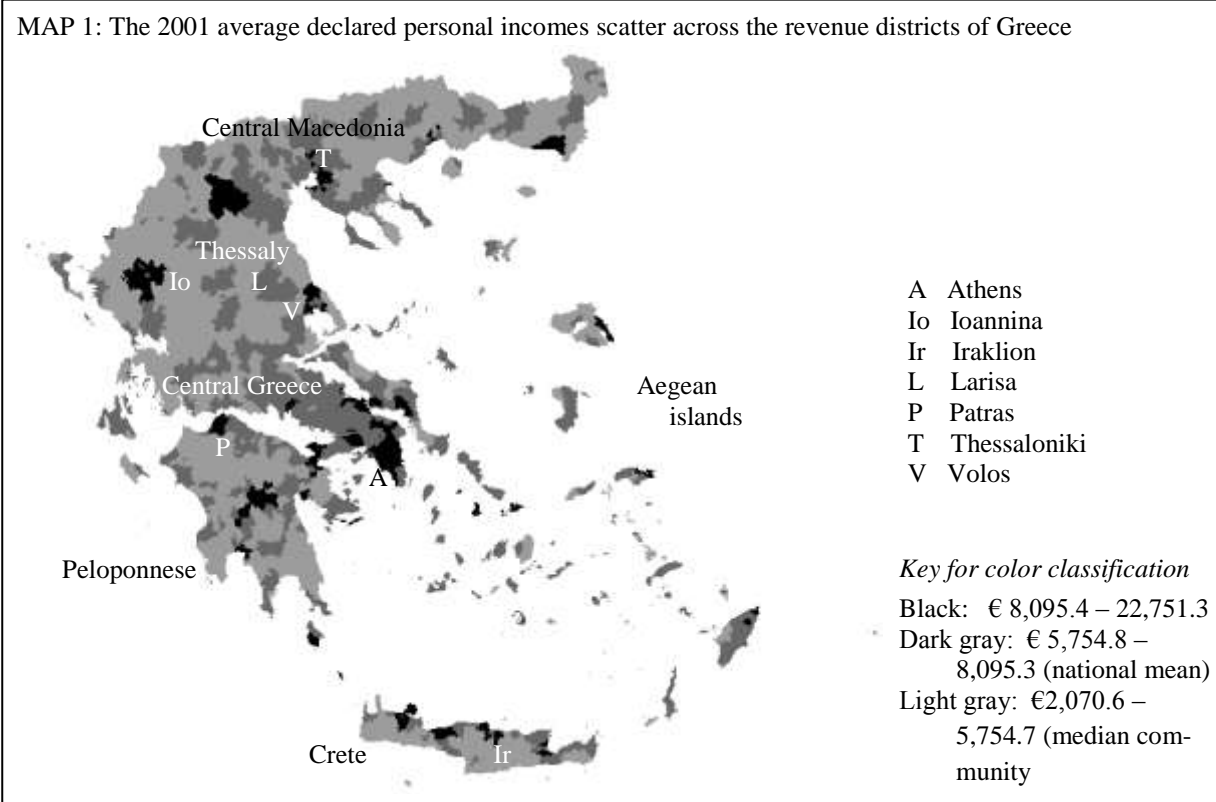
country into a host of tiny places: the notorious patchwork of city-states and self-governing tribes in classical antiquity, the mosaic of jurisdictional cantons in early modern times. To illustrate by way of comparison, the country's coastline accounts for 13.6% of the EU total, yet is all packed in a rather small area: about 3.1% of the EU landmass. Obviously, the splintering impact of the landscape is, to some extent, tempered by the effectiveness of the transportation network linking these districts (coastal strips, plateaus, and islands). On the other hand, this irregular, very idiosyncratic landscape critically impedes the spatial representation of the observations through contiguity or proximity weight.³

According to the *Census* conducted in 2001, the country was inhabited by 10.966 million people (99.7% registered residents), and according to the revenue service records some 7.735 million people (70.5% of the population) filed statements regarding their income earning activities. By the end of period under examination (i.e., 2008), the number had climbed to 8,372 million (an increase of 8.24%). Correspondingly, in the course of 2001-08, declared income increased from about € 62.615 to 98.792 billion: an increase of 57.78%, even as the consumer price index rose from one year to the next and subsequent years by 26.32%. The close association between a district's reported income, and the size of its income-filing population is undeniable ($r \approx 99.1\%$ throughout the period). Yet, additional forces also played a role.

Indeed, if we turn to declared personal income averages, we note that in 2001, 128 districts exceed the national average. These districts are indicated in Map 1 with black and: (a) form clusters around the cities of Athens and Thessaloniki or extend along their immediate rail and motorway networks; or correspond to (b) the main transportation nodes on the mainland (Alexandroupolis, Kavala, Ioannina, Volos, Corinth, Patras, Kalamata), the Aegean islands (Siros, Rhodes, Samos, Mitilini), northern Crete and their environs; (c) long-established tourist places (directly linked to Athens-Piraeus) not included in (a) and (b) above (such as Mikonos, Hydra, Ialisos, Nafplion, parts of Santorini, Milos and Kithira islands), and the main sites of energy-production and mineral-extraction (Distomon, Larimna, Aliverion, Megalopolis and Tripolis, Stratonion, Ptolemais and Kozani). At the same time, in 338 districts (indicated with dark gray) average incomes exceed the amount observed in the median district. These districts either (i) form a cluster that comprises most of Central Greece

³ For instance, the contiguity matrix that may be used in an empirical analysis cannot handle the country's many islands. The distance matrix mixes land with sea distances or assumes neatly decaying features when, in fact, some islands are well linked (via ferries) with some (but not all) nearby islands and continental ports, whereas other islands are not as well linked with neighboring or more distant islands or the mainland. In addition, it may also render inaccurate associations in the cases of localities which are situated in some distance from each other but are well linked via the road-and-rail network, i.e., are *much closer* than they appear on the map.

and a portion of south-east Thessaly, and two smaller clusters in Central Macedonia (one along the lower Aliakmon plain, the other along the plains of Kilkis and Halkidiki), or (ii) involve all of the country’s prefectural seats not included above, and a good number of localities situated in proximity to them or along corridors linking them. The remaining 466 districts (indicated with light gray) are associated with lower levels of average income.



3. ANALYZING OVERALL INCOME

Insofar as a community’s overall personal income, Y , is equivalent to the product of its mean (i.e., average income), y , times the size of the income-declaring population, n , which grow at the annual rates of b_t and c_t , respectively, it is understood that over time, t ,

$$Y_{t+k} = y_{t+k} \times n_{t+k} = (1+b) \times y_t \times (1+c) \times n_t, \tag{1}$$

where $(1+b_t) \times (1+b_{t+1}) \times \dots \times (1+b_{t+k}) = 1+ b$; $(1+c_t) \times (1+c_{t+1}) \times \dots \times (1+c_{t+k}) = 1+ c$.

So in Table 1, col. 1-4, we explain the initial levels and annual growth rates of y and n in terms of the same set of (available) factors within a seemingly unrelated regression (SUR) framework. The particular factors or similar factors are routinely used as explanatory variables in empirical analyses concerning personal earnings, average incomes, gross product per capita (e.g., Miles (1997), Bhatta and Lobo (2000), Aronson et al. (2001), Prodromidis

(2006), and the sources cited therein).⁴ Yet, in order to avoid a situation whereby part of the explained variance is accounted by two or more regressors (which makes it hard to disentangle the effects) the explanatory variables are made orthogonal to each other. (In essence, instead of regressing, say, y on arguments, say, w , x and z ; we first regress x on w , predict x' and estimate an orthogonal $\chi = x - x'$, regress z on w and χ , predict z' , and estimate an orthogonal $\zeta = z - z'$. Thus, we explain y in terms of w , χ and ζ .) Males aged 15-24, without primary school diplomas, who engage in paid work as manual workers are taken as the reference population.

The findings suggest that marginal increments in the initial population shares of (a) females possessing doctorate degrees, (b) females and (c) males possessing postgraduate degrees, (d) males employed as science and art professionals, and (e) unemployed females with paid work experience (or factors that gave rise to such features) are associated with large positive effects on average incomes in 2001. At the same time, similar increments in the population shares of (f) unemployed males lacking paid work experience, and (g) people whose nationality is unknown or unclear produce large negative effects. Likewise, marginal increments in the population shares of items (a) and (c) produce large positive effects on average local incomes during 2001-08; and similar increments in the population shares of (g) and (e) produce large negative effects on average local incomes during 2001-08. According to the coefficients recovered from the regression concerning the income-filing population figures in 2001, marginal increments in the initial population shares of (i) females with doctorate degrees, (ii) unemployed females lacking paid work experience, and (iii) people whose nationality is unknown or unclear have large positive effects on the dependent variable. At the same time, similar increments in the population shares of (iv) males with postgraduate degrees, (v) senior female officials and managers, and (vi) females employed as plant and machine operators and assemblers yield large negative effects. Likewise, marginal increments in the population shares of (i), (iii) and females with postgraduate degrees produce large positive effects in local income-filing population figures during 2001-08; and similar increments in the population shares of (iv) and of female clerks or females employed in ill-defined or undefined professions produce large negative effects during 2001-08.

⁴ Additionally, the land-to-population ratio (or inverse population density) is meant as a seclusion proxy aimed to capture the impact of fewer monetary transactions and weaker multipliers in sparsely populated districts. The income-filing figure-to-population ratio is incorporated with the intent to capture differences in the local income-earning-spending-and-declaring culture across the country, and treat some of the bias arising from under-reporting in certain quarters (Vasardani, 2011).

TABLE 1

The estimated functions of average declared personal income (dpi) and income-filing population in 2001, their annual rates of increase during 2001-08, and the number of years in 2001-08 that dpi exceeded the levels predicted by the components considered in Table 2, across Greece's 932 revenue districts

Explanatory variables	Dependent variables:	Average personal	Income-filing	Growth	Growth	Number of times the residuals of Table 2 exceed zero		
		income in 2001	pop. in 2001	rate of (1)	rate of (2)	(5)	<i>Prefectural</i>	<i>Micro-regional</i>
		(1)	(2)	(3)	(4)		(6)	(7)
1	Constant (reference population)	7,020*	13,825*	1.46*	1.11*	2.97*	3.57*	3.77*
2	Average altitude	-2*	-19	0.00*	-0.00*	0.00*	0.00*	0.00*
3	(Average altitude) square	0	0	-0.00	0.00	-0.00*	-0.00*	-0.00*
<i>Population density and revenue-filing composition, net of effects 2-3</i>								
4	Area / income-filing population (i.e., inverse filer population density)	-1,565*	-12,201*	0.04	-0.08*	0.29	0.09	0.24
5	(Area / income-filing population) square	185*	1,362	0.00	0.01	-0.03	-0.01	-0.02
6	Income-filing population / district population	2,783*	28,487*	-0.02	-0.03	-0.45	-0.57	-0.28
7	(Income-filing population / district population) square	-2,178*	-32,676*	0.03	0.03	0.60	1.07	0.52
<i>The population in terms of workforce involvement net of effects 2-7</i>								
8	% employed males aged 10 years or older (i.e., 10 ⁺) (reference population)							
9	% unemployed males aged 10 ⁺ who possess paid work experience	-40,679*	66,762	0.94	0.72	17.34	11.51	13.99*
10	% unemployed males aged 10 ⁺ who have never engaged in paid work	-61,666*	-247,225	1.58	-0.66	22.54*	9.32	15.26*
11	% non-participating males aged 10 ⁺	5,054*	43,488	0.01	-0.07	1.15	0.72	-0.36
12	% employed females aged 10 ⁺	28,900*	295,841*	0.31	-0.94*	3.40	0.17	1.01
13	% unemployed females aged 10 ⁺ who possess paid work experience	86,124*	300,538	-3.38*	-1.11	-47.55*	-38.45*	-42.05*
14	% unemployed females aged 10 ⁺ who have never engaged in paid work	20,919*	812,307*	0.74	-0.32	-0.78	-4.86	-2.08
15	% non-participating females aged 10 ⁺	9,307*	126,805*	0.22	-1.45*	1.30	0.74	1.42
16	% children below the age of 10 years	17,218*	42,995	-0.87*	0.42	-8.95*	-12.44*	-8.18*
<i>Employed as well as unemployed who used to work, net of effects 2-16</i>								
17	% unskilled manual workers (reference population)							
18	% senior male officials and managers	23,222*	-215,832	-1.66*	0.40	-10.26	-8.61	-17.62*
19	% male science and art professionals	49,287*	-25,993	-0.29	-0.23	10.40	9.15	9.40
20	% male technicians	33,839*	97,656	1.81	-1.10	0.34	10.39	-1.05
21	% male clerks	-40,245*	355,792	1.93	-0.04	29.35	28.14	25.98*
22	% male service and sales workers	-5,704	235,151	0.55	0.15	4.50	4.05	-0.47
23	% skilled male workers in agriculture and fishing	-7,234*	142,157	-0.13	0.53	2.93	4.52	2.35
24	% male craft and trade workers	-1,597	164,510	-0.22	0.70	-0.22	1.74	-3.05
25	% male plant and machine operators and assemblers	13,530*	133,667	0.39	-0.05	5.91	8.97	0.39
26	% males in ill-defined or undefined professions	6,744	99,958	-0.36	0.86	1.76	4.86	-4.47
27	% senior female officials and managers	29,660*	-1,109,022*	0.31	0.30	-1.77	-3.31	-0.19
28	% female science and art professionals	13,000	69,266	1.58	1.03	13.58	2.88	7.23
29	% female technicians	-11,724	59,328	-0.40	-0.53	3.79	1.75	0.20

Notes: The equations displayed in columns 1-5 are estimated in a SUR framework. The equations in columns 6-7 are estimated via OLS and rely on spatial dummies the coefficients. The sizes of the estimated coefficients associated with columns 6 and 7 are illustrated in Maps 2 and 3, respectively. Asterisks (*) denote rejection of the hypothesis of equality to zero at the 1% margin of error, as estimated in analyses that rely on samples.

TABLE 1 (Continued)

Explanatory variables	Dependent variables:	Average personal	Income-filing	Growth	Growth	Number of times the residuals of Table 2 exceed zero		
		income in 2001	pop. in 2001	rate of (1)	rate of (2)	(5)	<i>Prefectural</i>	<i>Micro-regional</i>
		(1)	(2)	(3)	(4)		(6)	(7)
<i>Employed and unemployed who used to work, net of effects 2-16</i>								
30	% female clerks	9,930	-232,800	1.45	-2.60*	29.67	16.65	29.10*
31	% female service and sales workers	-41,711*	-387,878	-0.19	0.06	4.13	-4.76	1.19
32	% skilled female workers in agriculture and fishing	-29,158*	-522,970*	1.83*	-1.19	23.63*	17.15	16.47*
33	% female craft and trade workers	-35,211*	-162,607	0.27	-0.54	20.07	18.71	11.99
34	% female plant and machine operators and assemblers	-16,149	-892,133	0.48	1.66	3.60	-5.63	-6.87
35	% females in ill-defined or undefined professions	6,218	-539,014	1.46	-2.86	16.83	4.55	17.69
<i>The population in terms of employment status, net of effects 2-35</i>								
36	% paid workers (reference population)							
37	% male employers and self-employed individuals	-23,839*	-145,451	-0.56	0.02	-4.93	-1.06	-4.91
38	% males assisting family members	-28,001*	-16,131	-0.63	0.04	-6.75	-14.13	6.08
39	% female employers and self-employed individuals	-3,183	-232,719	-1.52*	0.56	-12.97	-4.99	-6.54
40	% females assisting family members	-196	-3,887	0.16*	0.03	0.74	0.44	1.01*
<i>The population in terms of the highest qualification, net of effects 2-40</i>								
41	% males with doctorate degrees	-15,504	-361,948	1.61	-2.40	29.91	43.77	34.26
42	% males with postgraduate degrees	86,139*	-1,370,930	2.66	-5.65	6.69	14.13	7.66
43	% males with bachelor degrees	15,469*	-70,844	-1.20	1.06	-4.30	-4.97	-1.04
44	% male with tertiary level vocational degrees	21,981*	-330,602	0.05	-0.24	6.00	3.82	-2.17
45	% males with post-secondary school diplomas	-8,044	-73,305	0.61	-1.61	15.27	14.56	22.65*
46	% males with higher secondary school diplomas (k-12)	-4,766	-87,475	-0.36	0.73	3.20	5.71	5.24
47	% males with technical secondary school diplomas (k-12)	10,370*	-129,673	0.30	-0.23	3.42	6.15	2.06
48	% males with lower secondary school diplomas (k-9)	1,286	-130,096	-0.26	0.54	1.96	6.17	7.34*
49	% males with primary school diplomas (k-6)	632	-111,887	0.21	0.03	2.72	4.78	5.96*
50	% females with doctorate degrees	83,951*	983,647	5.38	2.87	35.05	29.13	-11.05
51	% females with postgraduate degrees	197,408*	506,593	-0.02	9.43	36.52	14.72	27.17
52	% females with bachelor degrees	-1,785	276,064	-0.10	-1.85	-8.65	-5.47	-4.28
53	% female with tertiary level vocational degrees	-14,393	354,885	-0.25	1.79	-2.17	-13.03	-11.74
54	% females with post-secondary school diplomas	16,931*	-235,887	-0.81	0.94	-4.96	-19.79	-6.84
55	% females with higher secondary school diplomas (k-12)	12,581*	262,380*	-0.53	-0.45	-11.87*	-12.21	-8.72*
56	% females with technical secondary school diplomas (k-12)	9,863	209,033	-0.44	1.02	-3.25	-11.32	-1.09
57	% females with lower secondary school diplomas (k-9)	525	-121,566	-0.42	0.92	-6.10	-11.35	-10.55
58	% females with primary school diplomas (k-6)	86	8,085	-0.23	0.04	-2.02	-2.33	-2.59
59	% of all with lower or no qualifications (reference population)							
<i>The population in terms of attachment to the community, net of effects 2-59</i>								
60	% nationals registered in the district (reference population)							
61	% nationals registered in other districts	-487	1,457	0.04	-0.08	-0.54	-0.16	-0.66
62	% aliens	353	14,665	-0.61*	0.04	-5.34*	-4.30*	-5.90*
63	% whose nationality is unknown or unclear	-115,804	14,300,000	-34.15	14.93	-590.63	-525.92	-628.10

TABLE 1 (Continued)

Explanatory variables	Dependent variables:	Average personal	Income-filing	Growth	Growth rate	Number of times the residuals of Table 2 exceed zero		
		income in 2001 (1)	pop. in 2001 (2)	rate of (1) (3)	of (2) (4)	(5)	<i>Prefectural</i> (6)	<i>Micro-regional</i> (7)
<i>The registered population's demographic composition, net of effects 2-63</i>								
64	% of all who are aged 0-4 years old	5,097	-254,134	1.06	-0.39	0.91	2.42	-2.77
65	% males aged 5-14 years old	7,919	-350,236	0.32	-1.03	6.15	6.54	6.88
66	% females aged 5-14 years old	3,035	-252,721	0.40	0.62	-9.22	-13.03	-6.34
67	% males and females aged 15-24 years (reference population)							
68	% males aged 25-34 years old	863	113,189	0.19	-0.18	3.94	3.95	-0.01
69	% females aged 25-34 years old	-397	5,314	-1.21	0.27	-16.87	-22.10*	-15.56*
70	% males aged 35-44 years old	982	-1,837	-0.63	1.68*	-6.10	-2.35	-4.82
71	% females aged 35-44 years old	7,026	-191,459	0.31	-1.50*	-0.64	5.49	-5.16
72	% males aged 45-54 years old	13,384*	-179,471	-0.83	1.45*	-2.76	-9.78	-4.39
73	% females aged 45-54 years old	14,687*	-137,582	-0.64	-0.95	-7.09	-7.28	-7.18
74	% males aged 55-64 years old	-6,595	-374,867*	0.62	0.38	4.38	8.75	2.31
75	% females aged 55-64 years old	581	-61,906	1.14	-1.01	10.29	3.64	7.67
76	% males aged 65-79 years old	4,574	-265,593*	-0.33	-0.12	-2.07	-2.44	-5.17
77	% females aged 65-79 years old	-4,298	3,035	0.51	-1.16*	-2.21	-1.86	-4.77
78	% males aged 80 years or older	-9,089	-63,024	1.06	1.49*	8.84	2.23	11.60*
79	% females aged 80 years or older	9,540	-213,028	-0.90	-0.65	-12.59	-13.30	-6.42
Statistics		R ² = 92.83 %	28.69 %	37.94 %	42.99 %	30.98 %	39.33%	83.41%
		X ² = 12,061.90	374.93	569.81	702.72	418.30		
	Ramsey's regression equation specification error test omitted variables (outside the SUR framework):	F = 47.81	135.15	3.77	5.94	2.46	2.38	0.99
	Ho: the equation has no omitted variables	Prob > F 0.0000	0.0000	0.0104	0.0005	0.0614	0.0684	0.3977
	Provides evidence of functional form misspecification	yes	yes	some	yes	some	some	no

Sources: HMF and NSSG. Own calculations.

4. LOOKING INTO THE RESIDUALS AND MAKING AN ARGUMENT FOR THE USE OF FRESH SPATIAL REGRESSORS

An alternative model of explaining overall income may be developed from the same building blocks. Since,

$$Y_{t+1} = y_{t+1} \times n_{t+1} \text{ and } y_{t+1} = (1+b_t) \times y_t,$$

it follows that $Y_{t+1} = (1+b_t) \times y_t \times n_{t+1}$. (2)

In linear format: $\ln Y_{t+1} = \ln (1+b_t) + \ln y_t + \ln n_{t+1}$. (3)

The incorporation in expression (3) of six temporal categorical (dummy) variables, d_i , in order to estimate the discrete annual effects, g_i , on each b_t , renders the un-logged version of expression (3) as follows:

$$Y_{t+1} = (1+b_t) \times y_t \times n_{t+1} \times e^{\sum(g_i \times d_i)}. \quad (4)$$

The empirical results obtained from (932 observations \times 7 years =) 6,524 observations are provided in Table 2; and the residuals recovered in the process bring to light individual communities or clusters of communities that experienced further (unexplained) income increases throughout the period or in six out of the seven years; other places that turn out to be susceptible to more oscillations (with fewer “ups” (four or five) and more “downs”), places that were even less consistent (by performing worse in four or five times out of the seven); and communities or clusters of communities that performed worse than expected in six out of the seven years or throughout the period.

TABLE 2

The declared personal income across the 932 revenue districts of Greece during 2001-08

Dependent Variable	Coefficients obtained on the condition that the second and third coefficients take the value “1”
Natural logarithm of the overall personal income	
Explanatory Variables	
1. Constant	0.061*
2. Natural logarithm of the previous year’s average income	1.000
3. Natural logarithm of the income-filling population	1.000
4. Change from the second to the third year (2002-3)	-0.027*
5. Change from the third to the fourth year (2003-4)	-0.030*
6. Change from the fourth to the fifth year (2004-5)	0.030*
7. Change from the fifth to the sixth year (2005-6)	-0.000
8. Change from the sixth to the seventh year (2006-7)	0.018*
9. Change from the seventh to the eighth year (2007-8)	-0.020*
Statistics	R² = 99.93 %

Note: Asterisks (*) denote rejection of the hypothesis of equality to zero at the 1% margin of error, as estimated in analyses that rely on samples.

Sources: HMF. Own calculations.

To explain these patterns, the number of times that the recovered residuals exceed zero is regressed on the same available regressors considered in Table 1, col. 1-4. To produce more efficient estimators, instead of using standard ordinary least squares (OLS), the analysis is carried out within the SUR system, thus also taking into account the correlations among the residuals generated by the four regressions discussed above (Gujarati, 1995). The recovered coefficients are provided in col. 5, and suggest that: (a) Altitude is associated with a positive effect up to 1,741 meters, and yields a maximum at 871 meters. (This is the result of the twice differentiable function with respect to altitude.) (b) The initial population shares of males and females with doctorate degrees, females with postgraduate degrees, males and females employed as clerks produce large positive effects. (c) The initial population shares of unemployed females who possess paid work experience and of people whose nationality is unknown or unclear produce large negative effects. However, there exists also an unexplained portion which is unevenly distributed across space, if residuals are any guide.

In our view, the presence of concentrations or patterns in the residuals recovered from an econometric analysis is indicative of some omission, the obvious omission being that of an (unmeasured or unknown) explanatory variable or variables. In practice, the deficiency may lead to the estimation of misleading results (Pindyck and Rubinfeld, 1991; Gujarati, 1995). Yet, to the extent features of the missing variables are captured in the residuals, then information associated with the missing variables may be picked up along the spatial dimension and inferred from the territorial patterns of the residuals. Consequently, if we constructed spatial dummies for the non-random territorial concentrations and dispersions of the residuals, and inserted these dummies in the regression (when the equation is estimated again), then we might ameliorate the misspecification problem. Indeed, as we see from the Ramsey test, the probability that no relevant regressor is excluded from the analysis climbs from about 6% (a probability that remains virtually unchanged from the specification that lacks spatial regressors (in col. 5), to the one that relies on conventional spatial regressors (in col. 6)) to about 40% (in col. 7).

5. EXPLAINING THE PATTERNS THROUGH CONVENTIONAL AND FRESH SPATIAL REGRESSORS

The consideration or reliance on dummies standing for territorial formations is part and parcel in empirical economics (though the practice may be hard to defend if disparities within the spatial units considered are quite large.) In our case, if the country's revenue districts are grouped along the customary prefectural lines, then the number of regressors increases by 53

(the prefecture of Athens serves as the reference area) and, as expected, the equation's fitness improves, though not much: The R^2 goes up from 31 (in col. 5) to 39% (in col. 6).

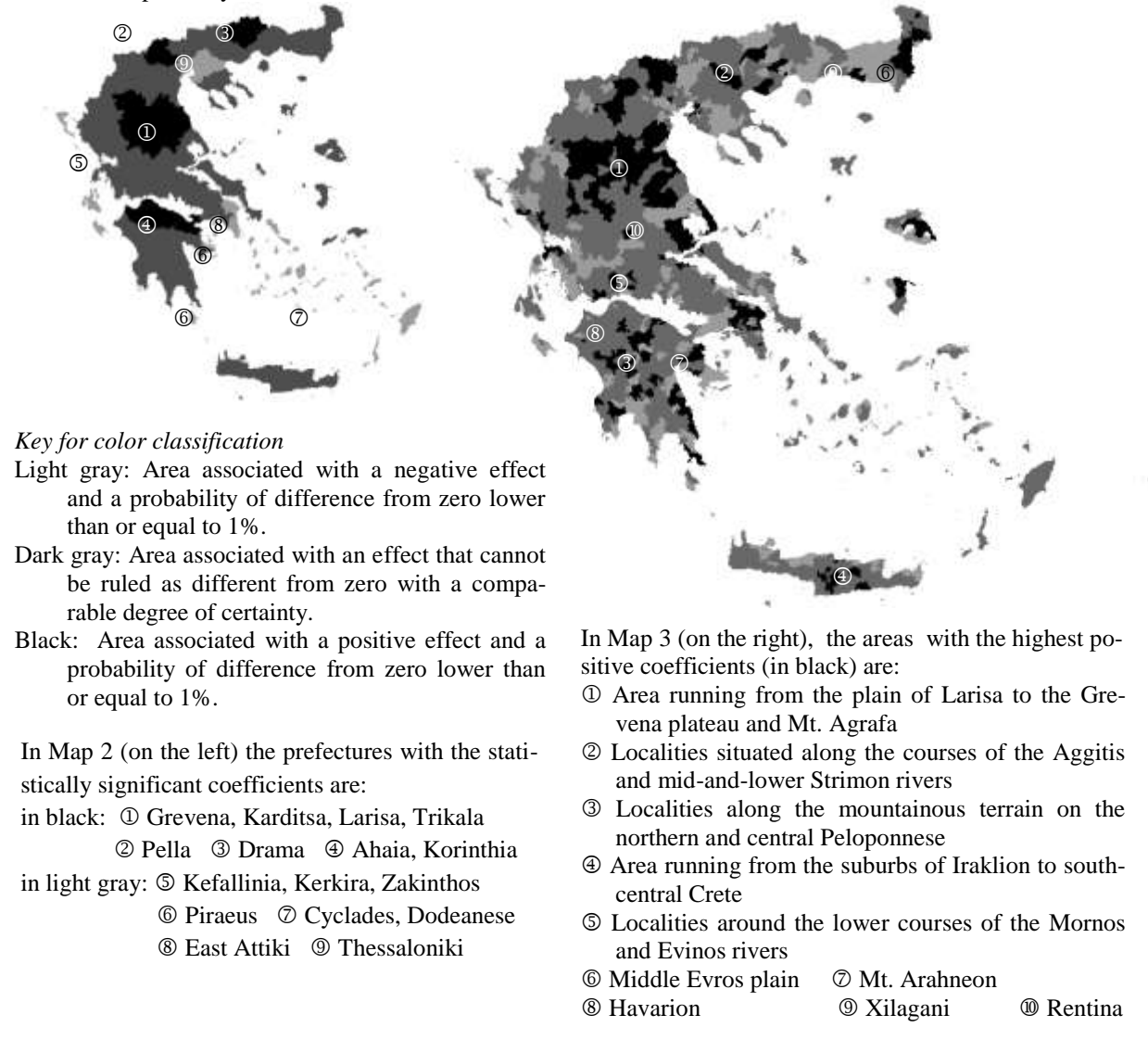
The recovered coefficients reveal that the districts which comprise: (a) the prefectures of Grevena, Trikala, Karditsa on average exhibited an extra year of total income increase vis-à-vis the reference area; (b) the neighboring prefecture of Larisa, as well as the prefectures of Drama and Pella averaged slightly less than an extra year of total income increase compared to the reference area. These results, along with the positive results pertaining to Ahaia and Korinthia (in the northern Peloponnese) turn out to be statistically different from zero, if z-statistics are any guide. To visually aid the reader we offer Map 2. We also note that all areas which grow steadily (year after year) are on the mainland. One of these, the prefecture of Pella, is fairly agriculture-oriented; the rest seem to possess no distinct industrial orientation. (The relevant location quotients are supplied in Table 3.)⁵ On the other hand, not all agriculture-oriented prefectures (e.g., Serre, Imathia, Messenia) and not all unspecialized prefectures (e.g., Kerkira, Pieria) share this feature, so there may exist some other factor (factors) that makes (make) the difference. By contrast, the districts that comprise the prefectures of (i) Zakynthos and Kerkira averaged, respectively, two extra years and an extra year and a half of total income decreases compared to the reference area; (ii) Piraeus and Thessaloniki averaged a year less; and (iii) Kefallinia, the Cyclades, and the Dodekanese averaged slightly less than a year compared to the reference area. These, along with the districts that comprise East Attiki (they averaged seven months less than the reference area) exhibit high z-values. It is quite clear that compared to the prefecture of Athens, certain highly populated areas (i.e., the prefectures of East Attiki, Thessaloniki and Piraeus) along with many insular prefectures consisting of medium-sized and small islands (namely, the prefectures of Kerkira, Kefallinia, Zakynthos, the Cyclades and Dodekanese) operate with a disadvantage.

In this setting, the number of times (years) that total income exceeds the level predicted in Table 2, increases with altitude up to 652 meters, and reaches a maximum at 326 meters. At the same time, the initial population shares of (a) males and females with doctorate degrees, and (b) males employed as clerks are associated with large positive effects; while the initial population shares of (i) unemployed females who used to engage in paid work, and (ii) people

⁵ The location quotient is a device that compares a region's percentage share of a particular activity (e.g., the employment observed in a given industry or sector) with the percentage share of its basic (national) aggregate (Isard, 1960). Thus, it supplies a measure of regional or sub-regional specialization in an industry. As a result, when the quotient of a particular industry is less (more) than unity, then the area in question has less (more) than its 'fair' share of the industry in question, and is less (more) specialized in the said industry than the national economy.

whose nationality is unknown or unclear are associated with large negative effects. The same factors (along with the population shares of females with post-graduate degrees or employed as clerks) produced large effects in the specification that lacks spatial regressors (col. 5) as well. The results persist in the alternative (micro-regional) setting which we introduce momentarily in col. 7. Some readers may also find value in noting that the effect regarding item (i), along with the effects pertaining to the population shares of females aged 25-34 years old, aliens, children below the age of 10 years (all of which are negative), and altitude, are associated with high levels of statistical significance.

MAPS 2 and 3: Portrayal of the statistically significant spatial effects that supplement Table 1, columns 6 and 7, respectively



We now turn to the last model. It makes use of the fresh spatial arguments obtained from the data, and provides a rather refreshing micro-regional perspective. Instead of grouping the country's districts along prefectural lines it relies on an algorithmic approach of grouping dist-

TABLE 3

The sub-regional specialization of Greece in 2001 in terms of location quotients (people in industries)

Industry	Prefectures																	
	Agriculture, husbandry, forestry	Fishing	Mining & quarrying	Manufacturing	Energy & water	Construction	Trade & repairs	Hotels & restaurants	Transport, storage, communication	Financial intermediation	Real estate & business activities	Public admin. & social security	Education	Health & social work	Other personal & social services	Private household work	Extra-territorial bodies	Unclassified
Attiki																		
Athens	0.0	0.1	0.3	1.3	1.0	0.4	1.2	0.9	1.2	1.8	1.5	1.2	1.1	1.3	1.3	1.2	1.7	1.1
E.Attiki	0.3	0.6	0.5	1.4	1.0	1.7	0.9	0.2	1.2	1.2	1.3	0.9	0.8	1.0	1.1	0.7	3.0	1.6
Piraeus	0.1	1.2	0.4	1.5	0.7	1.0	1.3	0.9	2.0	0.9	1.0	0.8	0.8	0.8	1.1	0.6	1.3	1.0
W.Attiki	0.4	0.7	1.0	1.9	0.7	1.6	1.1	0.7	1.3	0.5	0.8	1.1	0.3	0.6	0.8	0.3	0.5	1.3
C.Greece-Euboea																		
Boeotia	1.7	0.7	2.5	1.6	1.1	1.1	0.8	0.7	0.7	0.2	0.7	0.8	0.7	0.6	0.7	0.3	0.5	1.3
Euboea	1.0	4.4	2.8	1.6	1.5	1.2	1.0	0.9	0.9	0.6	0.8	0.7	0.9	0.6	0.8	0.3	0.2	1.1
Evrítania	1.3	0.2	0.2	0.7	2.3	1.5	0.8	1.3	1.0	1.0	0.7	1.1	0.9	1.1	0.8	0.1	2.4	0.9
Fokis	0.9	3.7	4.9	0.7	1.8	1.5	0.7	1.1	1.1	1.0	0.8	1.4	0.9	0.9	1.0	0.3	0.5	1.5
Fthiotis	2.0	2.0	3.1	0.8	0.8	1.1	0.7	0.7	0.8	0.8	0.6	1.0	1.0	0.6	0.7	0.2	0.2	1.2
C.Macedonia																		
Halkidiki	0.5	5.9	8.6	0.9	0.6	2.1	1.0	2.0	0.7	0.5	0.8	0.8	0.8	0.7	1.1	0.2	0.4	0.7
Imathia	2.3	0.1	0.7	0.4	1.2	1.0	1.1	0.8	0.6	0.7	0.8	0.9	1.0	0.5	0.8	0.1	0.8	0.6
Kilkis	1.7	0.1	0.3	1.9	0.5	0.9	0.7	0.7	0.6	0.4	0.6	0.9	0.6	0.8	0.7	0.1	0.2	1.4
Pieria	2.0	2.0	0.2	0.9	0.5	1.0	0.9	1.2	0.7	0.5	0.4	0.6	0.9	0.8	0.8	0.2	0.1	0.8
Pella	3.0	0.0	0.6	1.0	0.8	0.7	0.7	0.6	0.5	0.4	0.5	0.6	0.7	0.6	0.6	0.1	0.0	0.5
Serre	2.7	0.2	0.6	1.0	0.6	1.0	0.2	0.9	0.6	0.5	0.6	0.8	1.0	0.9	0.7	0.1	0.3	0.9
Thessaloniki	0.4	1.0	0.4	0.5	0.4	1.2	1.4	1.1	1.0	1.0	1.3	0.8	1.4	1.3	1.3	0.6	1.2	1.2
Crete																		
Hania	1.3	0.9	0.3	0.5	1.0	1.4	0.9	1.4	0.8	0.6	0.7	1.4	1.0	1.0	0.8	0.5	4.5	0.9
Iraklio	1.6	0.3	0.2	0.2	0.2	1.2	1.0	2.0	0.9	0.6	0.8	0.7	1.0	1.0	0.9	0.3	0.1	0.9
Lasithion	2.2	1.6	0.7	0.4	0.9	1.0	0.7	2.2	0.6	0.6	0.6	0.7	0.8	0.9	0.7	0.3	0.4	1.0
Rethimnon	1.7	0.5	0.5	0.5	0.8	1.4	0.7	2.8	0.6	0.6	0.7	0.5	1.0	0.8	0.2	0.4	0.2	0.9
E.Macedonia-Thrace																		
Drama	1.3	0.1	4.8	1.4	1.0	1.1	0.9	0.9	0.7	0.6	0.6	0.9	1.0	0.9	0.8	0.2	0.4	1.1
Evros	2.1	1.5	0.7	0.9	0.7	1.2	0.9	0.8	0.7	0.6	0.6	0.6	0.8	1.1	0.7	0.1	1.8	0.6
Kavala	1.5	2.7	1.8	0.4	0.7	1.3	1.1	1.3	0.9	0.8	0.8	0.9	1.0	1.0	1.0	0.3	0.2	0.6
Rodopi	3.5	0.6	0.4	0.9	0.7	0.8	0.5	0.5	0.4	0.3	0.4	0.6	0.7	0.5	0.5	0.1	0.2	0.6
Xanthi	2.0	0.3	0.4	1.5	0.7	1.4	0.3	2.2	1.0	0.3	0.8	0.7	1.3	1.0	1.7	0.1	0.0	1.1
Epiros																		
Arta	2.0	2.4	0.8	0.7	1.7	1.4	0.8	0.8	0.7	0.6	0.1	1.1	0.8	1.1	0.6	0.1	0.3	0.9
Ioannina	1.0	0.6	1.5	1.0	1.1	1.6	0.3	1.2	0.8	0.7	0.8	1.3	1.7	1.7	0.7	0.2	0.3	1.1
Preveza	2.1	2.2	0.8	0.7	0.7	1.3	0.7	1.2	0.8	0.5	0.6	1.1	1.1	0.2	0.7	0.2	0.0	0.9
Thesprotia	1.8	2.8	1.0	0.6	0.2	1.7	0.5	1.6	1.0	0.6	0.5	1.2	0.9	0.9	0.8	0.1	0.0	0.3
Ionian Islands																		
Kefallinia	1.0	4.1	0.7	0.5	1.0	1.9	0.8	1.7	1.4	0.6	0.8	0.9	1.0	1.0	0.9	0.4	0.5	0.3
Kerkira	1.2	1.3	0.5	0.5	0.6	1.4	1.0	1.0	1.2	0.6	0.9	0.9	1.0	0.8	1.1	0.5	0.6	1.4
Lefkas	1.3	6.6	0.1	0.6	0.5	1.7	0.9	0.5	1.2	0.6	0.8	1.3	1.2	1.1	0.8	0.3	0.0	0.5
Zakinthos	2.0	1.0	1.0	0.4	0.7	1.7	0.5	2.7	0.2	0.3	0.7	0.6	0.8	0.6	0.7	0.3	0.0	1.0

Note: The combinations associated with (a) the highest specialization in each industry are placed in frames; (b) specialization index values of 2.1 or more are denoted with shades.

TABLE 3 (Continued)

Industry	Agriculture, husbandry, forestry	Fishing	Mining & quarrying	Manufacturing	Energy & water	Construction	Trade & repairs	Hotels & restaurants	Transport, storage, communication	Financial intermediation	Real estate & business activities	Public admin. & social security	Education	Health & social work	Other personal & social services	Private household work	Extra-territorial bodies	Unclassified
Prefectures																		
Thessaly																		
Karditsa	2.1	0.0	0.4	0.7	0.9	1.2	0.9	0.9	0.6	0.7	0.6	1.1	1.2	1.0	0.8	0.1	0.4	0.4
Larisa	2.0	0.1	0.3	1.2	0.7	0.9	0.9	0.7	0.5	0.6	0.6	1.2	1.2	0.8	0.7	0.2	0.1	0.4
Magnesia	1.1	1.9	1.6	1.1	0.7	1.2	0.9	0.9	0.8	0.6	0.7	1.2	1.1	0.9	0.9	0.3	0.4	1.2
Trikala	2.1	0.0	0.2	0.8	0.9	1.4	0.9	1.2	0.6	0.6	0.6	0.9	1.1	0.9	0.8	0.2	0.1	0.1
N.Aegean Islands																		
Hios	0.7	6.1	0.8	0.6	1.3	1.8	1.1	1.1	1.5	0.9	0.7	1.1	1.3	0.9	1.1	0.4	0.5	0.3
Lesvos	1.8	4.2	0.5	0.5	1.0	1.2	0.7	1.0	0.8	0.5	0.5	1.4	1.0	0.8	0.7	0.2	0.2	1.0
Samos	1.3	3.2	1.7	0.2	1.3	1.7	0.6	1.9	1.1	0.6	0.6	1.5	1.1	1.0	0.8	0.4	0.0	0.7
S.Aegean Islands																		
Cyclades	0.7	4.7	5.4	0.6	1.7	2.2	0.8	2.2	1.1	0.6	0.5	0.8	0.8	0.5	1.0	0.4	1.2	1.1
Dodekanese	0.4	4.3	0.7	0.6	0.5	0.4	1.1	3.3	1.3	0.7	0.8	1.3	0.9	0.8	1.0	0.3	0.7	1.2
S. & E. Pelopon.																		
Argolis	2.0	2.3	0.8	0.7	0.7	1.1	0.8	1.1	0.7	0.5	0.7	0.7	0.8	0.6	0.8	0.3	0.3	1.3
Arkadia	1.5	0.7	1.9	0.6	4.4	1.4	0.8	0.7	1.0	0.3	0.7	1.1	1.0	0.8	0.8	0.2	0.4	1.1
Korinthia	1.5	1.2	0.7	1.1	0.9	1.2	0.8	1.0	0.8	0.8	0.8	0.8	0.6	0.6	1.3	0.4	0.5	1.1
Lakonia	3.2	1.2	0.3	0.4	0.6	0.8	0.6	0.7	0.7	0.7	0.5	0.8	0.8	0.6	0.2	0.3	0.4	0.9
Messenia	2.3	1.0	0.4	0.6	0.4	1.1	0.8	0.8	0.8	0.7	0.7	1.0	0.9	0.8	0.7	0.4	0.4	0.7
W.Greece																		
Aetolia-Akarn.	2.3	2.6	0.6	0.6	1.0	1.3	0.8	0.7	0.8	0.5	0.5	0.8	0.9	0.7	0.6	0.2	0.2	0.9
Ahaia	1.0	0.5	0.1	1.0	0.8	1.4	1.1	1.0	1.3	0.9	0.9	1.2	0.5	1.3	0.9	0.4	0.2	0.4
Ilis	2.4	0.4	0.1	0.5	0.7	1.2	0.7	0.7	0.7	0.6	0.6	0.9	0.7	0.6	0.7	0.2	0.4	1.5
W. Macedonia																		
Florina	1.9	0.5	5.7	0.6	6.4	1.4	0.7	0.8	0.2	0.5	0.4	1.2	1.2	0.9	0.7	0.0	0.0	0.9
Grevena	2.1	0.8	0.8	0.8	1.2	1.5	0.7	0.8	0.6	0.6	0.7	1.3	0.3	1.0	0.8	0.0	1.2	0.6
Kastoria	1.3	0.3	0.8	2.5	0.7	0.8	0.8	0.9	0.4	0.6	0.6	0.9	0.9	0.7	0.8	0.1	0.4	0.6
Kozani	0.9	0.1	16.5	0.9	11.2	1.5	0.9	0.7	0.6	0.6	0.7	0.9	1.2	0.9	0.8	0.1	0.1	0.5

Sources: NNSG. Own calculations.

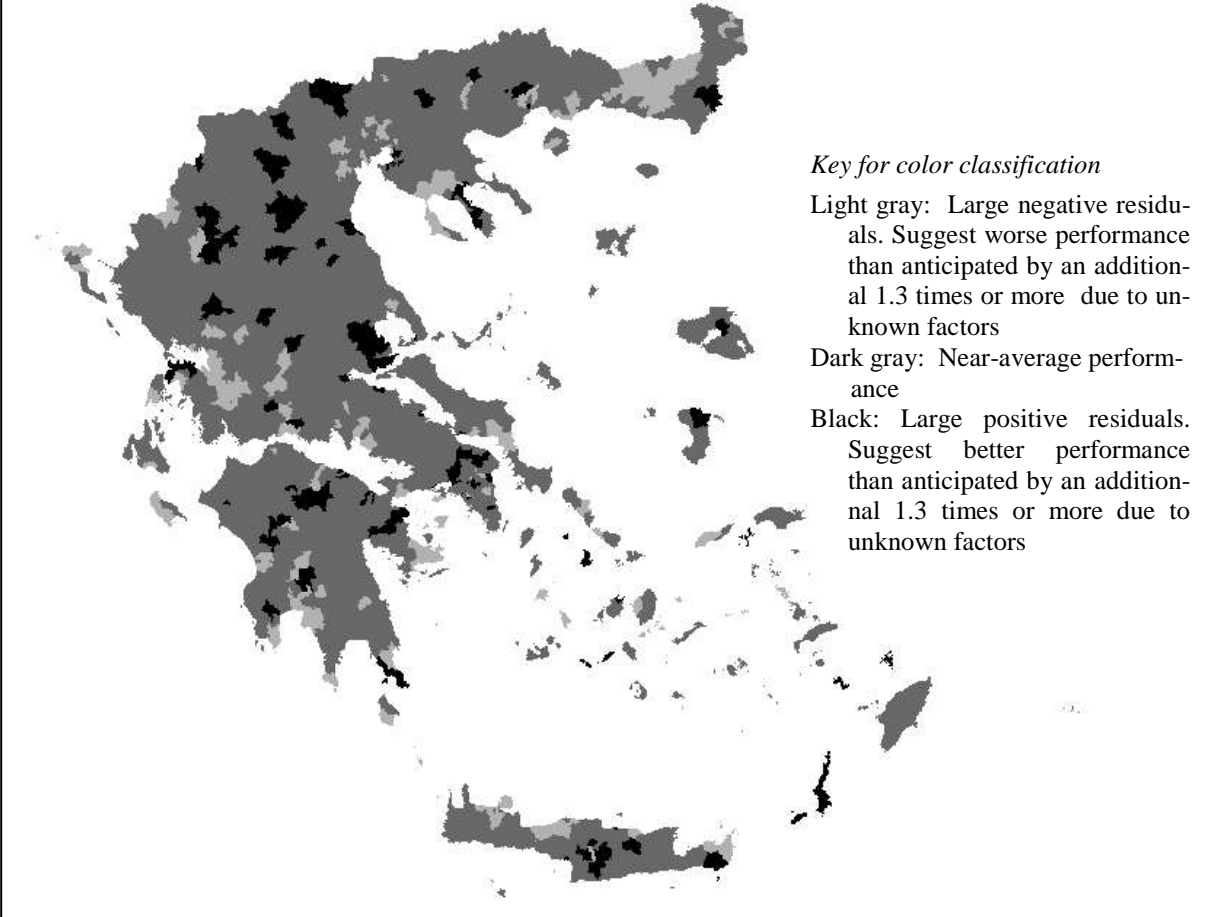
ripts together. Specifically, it takes into account the patterns of the residuals recovered from the non-spatial regression (of Table 1, col.5) in order to identify zones of neighboring districts sharing a similar “spatial shadow” of the omitted variables and outliers, on the basis of which it constructs spatial regressors. These are introduced in the equation. The steps are as follows:

- I. Localities in close proximity (including localities situated on opposite coasts, separated or linked by water) are grouped together, i.e., are assigned the same spatial dummy if their positive (negative) residual values initially exceed (fall below) a threshold value

which is initially set to 1.3 (-1.3).⁶ Distinct groupings (formations) and isolated localities are assigned different dummies.

- II. The dependent variable is explained in terms of (a) the said spatial dummies and (b) the other available regressors. The latter are modified so as to be uncorrelated with the spatial dummies and orthogonal towards each other for the reasons mentioned in Section 2. The procedure is described in footnote 7.
- III. Step II is repeated for each observation. In particular, each and every observation's inclusion in a grouping is examined separately in order to ensure the formation's homo-

MAP 4: The revenue districts of Greece in terms of the unexplained factors recovered from the estimation of the number of times (years) during 2001-08 that the residuals obtained from Table 2, exceed the value of zero, regressed on the demographic, occupational and other factors considered in Table 1, col.5



⁶ Commencing from observations that perform better or worse than anticipated by 1.3 times (years) or more ensures the consideration of a modest number of territorial cores or formations (see Map 4).

⁷ In effect, the first available explanatory variable, say, altitude, a , is regressed on the spatial dummies, δ ; next a variable a' is predicted; and an orthogonal explanatory variable $\hat{a} = a - a'$ is estimated. Then the second available explanatory variable, say, population density, p , is regressed on δ and \hat{a} ; a variable p' is predicted; an orthogonal explanatory variable $\pi = p - p'$ is estimated; and so on. Beyond satisfying a basic assumption regarding the independence of regressors, this course of action reduces the scope for (i) inflating the significance of the recovered effects or (ii) complications arising from missing variables (esp. if the correlations among regressors are to some or considerable extent caused by one or more unknown factors).

geneity. If the observation's exclusion boosts the coefficient's significance then the observation is excluded from the grouping.

IV. Groupings of observations associated with coefficients likely to be different from zero (i.e., formations that exhibit a probability of error less than 1%) are preserved.

V. Steps I-IV are repeated for observations associated with residual values ranging between -1.3 and 1.3. As a rule, these observations are either (a) singled out if their coefficients are likely to be different from zero, or (b) attached to existing neighboring formations if their inclusion boosts the coefficient's significance. (The process dies out for residuals values ranging between -0.7 and 0.7.) In addition, neighboring formations (identified in the previous steps) are banded together if their coefficients are similar. As a result, in several cases the initial dummies are replaced by a new (common) dummy.

Eventually, the procedure yields 55 spatial formations one of which serves as the reference area and the rest correspond to micro-regions (clusters or districts) and outliers. Though the number of spatial arguments ($55 - 1 = 54$) is about the same as the number of formations employed in the prefectural model (53), the equation's fitness improves considerably: The R^2 increases from about 39 to nearly 83%. (In terms of adjusted R^2 s, the specification that lacks spatial partitions or formations accounts for 25.19%, the prefectural specification accounts for 29.92%, and the micro-regional for 80.81%.) To visually aid the reader the spatial formations identified in this fashion are portrayed in Map 3 in light gray and black. The picture that emerges diverges from the prefectural one (Map 2) in several ways. Firstly, the reference population is slightly different from the one considered in the first version (i.e., males aged 15-24 with little or no qualifications that engage in paid work as manual workers) and the second version (i.e., the subgroup of the said males who live/file in the prefecture of Athens) insofar as it concerns those filing in the core municipality of Athens and the rest of Greece. Secondly, a good number of clusters and strings of localities, as well as individual districts are associated with substantial positive and negative coefficients (effects). These would be missed if conventional spatial regressors were used instead.

In this setting, the number of times (years) that total income exceeds the level predicted in Table 2, increases with altitude up to 923 meters, and reaches a maximum at 462 meters. Yet, much like in the specification that lacked spatial regressors (Table 1, col. 5), the initial population shares of (a) males with doctorate degrees (b) females with postgraduate degrees, and (c) female clerks turn out to be associated with large positive effects; and the population shares of (i) unemployed females that possessed paid work experience, and (ii) people with unknown or unclear nationality (presumably, illegal immigrants) turn to be associated with

large negative effects.⁸ So, it would seem that nation-wide policies in the direction of extending people's highest education (i.e., investing in the formation high-quality human capital), the generation of clerical posts and the attraction of women in office tasks, the absorption of unemployed women who possess paid work experience in market-jobs (while another portion of these women may see advantages in turning to domestic production), and the departure or integration in society of illegal immigrants, might support the steady growth of earnings (as opposed to depressing them), and stabilize local prosperity.⁹

Several readers may also find value in noting that the coefficients associated with the population shares under items (b)-(c) and of males with primary school, lower-secondary and post-secondary school qualifications, male clerks and unemployed males (irrespective of their past paid work experience or not), males aged 80 years or older, females employed as skilled workers in agriculture and fishing or females helping in the family business (all of which are positive); as well as the population shares under item (i), and of females aged 25-34 years old, aliens, children below the age of 10 years, males employed as senior officials and managers, females with non-technical secondary school qualifications (all of which are negative) exhibit high levels of statistical significance. However, we will not dwell of these. Instead, in the remainder of the chapter we draw attention to a number of individual districts and clusters or strings of districts (listed in Map 3) which more often than not perform better than predicted: one and a half more times than the average (3.8 years) during the seven-year period under consideration. These micro-regions vary from each other in several respects. For instance: The area under item (1) possesses a large urban center and several towns, while the areas under items (8)-(10) are rural and in some distance from such centers. The area under item (4) is situated on the tri-state border with Turkey and Bulgaria (and subject to all the border-based economic activity this may entail), while the other areas are in considerable distance from the frontier. In all these areas the initial levels of average income were below the national mean, and, evidently, despite increasing over the seven-year period, the levels of average income remained below the national mean. Yet, it would be a mistake to conclude that average income could only go up (or go up in this fashion) for not all districts with initial

⁸ However, we note that the effects associated with the population shares of male clerks and of females with doctorate degrees are not as prominent here.

⁹ The alternative reading is that in communities which lack (or lacked) instruments to cope with (absorb or draw away) comparatively large numbers people of unknown or unclear nationality, were also those which were unable to grow or grow in a firm manner. The result regarding the highly educated segment of the population (e.g., men possessing doctorate degrees) may be explained in terms of wealth redistribution decisions which the highly educated and influential segment of the population may be in a position to affect; and the impact of women employed as clerks may be explained in terms of labor market distortions (e.g., in connection with the fairly unionized civil service)

levels of average incomes below the national mean advanced in the same way. On the other hand, in the districts listed under items (1)-(10), the “catching up” process was quite steady compared to other places. To the extent these districts are: (i) more on the rural rather than on the urban side of the (urban-rural) spectrum, and (ii) with one exception (namely, the localities under item (4)), situated on the mainland, the findings may be in line with some of the inferences drawn from the prefectural model; though the maps and implications for place-based policy interventions are clearly different.

Hence, it is conceivable that the achievement of a rather steady pace of personal income increase is to some or considerable extent attributable to: (I) The ability of people living on the mainland to reschedule transports so that deliveries are on time. (This is much harder in several insular communities considering that sea-faring activities to/from the port are both subject to regularity, and considerable disruption due to weather or strike.) (II) The choice of crops, herding practices or aquafarming undertaken in these areas (if our impressions are correct), or the steady flow of EU subsidies and transfers aiming to the protection and management of the land etc., or both. If that is so, then elements of the professionalism and efficiency in running production and/or EU programs displayed in the ten micro-regions we identified here via econometrics ought to be transferred to other parts of the country as well. Yet, to ascertain the source(s) and obtain more clues regarding the factors driving this kind of performance in the said areas, it might be a good idea to study them closely via field surveys. At the same time, the areas in light gray appear to be in need of territorial development planning assistance. The findings lend weight to the argument favoring the engagement in locally-targeted initiatives alongside policies that take place at the national level.

6. CONCLUSIONS

The spatial scatter of the disaggregated personal income averages reveals that the highest levels are observed in Athens, Thessaloniki and their environs, the country’s main transportation nodes, long-established tourist places, and the main sites of energy-production and mineral-extraction.

Both the average income figures and the size of income-filing population figures (i.e., the two components of overall income) in 2001, as well as their rates of change, and the number of times (years) that overall income exceeds (or falls below) the predicted level, may be explained to some or considerable extent in terms of a number of available regressors. Indeed, the empirical findings suggest that, in general, in communities with rather large initial population shares of: (a) Women holding doctoral degrees, large expansions in average

incomes and the income-filing population occurred over time. (b) Women holding postgraduate degrees, a large expansion of the income-filing population occurred over time, while total income usually exceeded the level predicted by the two components and the annual effects. (c) Men holding doctorate degrees, total income usually exceeded the level predicted by the two components and the annual effects. (d) Men holding postgraduate degrees, a large expansion in average incomes occurred over time, in conjunction with a large contraction in the size of the income-filing population. (e) Women employed as clerks or in ill-defined or undefined professions, a large contraction of the income-filing population occurred over time; though in the case of the former, total income usually exceeded the level predicted by the two components and the annual effects. (f) Unemployed women who possessed paid work experience, a large contraction in average incomes occurred over time; while total income usually fell behind the level predicted by the two components and the annual effects. (g) People of unknown or unclear nationality this was complemented by a large contraction of the income-filing population.

The experimental inclusion in the equation which explains the number times that overall income exceeds the level predicted, of a number of spatial dummies constructed after the patterns of the residuals, raises the probability that no relevant regressor is excluded from about 6-7% (whether conventional spatial regressors are included or not) to 40%. In our view a close study of the communities and clusters of communities we identified via econometrics may provide useful insights for the design of better-targeted policy interventions.

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