

ENVIRONMENTAL LAND POLICY MEASURES AND SUSTAINABLE REGIONAL DEVELOPMENT IN CYPRUS

By Dr. Andreas S. CHRISTODOULIDES

Continued from Previous Issue

3.1. Estimation of the parameters of the econometric model

Using statistical data and numerical facts for statistical regions and spatial areas, the parametre can be estimated. The estimations are presented in Tables 6 and 7. Table 6 gives the estimations with statistical data and facts in the level of the Region «outside the development area» (rural areas), and «within development area» and also for the whole of Cyprus. Table 7, gives respectively the same estimation with statistical data in the level of Spatial unit.

TABLE 6
ESTIMATION OF PARAMETRES WITH DATA IN REGIONAL LEVEL

| VARIABLE | AXIA 1 OUTSIDE DEVELOPMENT | | AXIA 2 WITHIN DEVELOPMENT | | AXIA 12 COUNTRY | |
|-----------|----------------------------------|--------|---------------------------------|--------|--------------------|--------|
| | ESTIMATION | | ESTIMATION | | ESTIMATION | |
| CONSTABLE | 8.873796 | 4.120 | 2.273400 | 0.732 | 6.778749 | 3.505 |
| X1 | -0.006436 | -0.646 | 0.010550 | 0.734 | -0.003468 | -0.387 |
| X2 | -0.009455 | -0.879 | -0.011045 | -0.712 | -0.009641 | -0.998 |
| X3 | 0.251423 | 0.437 | -2.036409 | -2.455 | -0.032380 | -0.063 |
| X4 | 1.008899 | 2.761 | 0.969165 | 1.840 | 1.053776 | 3.212 |
| X5 | -0.238369 | -0.611 | 0.692456 | 1.230 | -0.002500 | -0.007 |
| X6 | -0.241289 | -0.628 | 0.277375 | 0.501 | -0.317000 | -0.920 |
| X7 | 0.776803 | 0.819 | 1.543751 | 1.129 | 0.781742 | 0.918 |
| X8 | 55.224896 | 2.191 | 0.492819 | 0.014 | 49.307997 | 2.179 |

| VARIABLE | AXIA 1 OUTSIDE DEVELOPMENT | | AXIA 2 WITHIN DEVELOPMENT | | AXIA 12 COUNTRY | |
|----------|----------------------------------|--------|---------------------------------|--------|--------------------|--------|
| | ESTIMATION | | ESTIMATION | | ESTIMATION | |
| X9 | -35.649612 | -2.340 | -9.634114 | 0.439 | -30.840037 | -2.255 |
| X10 | -19.656625 | -1.259 | -3.876654 | -0.172 | -21.054558 | -1.502 |
| X11 | -0.009911 | -0.042 | 0.861005 | 2.546 | 0.132136 | 0.628 |
| X12 | -2.538746 | -0.598 | -10.575576 | -1.728 | -4.639742 | -1.218 |
| X13 | 0.895080 | 0.431 | 2.447321 | 0.817 | 1.576403 | 0.845 |
| X14 | 0.375710 | 0.128 | 9.002479 | 2.135 | 2.219353 | 0.845 |
| X15 | -7.601927 | -1.453 | -4.936497 | -0.655 | -8.382060 | -1.785 |
| X16 | 1.706775 | 1.141 | 1.489046 | 0.690 | 2.452032 | 1.825 |
| X17 | 0.196935 | 0.146 | 0.341710 | 0.176 | 0.378695 | 0.312 |
| X18 | 1.664174 | 2.555 | 2.081978 | 2.217 | 1.723984 | 2.948 |
| X19 | 0.092988 | 0.152 | -0.774487 | -0.877 | 0.071531 | 0.130 |
| X20 | -0.011660 | -1.637 | -0.026743 | -2.603 | -0.012832 | -2.006 |
| X21 | -0.003354 | -1.797 | -0.006475 | -2.406 | -0.004008 | -2.391 |
| X22 | -0.012143 | -0.947 | 0.014315 | 0.774 | -0.007940 | -0.690 |
| X23 | 0.004758 | 0.575 | 0.032932 | 2.760 | 0.0008935 | 1.202 |
| X24 | -0.014646 | -0.774 | -0.024137 | -0.884 | -0.010324 | -0.608 |
| X25 | 0.009210 | 0.668 | 0.046777 | 2.355 | 0.016181 | 1.308 |
| X26 | 0.002413 | 0.188 | -0.006941 | -0.376 | -0.002818 | -0.245 |
| X27 | 0.380599 | 1.351 | 0.709028 | 1.746 | 0.423088 | 1.673 |
| X28 | -0.121804 | -2.257 | -0.102731 | -1.320 | -0.123694 | -2.552 |
| X29 | 1.254094 | 0.764 | 4.404608 | 1.861 | 1.518780 | 1.030 |
| X30 | 0.373371 | 0.492 | 3.699806 | 3.378 | 0.883649 | 1.296 |
| X31 | 1.242342 | 1.391 | 0.099606 | 0.077 | 1.213017 | 1.512 |
| X32 | -0.466573 | -0.226 | 3.969632 | 1.332 | 0.067617 | 0.036 |
| X33 | 0.001267 | 0.761 | -0.003979 | -1.658 | -0.000082 | -0.055 |
| X34 | -0.364709 | -0.280 | 0.586285 | 0.313 | -0.470679 | -0.403 |
| X35 | -0.214092 | -0.593 | -0.463125 | 0.890 | -0.302993 | -0.935 |
| X36 | -1.042204 | -2.003 | -0.665955 | -0.888 | -1.073605 | -2.299 |
| X37 | -0.449074 | -1.207 | 0.162082 | 0.302 | -0.358614 | -1.074 |

AXIA 1

$R^2 = 0.9632$

$\bar{R}^2 = 0.8876$

AXIA 2

$R^2 = 0.9107$

$\bar{R}^2 = 0.7273$

AXIA 12

$R^2 = 0.9629$

$\bar{R}^2 = 0.8865$

TABLE 7
ESTIMATION OF PARAMETRES WITH DATA IN SPATIAL LEVEL

| VARIABLE | AXIA 1 OUTSIDE DEVELOPMENT | | AXIA 2 WITHIN DEVELOPMENT | | AXIA 12 COUNTRY | |
|-----------|----------------------------------|--------|---------------------------------|--------|--------------------|--------|
| | ESTIMATION | | ESTIMATION | | ESTIMATION | |
| CONSTABLE | 6.844731 | 5.066 | 4.659909 | 2.177 | 6.856781 | 5.287 |
| X1 | -0.001028 | -0.222 | -0.001243 | -0.170 | -0.001803 | -0.406 |
| X2 | -0.004159 | -0.827 | -0.000964 | -0.121 | -0.004504 | -0.933 |
| X3 | -0.057063 | -0.610 | -0.001179 | -0.008 | -0.045211 | -0.503 |
| X4 | 0.135023 | 1.669 | 0.045188 | 0.359 | 0.133282 | 1.747 |
| X5 | 0.200020 | 1.959 | 0.470697 | 2.910 | 0.199454 | 2.035 |
| X6 | 0.108123 | 1.725 | 0.162456 | 1.636 | 0.091739 | 1.525 |
| X7 | 0.439933 | 2.846 | 0.195615 | 0.799 | 0.406078 | 2.737 |
| X8 | 1.549570 | 0.279 | -4.828165 | -0.549 | -0.206499 | -0.039 |
| X9 | -3.533546 | -1.236 | 0.635456 | 0.140 | -2.497164 | -0.901 |
| X10 | 2.217609 | 0.678 | 4.219056 | 0.815 | 2.861738 | 0.912 |
| X11 | 0.103559 | 1.560 | 0.032924 | 0.313 | 0.081565 | 1.280 |
| X12 | -2.470844 | -2.607 | -2.046493 | -1.363 | -2.929229 | -3.220 |
| X13 | -0.162712 | -0.361 | 0.072878 | 0.102 | 0.051956 | 0.120 |
| X14 | 0.221529 | 0.416 | 0.949378 | 0.059 | 0.277205 | 0.542 |
| X15 | 0.550535 | 0.359 | 0.471542 | 0.194 | 0.935487 | 0.636 |
| X16 | 0.630924 | 1.269 | 0.822326 | 1.044 | 0.598384 | 1.254 |
| X17 | 0.056497 | 0.269 | 0.000862 | 0.003 | 0.133989 | 0.665 |
| X18 | 0.919047 | 5.367 | 0.489842 | 1.806 | 0.859619 | 5.230 |
| X19 | 0.439495 | 2.124 | 0.500078 | 1.526 | 0.588199 | 2.961 |
| X20 | -0.011162 | -4.576 | -0.018384 | -4.758 | -0.011305 | -4.828 |
| X21 | 0.000217 | 0.566 | -0.000586 | -0.964 | 0.000143 | 0.389 |
| X22 | 0.001132 | 0.586 | -0.001143 | -0.374 | 0.000650 | 0.351 |
| X23 | 0.008047 | 3.521 | 0.005089 | 1.406 | 0.007525 | 3.430 |
| X24 | -0.016141 | -2.736 | -0.009644 | -1.032 | -0.012736 | -2.249 |
| X25 | -0.000781 | -0.230 | 0.001566 | 0.291 | 0.000005 | 0.000 |
| X26 | 0.011587 | 2.428 | 0.004270 | 0.565 | 0.006131 | 1.338 |
| X27 | 0.249828 | 5.711 | 0.208860 | 3.014 | 0.237444 | 5.654 |
| X28 | -0.087551 | -7.430 | -0.045792 | -2.453 | -0.080435 | -7.111 |
| X29 | 0.216756 | 0.586 | 0.164280 | 0.280 | 0.041840 | 0.118 |
| X30 | 0.425891 | 3.377 | 0.470205 | 2.354 | 0.366813 | 3.030 |
| X31 | 1.220379 | 1.638 | 2.607658 | 2.209 | 1.441403 | 2.015 |

| VARIABLE | AXIA 1 OUTSIDE DEVELOPMENT | | AXIA 2 WITHIN DEVELOPMENT | | AXIA 12 COUNTRY | |
|----------|----------------------------------|--------|---------------------------------|--------|--------------------|--------|
| | ESTIMATION | | ESTIMATION | | ESTIMATION | |
| X32 | 0.306453 | 0.804 | 0.264708 | 0.438 | 0.267148 | 0.730 |
| X33 | 0.000356 | 1.741 | 0.000385 | 1.190 | 0.000341 | 1.740 |
| X34 | -0.225603 | -0.514 | 0.274345 | 0.394 | -0.087942 | -0.209 |
| X35 | -0.049340 | -0.288 | 0.075752 | 0.279 | -0.88401 | -0.538 |
| X36 | -0.507992 | -3.072 | -0.489439 | -1.869 | -0.504752 | -3.180 |
| X37 | -0.370007 | -3.379 | -0.222382 | -0.903 | -0.295233 | -1.978 |

AXIA 1

$$R^2 = 0.7782$$

$$\bar{R}^2 = 0.7463$$

AXIA 2

$$R^2 = 0.5002$$

$$\bar{R}^2 = 0.4282$$

AXIA 12

$$R^2 = 0.7578$$

$$\bar{R}^2 = 0.7230$$

3.2. The development and the influence of Land Policy on the «outside development area» (AXIA 1)

The size of the coefficient of determination (R) and the size of the adjusted coefficient of determination (\bar{R}) are presented by being higher in the case where the estimation has been done by using regional data ($R = 0.9632$ and $\bar{R} = 0.8876$) instead of in the case where the level of this spatial area, has two coefficients which are lower ($R = 0.7782$ and $\bar{R} = 0.7463$). In both cases, the size of both coefficients is satisfactory and therefore 96.32% (88.76%) and 77.82 (74.63%) of both coefficients respectively and of the total variance to the dependent variable are interpreted by the use of variables.

Number of Animal Zones. The positive influence of the percentage of change of development due to the existence of farming zones, was expected. The existent defined areas are intended for animal farming development and the contribution to qualitative security of the rest of the areas. Additionally, the size of the percentage change indicates that the number of existing zones are probable to tolerate an increment and that there is further need for animal zones.

Number of Tourist Zones. It was expected that the number of tourist zones would influence the level of development. The tourist sector is a dynamic sector of the Cypriot economy and there is a strong demand for land which is intended for tourist development. The number of zones as used here has a dual meaning. It is connected to the size or tensions which are intended for tourist development and also to the quality which is the result of the variety, increase of the number of tourist zones which increases the possibility of differentiation of tourist products, because every tourist zone is provided for different development e.g. hotels, villas etc. Generally speaking the number of tourist zones seems to continue its contribution and implementation of the policy for spatial development.

Average Building Tourist Zones Coefficients. The estimated size of the parametre of this coefficient, namely the percentage of positive influence of development, as it is expressed by AXIA 1, reveals the significant role which the coefficient plays in spatial development. The coefficient is related to the concentration of tourist development. The coefficient does not have any relationship to the density of development which is related to the average maximum tourist building coefficient.

Average Maximum Tourist Building Coefficient (AMATBC). The AMATBC gives the possibility for development with high density and low quality. The negative influence and the height of the estimated parametre demonstrate that the high level of quality consists of a critical point in development and warns for reduction of AMATBC. The attempt for increasing qualitative tourism is reflected and confirmed by the fact that it does not coincide with the high coefficient of tourist development.

Average Residential Building Coefficient (ARBC). The negative influence of ARBC parametre is debatable because the increase of average ARBC would be a factor which should lead to a positive percentage change or development as it is defined from AXIA 1. The explanation of this influence must be investigated in the area in which the analysis is referred to. Furthermore, this refers to the areas which are situated «outside development areas» and so the increase of ARBC, includes an increase of the value of the selling price of land or capitalization, of the building of coefficient, without facilities which could wait. So the increase of the selling price in areas «outside development areas» and the absence of facilities restricts the development and so the increase of average building coefficient consists of a negative factor of development. Moreover, the pressures of the increase of the average building coefficient in these areas are a deterrent factor of speculation and benefits which are nearly exclusive to the small proprietors who are destined to use their small plots for selfhousing or as the dowry for the children. Additionally the negative influence of the parametre consists of a factor for the preservation of farmland in the fringes of the development areas.

Coastal Spatial Areas. The influence of this variable in the spatial development and especially in the development of coastal areas, was expected. The point which was unknown was the degree of influence in the spatial development from this proximity. Generally speaking, the increase of development from this proximity was expected to be greater and this must be due to the existence of other dynamic sectors of the economy, beyond tourism.

District of Limassol. The development «outside the development area» in the area of the District of Limassol as it is expressed by AXIA 1, it is lower in average terms from that of Nicosia as a percentage of 50%. This can be due to the concentration of the biggest parts of the population of the district in the town area of Limassol and also to the small demand for land outside the area of development.

District of Paphos. The development «outside the development area» in the District of Paphos is also lower than that of Nicosia as a percentage of 37% and this must be due to the small size of demand for land outside the areas of development.

3.3. The development «within the area of development.(AXIA 2)

The size of the coefficient of determination (R) and also the size of the adjusted coefficient of determination (R) are smaller in comparison to those of AXIA 1, and so

the total variation of the dependent variables, namely the development within the development area» as defined from AXIA 2, is interpreted from the land policy measures to a lower degree. This significant restriction of the coefficient of determination reflects the restrictive role of land policy measures which are used in the study of the «within the development area», of town and villages in the existent factors of the determination of the level of development. We analyse further the estimation of the areas «within the development area».

Number of Industrial Zones. The existence of industrial zones within the development area influences negatively the development not only of the surrounding areas but, on a wider scale, the development of the build up areas. The influence of the estimation of this parametre was expected even though its size is higher and reflects the sensitivity of the people to environmental matters. Additionally, the standard of living and the level of development of the country allow the demand of land for housing purposes far away from these zones. Beyond them the shifting economic employment to the sector of services deducts from the industrial sector the dynamic it had had until the end of the decade of 1980.

Number of Agricultural Zones. The existence of agricultural areas within the development areas seems to be of help to the process of development. However this conclusion must be investigated further because farmlands in these areas are in demand, not because of the fertility of the land but because of the demand including the element of speculation and also the preservation of the land for future building development. Conclusively the high positive price of the parametre must be due to the exchanged value of these areas and not to their economic return.

Number of Residential Zones. The number of zones is a contributing factor to development. The number of zones in this case is a coefficient of differentiation and a factor which influences the quantitative separation of residential units. This separation in the future will possibly create social problems.

Average Minimum Residential Building Coefficient (AMRBC) The AMRBC in the areas of development is a significant factor in development and this is due to the fact that in the development areas the price of land was formed by constrains in the lowest building coefficient which lead to greater costs for the extension of buildings. So increment of the lowest residential coefficient reduce the cost of development and contribute to development.

3.4. The influences of Land Policies on the whole of Cyprus (AXIA 12)

From the above analysis we realize that there is a difference between the effectiveness of land policy measures in the two areas as these are defined by the boundary of development. It is correct to investigate the effectiveness of Land Policies for the whole of Cyprus. We use again the estimation elements in the Regional and Spatial level.

The size of the coefficient of determination moves between the coefficients «within» and «outside» the boundaries of development and its size is considered to be satisfactory ($R = 0.9629$ with data of region and $R = 0.7578$ with data of spatial units). Consequently,

in a national level, Land Policy is interpreted as having a greater degree in the size of the percentage of development

We present in short the results separated for the estimations with element of region and spatial level.

(a) Estimations with data of region

The percentage of change of development as it is defined in AXIA 12, is influenced positively by the following Land Policies:

- the number of animal farming zones
- the average tourist building coefficient.

Also the same percentage change estimations with data of region are influenced negatively by the following factors and policies:

- the average maximum building coefficient
- the distance from a town
- the land consolidation
- the number of plots.

(b) Estimation with data of Spatial Units

The estimation of the percentage of change of development as defined in AXIA 12 is influenced positively by the following factors and policies:

- the number of agricultural zones
- the number of planning zones
- the percentage of non-irrigated land to yearly cultivations
- the number of holdings of agricultural land
- the Improvement Boards as a form of local authority.

Finally, with the same estimation the percentage change of development is influenced negatively by the average building coefficient.

4.0. Some final conclusions

In closing the presentation and summing up the results of this investigation we come to the conclusion that the effectiveness of Land Policies is greater «outside the area of development» compared to the areas «within the development» so these areas must seek for their sustainable development in other factors as for example in localization economies, urbanization economies etc., or in policies like fiscal policy, monetary policy etc..

Generally speaking, Land Policy plays a significant and distinguished role in the trial for development.

Another conclusion is that the density is opposed to the sustainable development, simultaneously there are land policy measures which without additional expenses are in a position to support the trial for sustainable regional and spatial development.

References

1. Simie J., - Tunnell Chr., (1992): «Urban containment and land-use planning» *Land Use Policy*, Vol. 9 (4), p. 36-46.
2. Pollakowski H.O., - Wachter S.M., (1990): «The effects of Land-Use constraints on housing prices», *Land Economics*, Vol. 66(3), p. 379-389.
3. Fischel W.A. (1990): «Do Growth Controls Matter» *Cambridge, Massachusetts*, p. 43-51.
4. Peiser R.B., (1989): «Density and Urban Sprawl», *Land Economics*, Vol. 65 (3).