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## Economic Space Trajectory
through Different Regional Growth Models

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# ECONOMIC SPACE TRAJECTORY THROUGH DIFFERENT REGIONAL GROWTH MODELS.

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**Abstract**
Since the early 1990s, regional economic growth processes assume a key role in the EU policy agenda as a main tool to enhance social and economic convergence within the EU spatial landscape. Literature on regional economic growth and convergence provides some evidence on the most relevant factors affecting economic processes, mainly assuming homogeneity of production functions and steady state conditions in cross-section and panel regressions.
In this framework, assuming a minimal definition of *transitional steady state*, econometric methods are adopted to identify regional characteristics and examine the determinants of different development models. The quantitative analysis is centred on:
- LSDV (Least Square Dummy Variables) estimates to cluster EU 11 regions (EU 13 excluding UK and Ireland due to lack of statistical data) by defining homogeneous latent structures affecting different *transitional* growth patterns;
- coupled with multinomial conditional logit models to qualify the spatial distribution of expected *vs* actual regional gaps.

Even conscious of the shortcomings of the described neoclassical production function convergence and divergence mechanisms, a sort of metaphor of substantive economic behaviour, three main findings for an explorative analysis are proposed:
i) the role of enlarged neoclassical production function and, at same time, its limited weight on average with respect to social and political factors as well as other stock fundamental determinants;
ii) the deep differences of above defined weight of enlarged neoclassical production function at regional level in Europe;
iii) the need for an adaptive governance of EU finance effort, within the same strategic objective of convergence.

## 1. Introduction

As in the Article 130A of the Treaty of Maastricht, convergence processes between regions at economic and social levels are strongly pursued and they represent the hard core of the European cohesion policy directed to reduce observed inequality in development dynamics. In fact, although the phenomenon seems to be particularly evident by analyzing socioeconomic characteristics of enlarged EU, it is still relevant in the sub-area constituted by the first participants to the EU and it is possible to verify the existence of important discrepancies at economic and social level between regions in the EU spatial landscape.

Literature on regional economic growth and convergence provides some evidence on the most relevant factors affecting economic processes However, production functions as well as steady state conditions at regional level are mainly assumed being homogeneous in cross-section and panel regressions.

The main point characterizing the present work is the assumption of heterogeneity of production functions: regions are described as economic systems characterized by specific social, economic and institutional latent factors differently affecting development performances. Furthermore, the role of the enlarged production function in economic development processes is deeply analysed by focusing its weight with respect to social and institutional factors. Section 2 presents a description of the main macroeconomic characteristics of EU providing information about economic growth

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patterns at regional level. Section 3 briefly focuses on the main economic literature on regional economic growth. Section 4 describes the methodological approach adopted in order to develop the analysis. Section 5 describes the data. Finally, section 6 and 7 discuss the main findings and provide suggestion for a general overview of regional economic growth issue and for further deepening.


## 2.    A snapshot of regional growth in Europe

As previously discussed, inequality in development dynamics observed in the EU system at regional level still represents an important issue. By ranking GDP per capita levels as share of average standards in the EU11 sample of countries (EU13 excluding United Kingdom and Ireland due to lack of statistical data), it is possible to find out that the 10 most developed regions record a GDP ratio of around 1.58 in the period 2000–2004, in contrast to the 0.55 of the 10 poorest regions. In this framework, it is important to highlight the lack of significant dynamics in terms of movements either in or out the 2 defined groups. Furthermore, the exam of GDP distribution across all sample during the same time span indicates as more of the 66% of the regions are characterized by a GDP per capita below the average level and as more than 25% of the sample shows GDP per capita standards below the 75% of total average value. In general, among EU11 low income regions are geographically concentrated in the southern parts of Spain, Italy, Greece and Portugal (and some German areas) confirming common conclusions on periphery development delay.

*Figure 1: Growth of GDP per capita in Europe by countries and regions, 2002-2004*
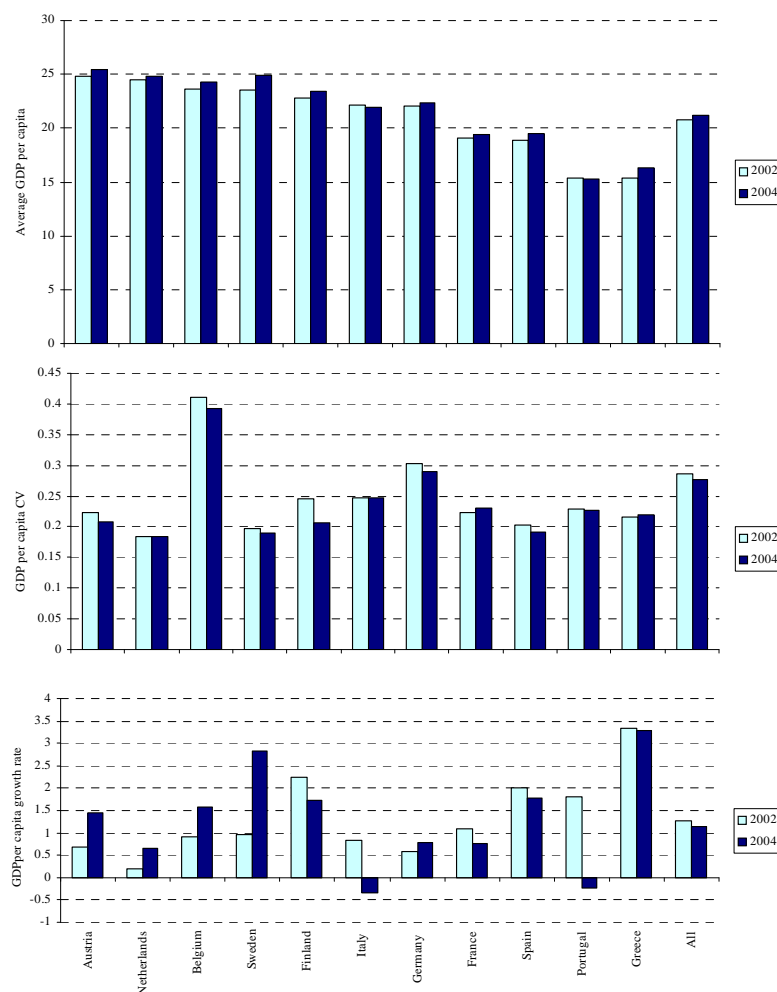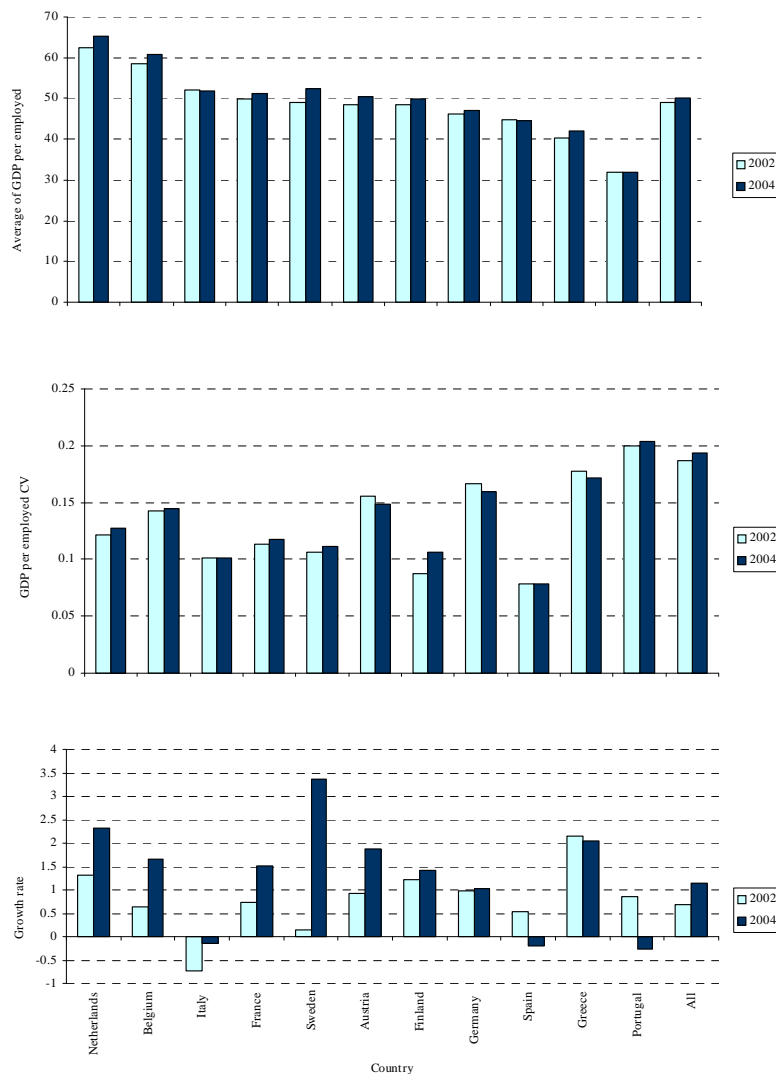
*Figure 2: Productivity in Europe by countries and regions, 2002-2004*



As it is reasonable to be expected, productivity dynamics are strongly related to income distributions across regions and they show the existence of important regional disparities and similar conclusions can be derived by analysing GDP per capita levels. In particular, during the period 2000–2004, it is found out that productivity level range from on average 1.41 of the EU11 sample average level in the first 10 richest regions to 0.61 in the last 10 less developed regions, mainly concentrated in the southern part of Portugal, Greece, Spain and some German areas.

Finally, as presented in Figures 1 and 2, GDP and productivity disparities are also clear if national GDP and productivity dynamics are examined. In particular, during the 2002-2004 period, processes of economic growth are evident in all 11 countries but Italy, Portugal and Spain (even if the last one shows positive temporal variations in GDP levels) though trends present strong differences between different countries.

High variability in GDP and labour productivity levels both between and within countries together with GDP and productivity high variability characterizing the whole sample at regional level (bar named "All" in the Figures) indicates the possibility of identifying different development patterns. May partitions of European economic space other than country level be more useful on theoretical and policy grounds?

The mentioned strategic EU effort toward regional cohesion coupled with the above described economic framework suggests a deeper analysis of convergence/divergence mechanisms within the overall European area, overwhelming, to some extent, the country level.

## 3.     Literature review

Neoclassical growth theory stresses the existence of convergence processes in the long-run as suggested by convergent dynamics of economic growth rates between different areas, countries as well as regions. Starting from the mid-1980s, further theoretical developments and in particular the endogenous growth theory highlight as convergence mechanisms seem to be weaker than it was expected, by showing longer times and more unstable patterns of realization than those suggested in by Solow-Swan model.The new theory addresses economic growth problem by identifying increasing returns and technical change as main factors of development (Romer, 1986; Lucas, 1988; Mankiw, Romer and Weil, 1992; Barro and Sala-i-Martin, 1997). In this general framework, it is possible to define at least three main model variants, *i.e.* "conditional" convergence, "club" convergence and explosive growth patterns. In the first category are included theoretical studies proposing the existence of different long-run steady state solutions constrained by structural and institutional differences between areas. The second groups of theories highlights phenomena of economic convergence between countries characterized by similar economic and social backgrounds. Finally, the third category stresses the possibility of high concentration of technological knowledge and, as a consequence, addresses the hypothesis that differences in economic development trends may be divergent between areas, technological advance being characterized by difficulty in diffusion mechanisms. As in de la Fuente (2002) the findings of "practically all existing studies … allow us to reject with a fair degree of confidence a series of recent models in which the assumption of increasing returns generates an explosive behaviour of distribution of income across economies that cannot be found in the data".

## 4.     Methodological issues

Literature on regional economic growth and convergence provides some evidence on several relevant factors affecting economic processes, mainly assuming various extensions of the neoclassical production function in cross-section and panel regressions. Theoretical conclusions and policy suggestions have not reached a *consensus*, even if it is recognized some relevance of human capital, structural change, reallocation of productive factors across sectors and heterogeneity of narrow defined steady state regional condition.

A minimal definition of *transitional steady state* for EU spatial units could be the equalization of regional growth rates of productivity, so that regional shares of GDP are stable over time.

In this framework, if it is hypothesised the existence of adaptive development mechanisms toward long-run productivity levels, a generic specification of the model can be formally developed as:

[1]     $\ln Y_{i,t}^* = \alpha_i + \sum_j \gamma_j \ln X_{j,i,t-\tau}$

[2]     $\ln Y_{i,t} - \ln Y_{i,t-\tau} = \beta(\ln Y_{i,t}^* - \ln Y_{i,t-\tau})$

[3]     $\ln Y_{i,t} = \beta\alpha_i + \beta\sum_j \gamma_j \ln X_{j,i,t-\tau} + (1-\beta)\ln Y_{i,t-\tau}$

where

$Y_{i,t}^{*}=$  expected transitional steady state productivity in region $i$, relative to EU regions average conditioned to $\alpha_i$ and $X_{j,i,t-\tau}$

$Y_{i,t}=$  gross productivity in region $i$ relative to EU regions average

$\beta =$  adaptive coefficient to the steady state condition, with $0 \le \beta \le 1$

$\alpha_i =$  unobserved region-$i$ specific social and institutional factors

$\gamma_j =$  across regions constant parameters for observed factors $X_{j,i,t-\tau}$ (physical and human capital structural indexes, relative to EU average)

Three different potential scenarios can be described:

- $\alpha_i = \alpha$ and $\gamma_j = 0$ → *absolute convergence*
- $\alpha_i = \alpha$ and $\gamma_j \ne 0$ → σ-*convergence* without fixed effects
- $\alpha_i \ne 0$ and $\gamma_j \le 0$ → extended neoclassical growth model or club convergences

From [1], [2], [3]:

[4]    $d \ln Y_{i,t} = \theta_i + \sum_j \varphi_j \ln X_{j,i,t-\tau} - \beta \ln Y_{i,t-\tau} + \varepsilon_i$

where

$\theta_i = \beta \alpha_i$

$\varphi_j = \beta \gamma_j$

Since $\alpha_i \ne 0$, $\gamma_j \le 0$, it is expected $\theta_i \le 0$ and $\varphi_j \le 0$.

Furthermore for $d \ln Y_{i,t} = 0$, *i.e.* $\ln Y_{i,t} = \ln Y_{i,t-\tau}$, the above transitional steady state condition is derived as:

[5]    $\ln Y_{i,t}^{*} = \dfrac{\theta_i}{\beta} + \sum_j \dfrac{\varphi_j}{\beta} \ln X_{j,i,t-\tau} = \alpha_i + \sum_j \gamma_j \ln X_{j,i,t-\tau}$

or by taking the exponential form:

[6]    $Y_{i,t}^{*} = e^{\alpha_i} * \prod_j X_{j,i,t-\tau}^{\gamma_j}$

## 5.    Data

The work in hand is based on the Eurostat regional statistics (NUTS 2) in the period 2000-2004 for 11 countries[1] and 147 regions.
Three different sub-sets of data are used:
- i)    Regional demographic statistics;
- ii)   Regional economic accounts (ESA 95);
- iii)  Regional labour market statistics.

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[1] Austria, Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden

The proposed models adopt the following variables:
- GDP in volume per employee;
- Gross Fixed Capital Formation on GDP;
- Labour force educational levels: upper secondary and post-secondary non-tertiary education - levels 3-4 on population;
- Labour force educational levels: tertiary education - levels 5-6 on population;
- L.B. Specialization indexes on value added and employees by sector[2].

## 6.    The estimates

Equation [4] is tested by adopting a two waves (2002, 2004) OLS panel fixed effects regression. The work proposes two different models. The first one (Minimal model) includes as covariates the (ln of) GDP per employee and (ln of) Gross fixed capital formation on GDP; in the second model (General) specialization indexes variables representing the structure of production and related improvement or worsening on productivity and (ln of) labour force education level variables as proxies of human capital relative level are introduced.

Both parameters in the Minimal model are consistent with the theoretical assumption of decreasing returns to scale (extended neoclassical growth model). As usual in panel regressions, the dimension of GDP per employee parameter is relatively high.

The inclusion of the discussed further covariates in the General model enhances the explanatory power of the model without violating economic plausibility due to absolute dimension of $\beta$.

In both models the sign of the fixed effects coefficients is not always negative as it is expected by equation [4].

*Table 1: Productivity growth rate (minimal model)*

| Dependent variable: Growth rate of GDP per employee (relative to EU average) | Minimal model |
|---|---|
| GDP per employee - relative to average (ln) | -.42044831*** |
|  | (-11.19) |
| Gross fixed capital formation / GDP - relative to average (ln) | -.03351889*** |
|  | (-4.05) |
| Constant | -.02043454*** |
|  | (-9.56) |
| Obs. Nr. | 294 |
| R-squared (adj.) | 0.5974 |
| F | 62.962 |

Legend: * p<.1; ** p<.05; *** p<.01
t in parentheses

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[2] The Lo Cascio-Bagarani (LB) specialization index can be represented as:

$$LB_{i,j} = \frac{\dfrac{x_{ij}}{\sum_i x_{ij}} - \dfrac{\sum_j x_{ij}}{\sum_{ij} x_{ij}}}{\left(1 - \dfrac{x_{ij}}{\sum_i x_{ij}}\right) \times \dfrac{\sum_j x_{ij}}{\sum_{ij} x_{ij}} + \left(1 - \dfrac{\sum_j x_{ij}}{\sum_{ij} x_{ij}}\right) \times \dfrac{x_{ij}}{\sum_i x_{ij}}}$$

where $X_{ij}$ is the value added or the number of employees of the region i in the sector j.

This index has a range from 1 (highest specialization) to -1 (absence of expenses, *i.e.* lowest specialization).

The difference between $LB_j^{VA}$ calculated on value added and $LB_j^{EMP}$ calculated on number of employees, can be considered as a measure of productivity of each region relative to the whole EU sample (Lo Cascio M, M. Bagarani "Specializzazione e commercio intra-industriale: il caso Sardegna", *Bollettino degli interessi sardi - Studi di economia e diritto*, n.1, 1991.

*Table 2: Productivity growth rate (general model)*

| Dependent variable: Growth rate of GDP per employee (relative to EU average) | General model |
|---|---|
| GDP per employee - relative to average (ln) | -.48211476*** |
| | (-12.8) |
| Gross fixed capital formation / GDP - relative to average (ln) | -.02066765** |
| | (-2.61) |
| L.B. S index in construction sector | -.0453386** |
| | (-2.26) |
| L.B. S index in trade sector | -.10004402** |
| | (-2.41) |
| L.B. S index in financial sector | -.08914969* |
| | (-1.87) |
| L.B. S index of productivity in industrial sector | -.09449938*** |
| | (-3.06) |
| L.B. S index of productivity in financial sector | -.08493117** |
| | (-2.28) |
| Labour force edu level - levels 3-4 (ln) | -.0256679** |
| | (-2.26) |
| Labour force edu level - levels 5-6 (ln) | -0.01198949 |
| | (-1.64) |
| Constant | -.03785978*** |
| | (-4.31) |
| Obs. Nr. | 286 |
| R-squared (adj.) | 0.6778 |
| F | 21.534 |

Legend: * $p<.1$; ** $p<.05$; *** $p<.01$

t in parentheses

Under the defined transitional steady state conditions, equation [6], four components are computed starting from the General model results:

    a)     Investment relative component;

    b)     Fixed effects component;

    c)     Structural component (product of components based on sector and productivity L.B. indexes);

    d)     Human capital component (product of components based on the two labour skill variables).

A cluster k-median analysis is developed on those components to group regions in 2002 and 2004. Visual inspection and analysis of descriptive statistics coming out from different clustering trials, indicate a seven economic space partition of EU being a good explicative representation of different regional models. Descriptive statistics for each class are reported in the following prospects and tables.

## Table 3: Cluster analysis results, 2002 and 2004

*Cluster k-median - 7 classes - Year 2002*

| Classes | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 14 | 9.79 | 9.79 |
| 2 | 36 | 25.17 | 34.97 |
| 3 | 22 | 15.38 | 50.35 |
| 4 | 23 | 16.08 | 66.43 |
| 5 | 15 | 10.49 | 76.92 |
| 6 | 16 | 11.19 | 88.11 |
| 7 | 17 | 11.89 | 100 |
| **Total** | **143** | **100** | |

*Cluster k-median - 7 classes - Year 2004*

| Classes | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 15 | 10.49 | 10.49 |
| 2 | 35 | 24.48 | 34.97 |
| 3 | 40 | 27.97 | 62.94 |
| 4 | 25 | 17.48 | 80.42 |
| 5 | 9 | 6.29 | 86.71 |
| 6 | 12 | 8.39 | 95.1 |
| 7 | 7 | 4.9 | 100 |
| **Total** | **143** | **100** | |

## Table 4: Descriptive statistics by classes and components – Cluster year 2002

| Variables – Year 2002 | Mean | Std. Dev. | Min | Max | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|---|---|
| | **Class 1** | | | | **Class 5** | | | |
| Transitional steady state GDP per emp. | 1.333 | 0.120 | 1.208 | 1.646 | 0.897 | 0.021 | 0.864 | 0.933 |
| Investment relative component | 1.000 | 0.012 | 0.962 | 1.011 | 1.000 | 0.007 | 0.992 | 1.018 |
| Fixed effects component | 1.338 | 0.091 | 1.201 | 1.524 | 0.834 | 0.024 | 0.787 | 0.870 |
| Structural component | 0.988 | 0.030 | 0.956 | 1.064 | 1.027 | 0.031 | 0.969 | 1.069 |
| Human capital component | 1.007 | 0.007 | 0.996 | 1.021 | 1.048 | 0.020 | 0.998 | 1.067 |
| | **Class 2** | | | | **Class 6** | | | |
| Transitional steady state GDP per emp. | 1.084 | 0.055 | 0.984 | 1.221 | 0.812 | 0.035 | 0.732 | 0.849 |
| Investment relative component | 1.001 | 0.006 | 0.987 | 1.016 | 0.995 | 0.010 | 0.975 | 1.015 |
| Fixed effects component | 1.059 | 0.049 | 0.979 | 1.170 | 0.804 | 0.036 | 0.745 | 0.895 |
| Structural component | 1.000 | 0.030 | 0.928 | 1.045 | 0.985 | 0.045 | 0.892 | 1.043 |
| Human capital component | 1.023 | 0.021 | 0.999 | 1.062 | 1.032 | 0.030 | 0.989 | 1.072 |
| | **Class 3** | | | | **Class 7** | | | |
| Transitional steady state GDP per emp. | 0.989 | 0.021 | 0.964 | 1.040 | 0.673 | 0.088 | 0.477 | 0.784 |
| Investment relative component | 1.001 | 0.004 | 0.993 | 1.008 | 0.991 | 0.010 | 0.977 | 1.008 |
| Fixed effects component | 0.945 | 0.028 | 0.901 | 1.000 | 0.647 | 0.110 | 0.421 | 0.752 |
| Structural component | 1.033 | 0.025 | 0.975 | 1.085 | 0.992 | 0.048 | 0.902 | 1.051 |
| Human capital component | 1.012 | 0.013 | 0.999 | 1.044 | 1.066 | 0.053 | 0.988 | 1.141 |
| | **Class 4** | | | | | | | |
| Transitional steady state GDP per emp. | 0.926 | 0.025 | 0.870 | 0.968 | | | | |
| Investment relative component | 0.999 | 0.003 | 0.992 | 1.005 | | | | |
| Fixed effects component | 0.910 | 0.020 | 0.872 | 0.947 | | | | |
| Structural component | 1.003 | 0.035 | 0.921 | 1.041 | | | | |
| Human capital component | 1.018 | 0.023 | 0.995 | 1.058 | | | | |

## Table 5: Descriptive statistics by classes and components – Cluster year 2004

| Variables – Year 2004 | Mean | Std. Dev. | Min | Max | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|---|---|
| | **Class 1** | | | | **Class 5** | | | |
| Transitional steady state GDP per emp. | 1.346 | 0.120 | 1.215 | 1.688 | 0.805 | 0.027 | 0.752 | 0.843 |
| Investment relative component | 1.001 | 0.010 | 0.969 | 1.013 | 0.998 | 0.009 | 0.986 | 1.015 |
| Fixed effects component | 1.327 | 0.098 | 1.170 | 1.524 | 0.794 | 0.019 | 0.754 | 0.813 |
| Structural component | 1.002 | 0.034 | 0.968 | 1.083 | 0.977 | 0.030 | 0.917 | 1.014 |
| Human capital component | 1.011 | 0.006 | 0.997 | 1.023 | 1.041 | 0.028 | 0.993 | 1.071 |
| | **Class 2** | | | | **Class 6** | | | |
| Transitional steady state GDP per emp. | 1.083 | 0.053 | 0.992 | 1.223 | 0.750 | 0.025 | 0.717 | 0.800 |
| Investment relative component | 1.002 | 0.008 | 0.986 | 1.024 | 0.994 | 0.005 | 0.985 | 1.004 |
| Fixed effects component | 1.056 | 0.046 | 0.984 | 1.157 | 0.729 | 0.026 | 0.685 | 0.777 |
| Structural component | 1.004 | 0.033 | 0.931 | 1.056 | 0.999 | 0.048 | 0.885 | 1.046 |
| Human capital component | 1.020 | 0.013 | 1.002 | 1.048 | 1.037 | 0.042 | 0.991 | 1.132 |
| | **Class 3** | | | | **Class 7** | | | |
| Transitional steady state GDP per emp. | 0.968 | 0.034 | 0.897 | 1.039 | 0.584 | 0.076 | 0.472 | 0.652 |
| Investment relative component | 1.003 | 0.005 | 0.986 | 1.011 | 0.994 | 0.009 | 0.983 | 1.007 |
| Fixed effects component | 0.932 | 0.028 | 0.885 | 1.000 | 0.540 | 0.093 | 0.421 | 0.650 |
| Structural component | 1.021 | 0.034 | 0.922 | 1.080 | 0.994 | 0.036 | 0.949 | 1.037 |
| Human capital component | 1.015 | 0.015 | 0.996 | 1.050 | 1.102 | 0.037 | 1.049 | 1.136 |
| | **Class 4** | | | | | | | |
| Transitional steady state GDP per emp. | 0.882 | 0.022 | 0.842 | 0.928 | | | | |
| Investment relative component | 0.999 | 0.005 | 0.990 | 1.013 | | | | |
| Fixed effects component | 0.846 | 0.033 | 0.787 | 0.915 | | | | |
| Structural component | 1.013 | 0.036 | 0.921 | 1.074 | | | | |
| Human capital component | 1.032 | 0.022 | 0.998 | 1.059 | | | | |

The most relevant facts emerging from previous analysis and showed in Figure 3, are:
  a)   opportunities and threats variability in socio-institutional factors (as represented by fixed effects values, $Y_{FC}$);
  b)   different gaps between transitional steady state and current relative productivity.

On this basis, by defining long run productivity expectation as $\dfrac{Y^*_{i,t}}{Y_{i,t}}$ and by describing the relationship between long-run GDP level and region-$i$ specific factors as $\dfrac{Y^*_{i,t}}{Y_{FC}}$, it is possible to identify four conditions involving 89 regions:
  I.    high expected productivity level with respect to current productivity and strong economic performance in both period (33 regions);
  II.   low expected productivity level with respect to current productivity and weak economic performance in both period (5 regions);
  III.  low expected productivity level with respect to current productivity and potential threats in socio-institutional environment (35 regions);
  IV.   high expected productivity level with respect to current productivity and potential opportunities in socio-institutional environment (16 regions);

*Figure 3: Four conditions in stability and through pass*
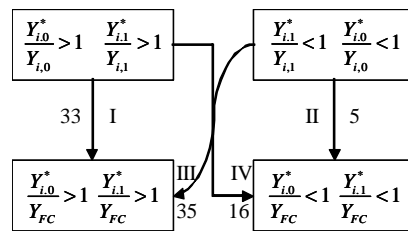


The first two conditions (I and II) represent a situation of stability in the model even if in opposite directions. For this reason they are grouped together in *carrying out* a multinomial logit model. In this framework, the original defined conditions are reorganized in the following three classes:
Class 1          Conditions I and II
Class 2          Condition III
Class 3          Condition IV
As in Table 6, higher performance in terms of a correct inclusion probability is found out selecting Human capital effects and Structural effects as explanatory variables.

*Table 6: Multinomial logit on 89 regions*

|  | 2002 | | 2004 | |
|---|---|---|---|---|
|  | Class logit = 2 | Class logit = 3 | Class logit = 2 | Class logit = 3 |
| Human capital effects | -275.15309*** | 77.49647*** | -156.16833*** | 61.45625*** |
|  | (-2.71) | (4.48) | (-2.93) | (3.47) |
| Structural effects | -186.64773*** | 27.71495** | -103.72067*** | 13.65083 |
|  | (-2.8) | (2.41) | (-3.67) | (1.35) |
| Constant | 461.64304*** | -108.0351*** | 260.53675*** | -77.07492*** |
|  | (2.77) | (-4.13) | (3.28) | (-3.05) |
| Obs. Nr. | 89 | 89 | 89 | 89 |
| Log likelihood | -40.016156 | -40.016156 | -56.816732 | -56.816732 |

(class logit = 1 is the base outcome)
Legend: * p<.1; ** p<.05; *** p<.01
z in parentheses

## 7. General overview and further deepening

The results achieved with the multinomial logit model allow to obtain more precise characteristics of the classes coming from cluster analyses and to qualify spatial distribution of expected versus actual regional gaps.

As a consequence, the proposed partitions of EU economic space definition are the following:

Partition 1:     High socio-economic and institutional development
Partition 2:     High development with socio-institutional constraints
Partition 3:     Structural stability
Partition 4:     Instability in development process
Partition 5:     Vulnerability at socio-institutional shocks
Partition 6:     Weak development process
Partition 7:     Weak development process and system instability

The information gain due overwhelming country level going to the above EU economic space partition comes evident comparing Figure 2 with Table 7: the reduction in variability within the defined partitions could be estimated in a range between 25% and 50% with respect to country figures.

*Table 7:    Comparison of Coefficients of variation (CV) within the Partitions - Gross productivity vs Transitional steady state*

|             | Current data |         | Transitional s.s. |         |
|-------------|---------|---------|---------|---------|
|             | CV 2002 | CV 2004 | CV 2002 | CV 2004 |
| Partition 1 | 0.0834  | 0.0920  | 0.0898  | 0.0892  |
| Partition 2 | 0.0659  | 0.0519  | 0.0503  | 0.0493  |
| Partition 3 | 0.0307  | 0.0356  | 0.0211  | 0.0356  |
| Partition 4 | 0.0330  | 0.0362  | 0.0271  | 0.0249  |
| Partition 5 | 0.0288  | 0.0550  | 0.0231  | 0.0334  |
| Partition 6 | 0.0657  | 0.0427  | 0.0432  | 0.0333  |
| Partition 7 | 0.1268  | 0.1254  | 0.1312  | 0.1293  |

Map 1 and Map 2 propose a representation of the above defined partitions respectively for 2002 and 2004. From a visual inspection, some integration, on one hand, and through pass, on the other hand, dynamics may be captured.

The representation of the partitions on the map for both period (2002 - 2004) shows a distribution in which the weakest models are located in the southern part of EU (Portugal, Spain, South of Italy and Greece). In this framework, it is worth noting as the Eastern-German regions constitute a relevant exception being characterized by a low development level (Map 1).

In 2004 an enlargement of the central partitions represented by medium-high economic developed regions in the specific area of north-central Europe is coupled with the creation of a new partition at the bottom of the rank, *i.e.* the extreme and poorest regions of Portugal and Greece (Map 2).

For deepening, it is useful to come back to what is defined as *transitional steady state*: a way by which all agents think on a more stable future for their decisions.

Agents have a good perception of their regional environment and discount shocks coming from outside of Europe coupled with the consequent risks; they have also a perception of the minimal consensus reached by the (so called) economic thinkers on the determinants of growth and they know that this general framework must be taken in account as a common ideology. Furthermore, they are not completely conscious of the deterministic chaos approach, another "gift" coming from social physics, even if the adjective "deterministic" is comfortable for them and very similar to daily experience; their perception is that little shifts in day by day decisions may adjust in a realistic way the potential of *butterfly effect*.

Decreasing time span for expected relevant decisions make in trouble long period steady state theorems *vs* stable transition horizon.

The resulting adaptive governance need of public policy makers implies that strategic priorities should be pursued with a sequence of flexible little shocks. So it is useful to deep the results of steady state transitional regional growth highlighted in the above partition-models.

In order to achieve a better understanding of the relative shares of human and physical capital, on one hand, and the social and political factors or other stock fundamental determinants (fixed effects), on the other hand, a panel regression has been carried out for six partitions (grouping the above partitions 5 and 6) of European area being "Expected *transitional steady state* productivity" the dependent variable (Table 8).

*Table 8: Panel estimates for detecting relative share between fixed and human & capital effects by partition – Cluster year 2004*

| Dependent variable: Expected transitional steady state productivity (ln) | Models | | | | | |
|---|---|---|---|---|---|---|
| | *Partition 1* | *Partition 2* | *Partition 3* | *Partition 4* | *Partition 5+6* | *Partition 7* |
| Fixed effects (ln) | 0.9619*** | 0.8337*** | 0.6579*** | 0.2687*** | 0.6765*** | 1.0056*** |
| | (10.25) | (9.62) | (5.57) | (2.54) | (5.68) | (8.54) |
| Human & capital effects (ln) | 1.4891*** | 0.6444*** | 0.4936*** | 0.6356*** | 0.5369*** | 1.5951*** |
| | (2.55) | (3.2) | (2.25) | (3.78) | (3.33) | (2.93) |
| Constant | 0.0013 | 0.01830*** | 0.0036 | -0.0992*** | -0.0890*** | -0.0577*** |
| | (.05) | (2.49) | (.39) | (-5.47) | (-2.65) | (-1.39) |
| Obs. Nr. | 30 | 70 | 80 | 50 | 42 | 14 |
| R-squared (adj.) | 0.8609 | 0.596 | 0.2762 | 0.2382 | 0.4684 | 0.916 |

Legend: * $p<.1$; ** $p<.05$; *** $p<.01$

t in parentheses

The results for partition 1 (potentially divergent aggregate in the transition phase: a self-cumulating endowment of activities and context) suggest an improvement in transmission of social and economic effects and linkages to and with the neighbour regions.

Partitions 2 and 3 can be defined as the EU "deep soul", in which, given the relevant levels of income, productivity and flexibility, policies on human and capital factors increasing competitiveness and attractiveness of the investments (typically policies toward converging technologies) are requested, more than actions on the latent components of fixed effects (European Commission, 2005). This is particularly relevant for partition 2 much more consistent but much less dynamic in the spatial integration than partition 3.
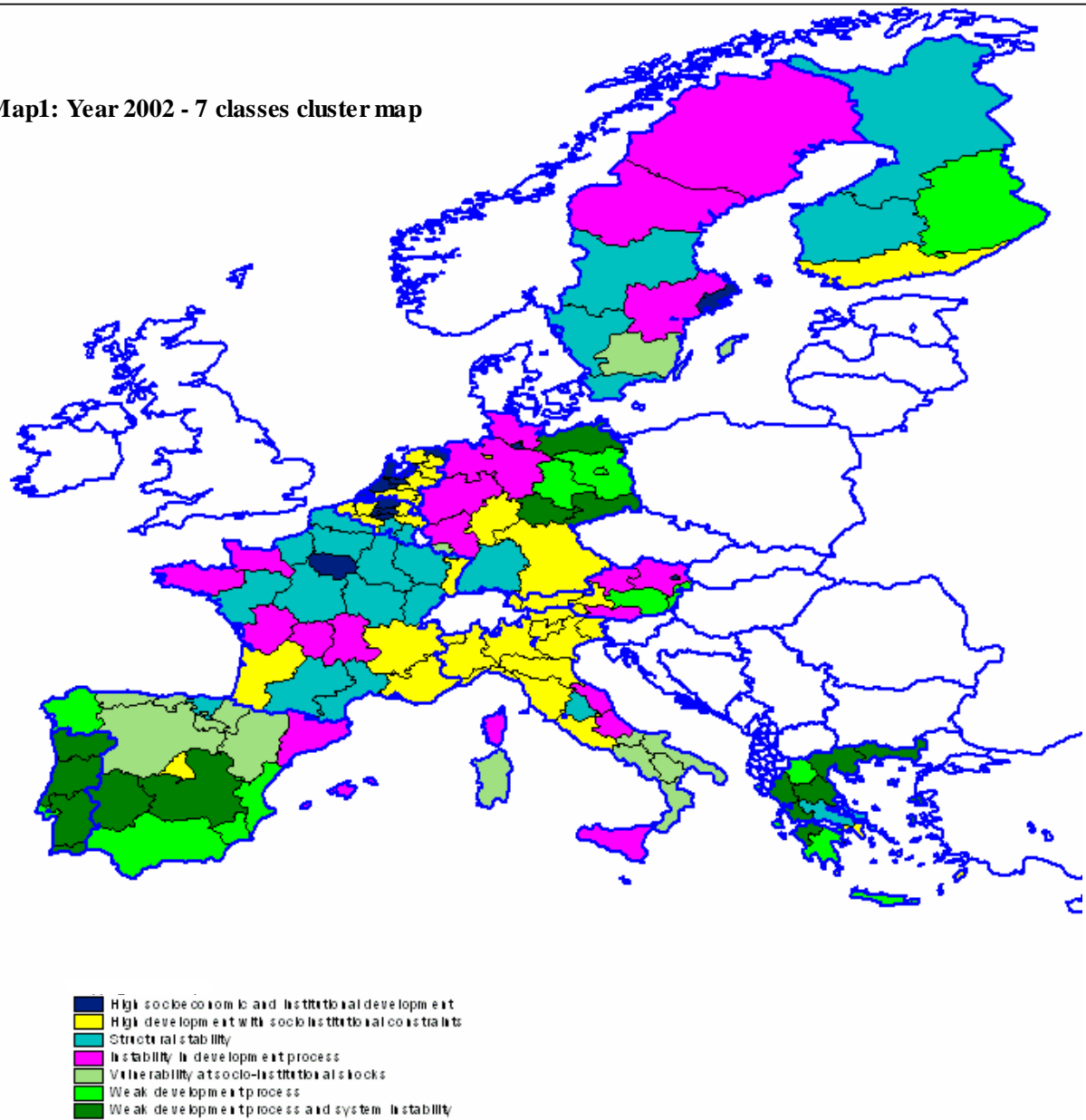
Partition 4 represents an area in which the potential of a part of economic structure (human & capital effects parameter) coupled with structural policies oriented toward the increasing in the stock fundamental determinants of the regional economies (fixed effects parameter) have a constraint by social and institutional factors (in general the more advanced regions included in EU Priority Convergence).

Partitions 5+6 and 7 show a continuum from weakness to divergence where the innovation in policy action could have a crucial role in reverting current trend mainly where (partition 7) subsidies and grants can have a crowding out effect on the local supply.
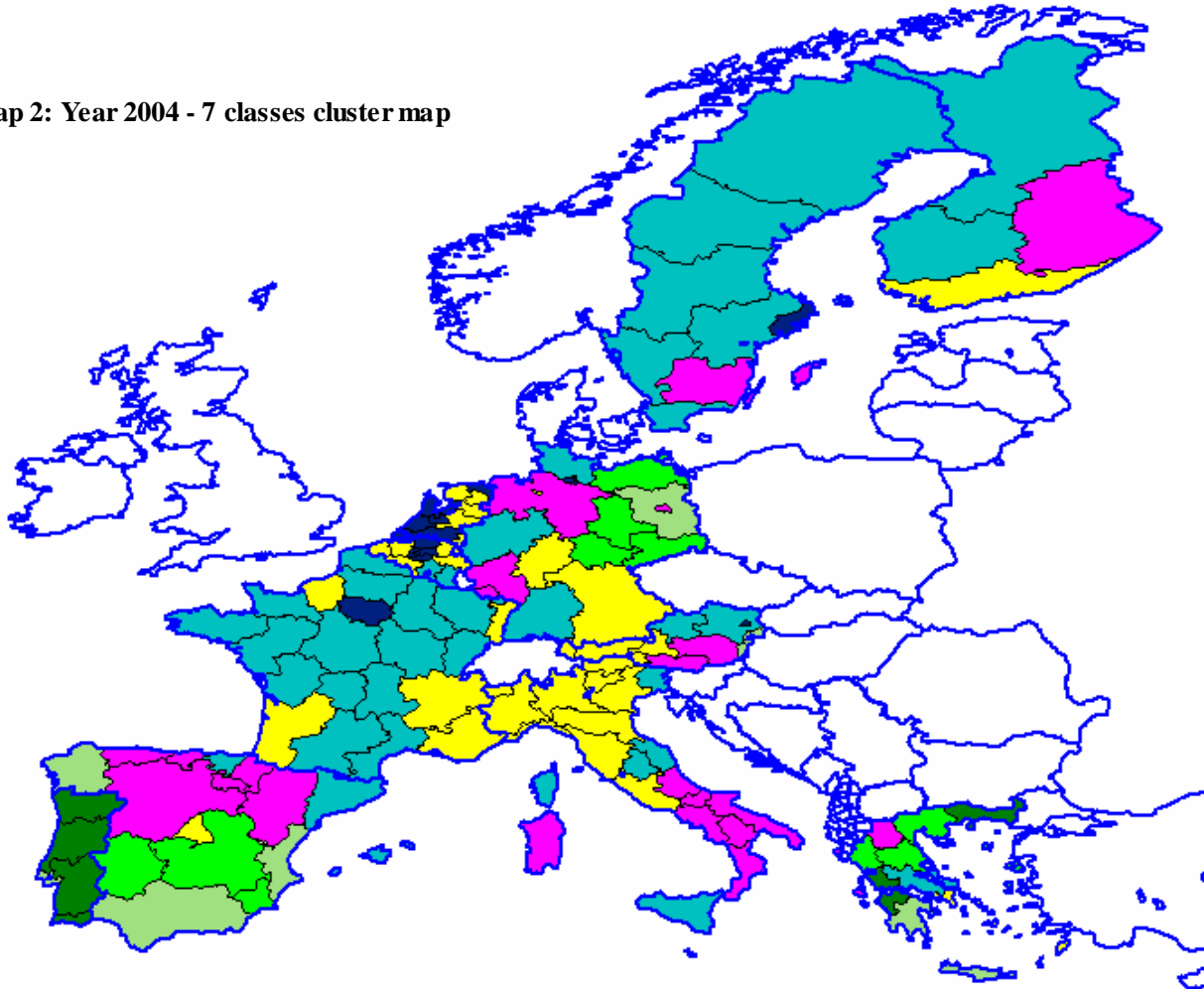
In conclusion, three main findings are proposed:
  i)     the role of enlarged neoclassical production function and, at same time, its limited weight in the average with respect to social and political factors or other stock fundamental determinants;
  ii)    the deep differences of above defined weight between European regions;
  iii)   the need for an adaptive governance of EU finance effort, within the same strategic objective of convergence.

**Map1: Year 2002 - 7 classes cluster map**

High socioeconomic and institutional development
High development with socio-institutional constraints
Structural stability
Instability in development process
Vulnerability at socio-institutional shocks
Weak development process
Weak development process and system instability

**Map 2: Year 2004 - 7 classes cluster map**

Mappa_cluster.shp
- High socioeconomic and institutional development
- High development with socioinstitutional constraints
- Structural stability
- Instability in development process
- Vulnerability at socio-institutional shocks
- Weak development process
- Weak development process and system instability

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