Journal of World Economic Review; Vol. 13 • No. 2 • (July-December 2018) pp. 159-169

Population Changes in Mountainous Less Favored Areas: A Case-Study for the Pieria Region (Greece)

Ioannis E. Kyritsis
Department of Economics, Aristotle University of Thessaloniki, Greece

Nikolaos M. Tabakis
Department of Farm Management,Technological Educational Instituteof Thessaloniki, Greece

ABSTRACT

The aim of this paper is to study the population changes in the mountainous disadvantaged areas (Less Favored Areas, LFA) of the Pieria (Greece). It initially applies cluster analysis and makes a correlation between the population changes in each region and their distance from the Prefecture's administrative centre, where the various health services, authorities and other basic infrastructure are located. This is followed by the introduction of an indicator pertaining to the type of employment per region, which is correlated with the relevant population changes. Finally, a study is carried out concerning the trends in student numbers observed in these areas in relation to the relevant population of the rest of the prefecture, in order to make a long-term forecast about the evolution of its population.

JEL Classification: *C13, C20, J11*

Keywords: *Less Favored Areas, Isolated Areas, Population Changes, Greece, Forecasting*

1. INTRODUCTION

Mountainous regions are characterized by a particular geomorphologic environment, which significantly affects the conditions pervading their economic and social development. These regions, which used to be active population centres, have in recent decades been experienced demographic desertification and economic decline. Nowadays, these inaccessible mountain ranges are exposed, to a lesser or greater degree, to the mechanisms of marginalization; the solution to this problem can be found in supporting their sustainable development through the introduction and preservation of economic activities that are in line with society's expectations. The unique character of mountainous regions, regarding both the problems they face and the philosophy underlying the policies for their development, is an issue that has at last attracted the attension of policy makers at an international level. In the decisions of the "Earth Summit" in Rio in 1992 and Johannesburg in 2002, where the principle of sustainability was adopted by all member-states, particular mention was made to the sustainable development of mountainous regions.

The special status of Mountainous Less Favored Areas is formulated by a cycle of interactions between the economy, society and growth. Specific conditions, such as the limited use of natural resources, insufficient infrastructure, a stagnant agricultural production, high installation costs for business activities, low productivity levels and increasing transportation costs in combination with low population density, lead to efforts with entailing disproportionately high costs in relation to their outcome, that call for the availability of substantial public funds per capita for infrastructure projects and services. This initiated a cycle of negative interactions, which produced under-development, limited opportunities, a reduction in natural and human resources, further deterioration of relevant demographic indicators and developmental opportunities, which result in a declining demographic profile (Beriatos *et al*., 1990).

Consequently, mountainous settlements with a low-scale local economy, which are located in remote areas and isolated from the modern economic activities of the region, continue to diminish regarding major determinants of economic prosperity, such as their population size, their economic activities and the infrastructure. Their total active workforce decreases at a much more rapid rate compared to other regions, since the inhabitants choose to move to larger towns and villages in search of employment and improved provision of services and infrastructure (Union Européenne, 1992). The constant decline in population and particularly of the active workforce, along with its low educational level, result in a dramatic lack of innovative initiatives and the use of outdated traditional agricultural production methods. The limited employment opportunities in local businesses, the farmers' struggle to achieve a satisfactory quality of life based only on their agricultural income and the inability of the communication network to connect these areas with the centres of administration and economic activity have served to create a negative economic and social climate (Kostopoulou and Kyritsis, 1998).

The territorial particularities of remote mountainous mainland areas are the basis for their characterization as Less Favored Areas regions, and isolation constitutes their primary characteristic. Inaccessible mountainous regions do not have the same conditions of access to large urban centres and national communication networks. They do not enjoy the same opportunities for employment, health, education, entertainment and information. Isolation, as pertaining to territorial division, has to do with the available communication services and with numerous other economic, social and cultural factors, which all act simultaneously and interact to varying degrees (Nutley, 1980).

However, the afore-mentioned disadvantages are present with a differing intensity within the mountainous regions themselves. In fact, the more disadvantaged the region, the greater the importance of primary production for its economic and social structure. These disadvantages, which are the basic reasons underlying the observed lack of development, the low quality of life and the simple social and economic structures, are in contradiction with what the mountainous settlements have to offer, to a greater or lesser degree, *i.e*., their cultural heritage with its particular attributes, their traditions, an attractive natural environment and ecological wealth.

Thus, in recent years, with the initiatives developed along this axis to support new investments in isolated mountainous areas, the phenomenon of a predominantly aged population (or abandonment of villages) and the existence of certain resort villages that are inhabited only during the summer break are no longer prevalent throughout. The areas where new economic activities could be developed, based on the initiatives of the local population, which were subsidized through national funds, have managed to retain their population through structures displaying a potential for local development.

The aim of this paper is to study the population change in mountainous disadvantaged regions in relation to two parameters: firstly, their distance from the nearest administrative centre providing a basic satisfactory level of services (*e.g*., related to health, leisure), and secondly, the occupation of their residents. However, apart from the population change in these settlements in absolute values, our purpose is also to study the evolution of the age composition of their population.

The rest of the paper is organised as follows: Next section, discusses the methodological issues, while the third section reports the empirical findings. Concluding remarks are given in the last section.

2. METHODOLOGICAL ISSUES

Greece is a primarily mountainous country of the European Union with many islands; 70% of the country is covered by mountainous terrain, while the islands make up 20% of its total area. The territorial inconsistency and division of its natural-geographical area, with its series of mountain ranges and abundance of islands, contribute to the limited access and isolation of the largest part of the country from the main transport axes. Greece is therefore characterized by an individual set of remote settlements, which experience a long-term marginalization which is non-reversible in most cases and requires the implementation of a special developmental policy (Mitropoulos, 1993).

In the present paper which examines a specific region of Greece, we will consider as Mountainous Less Favored Areas, those defined as such according to the criteria introduced by the Community Directive 75/268/EEC. According to the latter, mountainous regions share the following characteristics:

- The existence of very adverse climatic conditions, due to the altitude
- A lower altitude, but a greater inclination. Difficulties in using agricultural machinery
- A combination of the two factors leading to an equivalent result

Less Favored Areas are characterized by:

- Soil with reduced productivity
- An outcome clearly below the average
- Low population density or reduction trends

The Pieria Prefecture was chosen in order to study the population changes to mountainous disadvantaged settlements, mainly because it presents all those attributes of a "mean representative" area. It includes mountainous, semi-mountainous and lowland areas, urban and rural areas, and a great variety of occupations. From the published data of the Statistical Service, it can be seen that the mean income of the Prefecture's inhabitants is close to the mean income of the whole country, there is regular population mobility (migration, inflow of refugees), and the indicators for unemployment, employment, *etc*., approximate the mean indicators of the whole country. As a consequence of the Prefecture's representative profile, it has been used for the pilot implementation of several initiatives of an innovative nature.

According to the Journal of the European Communities[1], the Pieria Prefecture includes 28 mountainous or semi-mountainous Communities (or Community Districts after the application of the "Kapodistrias Plan"), whose population levels according to the last four national censuses (1971, 81, 91 and 2001) are presented in the first columns of Table 1. Based on these data, we have created the next four columns in the table, where column d_1 shows the percentual changes

Table 1
Data for the Pieria Prefecture

		Population				Population changes (%)					Employment (%)			
	Settlement	*1971*	*1981*	*1991*	*2001*	*d1*	*d2*	*d3*	*d*	*Distance*	*Sector 1*	*Sector 2*	*Sector 3*	*E.S.I.*
1	Aghios Dimitrios	1105	1041	973	907	–5.8	–6.5	–6.8	–17.9	33	86.18	7.16	6.66	120.48
2	Alonia	874	824	976	701	–5.7	18.4	–28.2	–19.8	22	68.94	14.97	16.09	147.15
3	Aronas	408	412	342	388	1.0	–17.0	13.5	–4.9	8	37.68	30.39	31.93	194.25
4	Elafos	626	666	621	626	6.4	–6.8	0.8	0.0	18	68.57	23.17	8.25	139.66
5	Elatokhori	944	796	681	715	–15.7	–14.4	5.0	–24.3	29	86.27	6.71	7.01	120.72
6	Exokhi	720	577	947	746	–19.9	64.1	–21.2	3.6	13	87.36	6.17	6.47	119.11
7	Fotina	434	918	883	838	111.5	–3.8	–5.1	93.1	–	–	–	–	–
8	Kastania	409	418	393	423	2.2	–6.0	7.6	3.4	46	68.63	19.62	11.75	143.12
9	Katalonia	603	559	484	472	–7.3	–13.4	–2.5	–21.7	21	80.08	11.59	8.32	128.22
10	Keramidi	651	612	793	731	–6.0	29.6	–7.8	12.3	7	84.99	7.71	7.30	122.31
11	Koukos	443	410	326	523	–7.4	–20.5	60.4	18.1	18	75.83	8.44	15.73	139.90
12	Laghorakhi	701	931	999	820	32.8	7.3	–17.9	17.0	16	90.82	3.82	5.37	114.57
13	Leptokaria	2247	2874	3366	4292	27.9	17.1	27.5	91.0	26	15.54	41.89	42.58	227.06
14	Livadi	309	301	243	307	–2.6	–19.3	26.3	–0.6	43	73.45	13.84	12.71	139.26
15	Milia	1786	1687	1655	1748	–5.5	–1.9	5.6	–2.1	16	77.74	9.58	12.67	134.91
16	Moscokhori	452	511	464	497	13.1	–9.2	7.1	10.0	10	64.81	20.11	15.08	150.27
17	Moscïpotamos	452	1181	823	808	161.3	–30.3	–1.8	78.8	–	–	–	–	–
18	Paliostani	812	723	664	543	–11.0	–8.2	–18.2	–33.1	29	77.48	9.03	13.49	136.01
19	Panteleimonas	657	948	1104	1187	44.3	16.5	7.5	80.7	33	53.52	22.64	23.85	170.35
20	Pori	358	458	723	742	27.9	57.9	2.6	107.3	42	40.40	13.42	46.19	205.81
21	Riakia	694	711	583	599	2.4	–18.0	2.7	–13.7	23	90.63	3.63	5.74	115.11
22	Ritini	1846	1806	1578	1671	–2.2	–12.6	5.9	–9.5	23	62.89	17.36	19.75	156.86
23	Sevasti	427	484	513	736	13.3	6.0	43.5	72.4	13	56.25	21.62	22.13	165.88
24	Sfendami	1141	1231	1209	1166	7.9	–1.8	–3.6	2.2	25	71.10	11.97	16.92	145.80
25	Skotina	1157	1120	1075	967	–3.2	–4.0	–10.0	–16.4	32	22.66	34.16	43.18	220.52
26	Trapezounta	527	557	504	553	5.7	–9.5	9.7	4.9	9	72.90	9.98	17.12	144.22
27	Trilofos	703	749	694	620	6.5	–7.3	–10.7	–11.8	14	61.46	23.57	14.97	153.51
28	Vria	410	503	394	422	22.7	–21.7	7.1	2.9	17	60.59	23.83	15.57	154.96

Source: National Statistical Service of Greece (NSSG) to the population during the period 1971-81, d_2 for the period 1981-91, d_3 for the period 1991-2001, and finally column d, which shows the percentual change during the three decades.

3. EMPIRICAL RESULTS

We first place the total number of settlements under examination as points on a three-dimensional system having as axes the percentual changes to the population during the decades 71-81, 81-91, 91-01, in order to detect potential extreme or deviant points with an unusual behaviour in relation to the cloud of the remaining ones. Various diagnostic tests are proposed in the relevant literature, for the detection of such points, which are usually characterized as "high leverage points" (Seaver and Trantis, 1995). Apart from the visual examination of the plot which highlights two "extreme" settlements, the hierarchical cluster analysis with Euclidean distance as a measure of distance in the three-dimensional system we have mentioned, proposes the creation of two clusters (with the use of the statistical package SPSS 14.0): one with the 2 "extreme" settlements and one with the remaining 26. We therefore exclude the settlements no (7) and (17) of Table 1 and continue our study with the rest.

We examine for the existence of a possible correlation between population changes and the distance from the administrative centre of the Prefecture, where the health and administration services and other basic infrastructure are collected. The correlation of the variable "distance" with the variable "percentual population change" is insignificant. During the period 1971-2001 the Pearson correlation is 0.151. The same holds for each individual decade: actually, for the 70s the correlation is 0.098, for the 80s it is 0.033, and finally, for the 90s it is 0.010. This means that the population change in mountainous disadvantaged settlements in the Prefecture is not correlated to their distance from the administrative centre and can be easily explained by the fact that the capital city is located in the territorial centre of the Prefecture, the distances are small, the road system is in a relatively very good condition and the phenomenon of isolation is virtually not an issue.

On the contrary, as we shall show later, there is a strong correlation between the population changes and the type of employment of the local residents. We introduce an Employment Sector Index (ESI), which increases when a larger amount of the population gets involved in processing and service provision, *i.e.*, in the secondary and tertiary sector, and which decreases when a larger amount of the population gets involved in primary production. ESI was calculated as the sum of prod 1 * 1, plus prod 2 * 2, plus prod 3 * 3, *i.e.*

$$\text{ESI} = \text{prod } 1 * 1 + \text{prod } 2 * 2 + \text{prod } 3 * 3, \tag{1}$$

where we use prod(i) ($i = 1, 2, 3$) to symbolize the percentage of a settlement's population which is employed in the primary, secondary and tertiary sector respectively. In doing so and using the data from the NSSG shown in Table 1, the final column in the table is created. The correlation test has shown a Pearson correlation equal to 0.552 for the variables "employment sector index" and "percentual population change" for the period 1971-2001. This means that a population increase is observed in settlements with a higher employment sector index.

The final requirement is to examine the composition of the population, *i.e.*, if the Mountainous Less Favored Areas of the Prefecture are inhabited by an actively renewed population or if a relevant ageing of the population is observed. For this purpose, the time series of the observations was examined (concerning the last nineteen academic years for which there was precise data) for quotient R of the student force in the Primary Schools of the Mountainous Less Favored Areas under study, in relation to the relevant number of students in the schools of the whole Prefecture (Table 2).

Table 2
The Student Force in the Primary Schools (Pieria Prefecture)

Year	*LFA*	*Other*	*Total*	*LFA/Total*
1988-89	1552	8211	9763	15.90%
1989-90	1444	8013	9457	15.27%
1990-91	1392	7839	9231	15.08%
1991-92	1249	7749	8998	13.88%
1992-93	1172	7488	8660	13.53%
1993-94	1132	7466	8598	13.17%
1994-95	1078	7415	8493	12.69%
1995-96	1014	7239	8253	12.29%
1996-97	991	7108	8099	12.24%
1997-98	974	6837	7811	12.47%
1998-99	1008	7011	8019	12.57%
1999-00	995	6979	7974	12.48%
2000-01	986	7129	8115	12.15%
2001-02	1009	7231	8240	12.25%
2002-03	1011	7190	8201	12.33%
2003-04	1024	7367	8391	12.20%
2004-05	1020	7352	8372	12.18%
2005-06	1028	7284	8312	12.37%
2006-07	1032	7301	8333	12.38%

Source: Office of Primary Education (Pieria Prefecture)

The empirical analysis proceeded with the estimation of several alternative models, in order to obtain the most appropriate specification. These formulations can be expressed mathematically as follows:

$$R = f(T) \quad (2)$$

$$R = f(T, T^2) \quad (3)$$

$$R = f(1/T) \quad (4)$$

$$R = f(1/T, 1/T^2) \quad (5)$$

$$R = f(R_{i-1}) \quad (6)$$

$$R = f(R_{i-1}, T) \quad (7)$$

$$R = f(R_{i-1}, 1/T), \quad (8)$$

where R stands for the quotient of the student force in the Primary Schools of the Mountainous Less Favored Areas under study, in relation to the relevant number of students in the schools of the whole Prefecture, and T is a time trend variable. The econometric formulations of the above functions can be rewritten as follows:

$$R_i = c + b_1 T_i + u_i \tag{9}$$

$$R_i = c + b_1 T_i + b_2 T_i^2 + u_i \tag{10}$$

$$R_i = c + b_1 (1/T_i) + u_i \tag{11}$$

$$R_i = c + b_1 (1/T_i) + b_2 (1/T_i^2) + u_i \tag{12}$$

$$R_i = c + b_1 R_{i-1} + u_i \tag{13}$$

$$R_i = c + b_1 R_{i-1} + b_2 T_i + u_i \tag{14}$$

$$R_i = c + b_1 R_{i-1} + b_2 (1/T_i) + u_i. \tag{15}$$

Next, we proceeded with the estimation of the above equations, and the results are reported in Tables 3-9. Based on the diagnostics and a number of statistical criteria (see, for example, Griffiths *et al.*, 1993), we concluded in favour of model (15) as the most efficient with regard to its ability to fit the real data. The estimates from model (15) are briefly presented below:

$$\hat{R}_i = \underset{(\text{s.e.} = 1.7984)}{5.9756} + \underset{(0.1538)}{0.4935}\, R_{i-1} + \underset{(1.5694)}{3.1303}(1/T), \tag{16}$$

$$\bar{R}^2 = 0.946, \quad F(2, 15) = 149.129\ [0.000],$$

$$RMSE = 0.20612, \text{ Theil's inequality coefficient} = 0.00799.$$

Table 3
Estimation Results and Forecast Evaluation ($R_i = c + b_1 T_i + u_i$)

Dependent Variable R: Estimation Corrected for Autocorrelation

Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
Constant	15.5137	0.8840	17.5501 [0.000]
T	–0.1915	0.0613	–3.1232 [0.006]

Diagnostic Tests

R-Squared	.91657	R-Bar-Squared	.90614
S. E. of Regression	.35884	F (2, 16)	87.8841[.000]
Mean of Dependent Variable	13.0222	S. D. of Dependent Variable	1.1712
Residual Sum of Squares	2.0602	Equation Log-likelihood	–6.7349
Akaike Info. Criterion	–9.7349	Schwarz Bayesian Criterion	–11.1516
DW-statistic	1.3254		

Parameters of the Autoregressive Error Specification

$$\hat{u} = \underset{(9.5693)}{0.9100}\, \hat{u}(-1)$$

Log-likelihood ratio test of AR(1) versus OLS: $X^2(1) = 25.3847$ [0.000]

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.33831 Theil Inequality Coefficient = 0.00886

Table 4
Estimation Results and Forecast Evaluation ($R_i = c + b_1T_i + b_2T_i^2 + u_i$)

Dependent Variable R: Estimation Corrected for Autocorrelation

Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
Constant	16.3633	0.3343	48.9453 [0.000]
T	–0.6270	0.0761	–8.2376 [0.000]
T^2	0.0225	0.0037	6.1351 [0.000]

Diagnostic Tests

R-Squared	.96206	R-Bar-Squared	.95447
S. E. of Regression	.24991	F (3, 15)	126.7936 [.000]
Mean of Dependent Variable	13.0222	S. D. of Dependent Variable	1.1712
Residual Sum of Squares	.93679	Equation Log-likelihood	1.4292
Akaike Info. Criterion	–2.5708	Schwarz Bayesian Criterion	–4.4597
DW-statistic	1.8139		

Parameters of the Autoregressive Error Specification

$$\hat{u} = \underset{(3.0889)}{0.5782}\,\hat{u}(-1)$$

Log-likelihood ratio test of AR(1) versus OLS: $X^2(1) = 7.2894$ [0.007]

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.22813 Theil Inequality Coefficient = 0.00851

Table 5
Estimation Results and Forecast Evaluation ($R_i = c + b_1(1/T_i) + u_i$)

Dependent Variable R: Estimation Corrected for Autocorrelation

Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
Constant	12.6610	0.4718	26.8346 [0.000]
1/*T*	2.1429	0.6637	3.2288 [0.005]

Diagnostic Tests

R-Squared	.93095	R-Bar-Squared	.91714
S. E. of Regression	.33715	F (3, 15)	67.4102 [.000]
Mean of Dependent Variable	13.0222	S. D. of Dependent Variable	1.1712
Residual Sum of Squares	1.7051	Equation Log-likelihood	–5.0171
Akaike Info. Criterion	–9.0171	Schwarz Bayesian Criterion	–10.9060
DW-statistic	1.8635		

Parameters of the Autoregressive Error Specification

$$\hat{u} = \underset{(6.0277)}{1.2562}\,\hat{u}(-1) - \underset{(-2.0057)}{0.4180}\,\hat{u}(-2)$$

Log-likelihood ratio test of AR(1) versus OLS: $X^2(1) = 14.5079$ [0.000]
Log-likelihood ratio test of AR(2) versus AR(1): $X^2(1) = 2.7385$ [0.098]

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.31670 Theil Inequality Coefficient = 0.00639

Table 6
Estimation Results and Forecast Evaluation ($R_i = c + b_1(1/T_i) + b_2(1/T_i^2) + u_i$)

Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
	Dependent Variable R		
Constant	11.4774	0.1248	91.9714 [0.000]
$1/T$	11.4108	0.9959	11.4578 [0.000]
$1/T^2$	-6.9849	0.9867	-7.0789 [0.000]

Diagnostic Tests

R-Squared	.95417	R-Bar-Squared	.94844
S. E. of Regression	.26594	F (2, 16)	166.5652 [.000]
Mean of Dependent Variable	13.0222	S. D. of Dependent Variable	1.1712
Residual Sum of Squares	1.1316	Equation Log-likelihood	–.16231
Akaike Info. Criterion	–3.1623	Schwarz Bayesian Criterion	–4.5790
DW-statistic	1.2193		

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.24405 Theil Inequality Coefficient = 0.00934

Table 7
Estimation Results and Forecast Evaluation ($R_i = c + b_1R_{i-1} + u_i$)

Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
	Dependent Variable R		
Constant	2.5948	0.6544	3.9649 [0.001]
R(-1)	0.7863	0.0499	15.7512 [0.000]

Diagnostic Tests

R-Squared	.93942	R-Bar-Squared	.93563
S. E. of Regression	.24591	F (1, 16)	248.0992 [.000]
Mean of Dependent Variable	12.8625	S. D. of Dependent Variable	.96924
Residual Sum of Squares	.96753	Equation Log-likelihood	.76950
Akaike Info. Criterion	–1.2305	Schwarz Bayesian Criterion	–2.1209
DW-statistic	2.1329	Durbin's *h*-statistic	–.28847 [.773]

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.23185 Theil Inequality Coefficient = 0.00899

Table 8
Estimation Results and Forecast Evaluation ($R_i = c + b_1R_{i-1} + b_2T_i + u_i$)

Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
	Dependent Variable R		
Constant	1.7939	1.3639	1.3153 [0.208]
R(-1)	0.8367	0.0905	9.2474 [0.000]
T	0.0136	0.0202	0.6728 [0.511]

Diagnostic Tests

R-Squared	.94119	R-Bar-Squared	.93335
S. E. of Regression	.25023	F (2, 15)	120.0323 [.000]
Mean of Dependent Variable	12.8625	S. D. of Dependent Variable	.96924
Residual Sum of Squares	.93919	Equation Log-likelihood	1.0371
Akaike Info. Criterion	–1.9629	Schwarz Bayesian Criterion	–3.2985
DW-statistic	2.3019	Durbin's *h*-statistic	–.69347 [.488]

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.22842 Theil Inequality Coefficient = 0.00886

Table 9
Estimation Results and Forecast Evaluation ($R_i = c + b_1R_{i-1} + b_2(1/T_i) + u_i$)

		Dependent Variable R	
Regressors	*Coefficients*	*Standard Errors*	*T-Ratio [Prob]*
Constant	5.9756	1.7984	3.3227 [0.005]
R (-1)	0.4935	0.1538	3.2084 [0.006]
1/*T*	3.1303	1.5694	1.9946 [0.065]

Diagnostic Tests

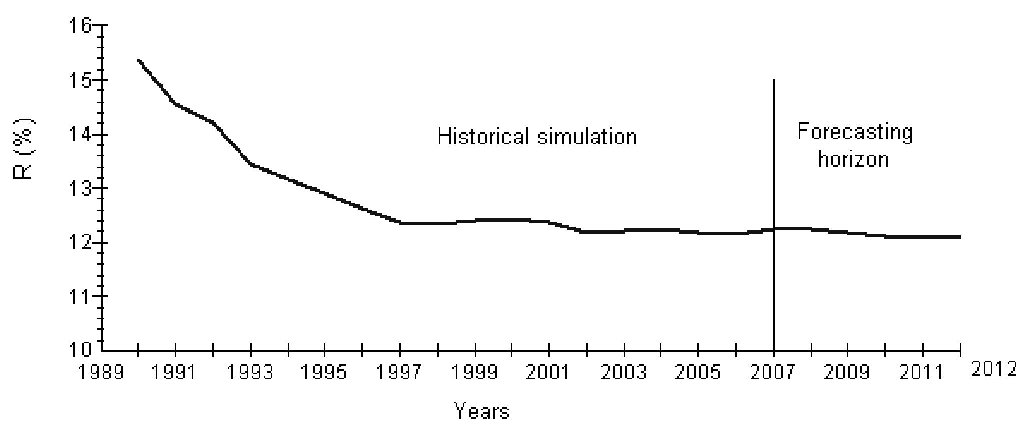
R-Squared	.95212	R-Bar-Squared	.94573
S. E. of Regression	.22579	F(2, 15)	149.1293 [.000]
Mean of Dependent Variable	12.8625	S. D. of Dependent Variable	.96924
Residual Sum of Squares	.76472	Equation Log-likelihood	2.8867
Akaike Info. Criterion	–.11332	Schwarz Bayesian Criterion	–1.4489
DW-statistic	2.2369	Durbin's h-statistic	–.66317 [.507]

Statistical Results Evaluating the Forecast

Root Mean Squared Error = 0.20612	Theil Inequality Coefficient = 0.00799

Considering model (16), we next produced forecasts for 5 years ahead. Forecasts showed that the percentage of the student population in Mountainous Less Favored Areas to the total student population of the region follows a stabilization path, which converges around 12% (Figure 1).

Figure 1
Plot of Fitted and Single Equation Forecasts



4. CONCLUSIONS

In the area under study, we observe a retention and even an increase of the population in mountainous disadvantaged settlements in areas where the residents were provided with potential employment that differed from traditional agriculture, such as processing (*e.g.*, traditional products) and services (*e.g.* agro-tourism). Furthermore, the children population in such areas appears to be stable and approximates the percentages observed in the rest of the region.

Note

1. Directive 268 of 28.04.1975 (published in the Official Journal of the European Communities on 19.05.1975) as modified by directives 645 of 1981, 148 of 1985 and 66 of 1993.

References

Beriatos *et al*., (1990), The Interdisciplinary Approach of the Development, National Technical University of Athens, *Proceedings – Scientific Conference*, Ed. Papazissi, Athens.

Griffiths W., Hill R., and Judge G., (1993), *Learning and Practicing Econometrics*, John Wiley and Sons, New York.

Kostopoulou S., and Kyritsis I., (1998), Mountainous and Islander Areas, The Problem of Marginalization, *Proceedings of the 1st Scientific Conference in Regional Development*, Department of Economics, Aristotle University, Thessaloniki.

Mitropoulos M., (1993), Concepts and Proposals for Remote Areas and Europe as Whole, *Artefactum*, No 48, Antwerp.

Nutley, S. D. (1980), The Concept of Isolation – A Method of Evaluation and a West Higland Example, *Regional Studies*, 14.

Seaver, B. and Trantis K., (1995), The Impact of Outliers and Leverage Points for Technical Efficiency Measurement Using High Breakdown Procedures, *Management Science*, 41(6).

Union Européenne, Publications Officielles, (1992), Les Facteurs de Résistance a la Marginalisation dans les Zones de Montagne et Defavorisees Mediteranneennes Communautaires, Rapport de Synthèse Redige par G. Basin et B. Boux.