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The Agricultural Convergence Hypothesis on
Regional Base in Europe:
A Parametric and Non-Parametric Approach

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THE AGRICULTURAL CONVERGENCE HYPOTHESIS ON REGIONAL BASE IN EUROPE: A PARAMETRIC AND NON-PARAMETRIC APPROACH

Carlo BERNINI CARRI – Maria SASSI

1. INTRODUCTION

The paper explores the phenomenon of agricultural convergence on regional base within the EU economic cohesion that has always been and still remains one of the mainstay of the EU building process (EU, 1997).

A crucial issue is the theoretical and empirical testing of a catching up process, that is a faster growth of the poor countries (regions) than that of the rich ones. The literature on this topic has strengthened recently, but it is mainly referred to economic convergence undermining the importance of the process in the agricultural sector. The relevance mainly refers to the role of the Common Agricultural Policy (CAP). It is the only European policy thought and managed at over-national level with the specific object to overcome the deep agricultural structural disparities within the Member States. This process has been considered fundamental to reach the agricultural and thus economic European integration.

Moreover, the interrelationship (if any) between agricultural and economic convergence is of potential interest given that the nature of structural change within agriculture is likely to be shaped by broader economic conditions (especially the state of local labour markets).

Thus, the paper first explores the process of agricultural and economic convergence using EU data on real Gross Domestic Product per capita and real Gross Agricultural Value Added per agricultural Work Unit at the level of NUTS 2 regions for 1982, 1986 and 1994.

Then, it analyses whether:

- The intensity of the convergence process in the agricultural sector has been strong enough to promote a decrease in the gap between the agricultural and the economic performance;
- The agricultural and economic process of convergence are related on territorial base.

Policy implications are not analysed because data at regional level are not available.

In literature, the results of testing convergence hypothesis are mixed and strongly dependent on the methodologies applied, the level of analysis, and the explanatory variables adopted (Bernini Carri, Sassi, 1998).

As to methodology, the paper investigates the three points previously underlined following both a parametric and a non-parametric approach. In the paper they are seen not as alternative but complementary in expressing a complete judgement on the process of convergence.

The analysis has been developed at regional level that is more suitable in the European context also at the light of the importance of the Regional Policy and its reform to address the territorial disparities.

As the EU has widened its border over time, the implications of the widening process on the agricultural and economic convergence are also presented.

After a more in-depth analysis of the methodological aspects, the paper underlines the main results achieved. The conclusions underline, among others, further directions of the empirical testing in order to better understand the process of agricultural convergence within the EU regions.

2. THEORETICAL APPROACH

A brief reference to the main theoretical foundations shows the different assumptions about the direction in the growth processes and the forces underlying the catching up or the divergent paths. These theories, obviously, refer to a general economic dynamics, expressed by the growth rate in real per capita income. We assume a same analytical power in the explanation of the agricultural dynamics among different regions for the strict interdependence between macroeconomic and sectoral growth.

The economic theory of regional growth can be organized into three groups:

- The neoclassical growth theory, emphasising a process of convergence in which cohesion is the final outcome determined by automatic mechanisms and specific economic policies aimed at reducing disparities;
- The post-Keynesian and neo-Marxism approaches that, although with different analysis, consider the regional disparities as the result of the process of integration and economic growth (Leonardi, 1995);
- The recent approaches, connected to the endogenous growth theories and to the new economic geography, that do not reach conclusive evidence or suggest two different phases of long term growth which follow each other.

The neoclassical thought is referred to Solow's pivotal growth theory (1956)¹. Countries characterized by the same structural parameters (for example, the propensity to save and invest in physical and human capital, the growth rate of the labour force, and the capital depreciation) tend towards a long-run equilibrium and when it is reached they grow at the same rate.

This approach is based on the assumption that the intensity of the income growth or the per-capita output is in inverse proportion with the starting level.

¹ See also Koopmans (1965).

At the centre of the convergence process there are the traditional neoclassical hypothesis about the production functions and the assumption of exogenous technical progress.

The assumption of diminishing return to capital, given identical preferences for saving vis-à-vis consumption, and technology between countries, should lead to faster growth in poor countries than in the rich ones, where the small amount of capital per head has a higher marginal productivity. In a free input market the process of convergence between countries should be realized without any additional costs or delays (Boggio, Serravalli, 1999).

From this view, the process of EU integration and the knocking down of the trade barriers should support the process of convergence (Cellini, 1997).

The post-Keynesian approach and neo-Marxism, formalized in the “centre-periphery” models, relax the assumption of diminishing return to capital into the industrial sector that is seen as the leading sector. Therefore, the initial investment in a specific area (country or region) has an increasing attractive power of capital and labour compared to the other areas without this endowment, promoting an unequal growth.

The hypotheses at the base of this body of literature are different from the neoclassical ones. Particularly, for the post-Keynesians the shortage of demand in backward regions is the main factor of the unequal growth. An industrial activity is established and develops in the regions characterized by a growing demand in order to take advantage to the domestic and external economies. The attraction power of the factors of production in these areas should increase, promoting their industrial development by withdrawing resources from the poor regions. Thus, in a free market there is a “polarization” of the growth, with the rich regions getting richer and the poor areas stagnant or declining.

In this view, the EU integration does not automatically bring about a process of convergence within its regions. To this end, a specific public policy is required in order to counterbalance the negative implications connected to the opening process of the regional economies².

Afterwards, this concept has been examined closely particularly by Kaldor (1967, 1970) and Thirlwall (1979, 1980), who underline the ‘Verdoon’s law’ as the utmost important “factor of reflux”.

The neo-Marxism is more pessimistic than the post-Keynesian approach. It believes that the “central” areas are not able to produce spread effects and that the differences in the rate of output growth and per capita income growth between the regions cannot be balanced by public policies.

² Following this thought, in the 1970s the EU regional policy referred to the Myrdal’s work based on the cumulative causation theory and against the comparative advantage in the international trade (Myrdal, 1957; Holland, 1976).

According to this approach, a situation of no convergence is a characteristic feature of a free market and only the collapse of the capitalism can modify it.

The more recent approaches, based on the “endogenous growth theories” deal with the convergence/divergence question following, essentially, two paths that can combine each other or not: a) it replaces the hypothesis of the technical progress as free good with the endogenous technical progress assumption; b) it widens the concept of capital, reproducible factor, eliminating the cause of its decreasing marginal productivity.

The “endogenous growth” approach, however originated in a neoclassical context, doesn’t constitute an organic theoretical *corpus* because it gives rise to several models. But the non convergence outcome is obtained in a similar way, depending on the hypothesis that the human capital and/or the public expenditure matched with the physical capital counterbalances the decreasing marginal productivity of the latter.. This means that the rate in the capital productivity (whole of physical and human capital and productive public expenditure) in the poor countries, on the contrary of the rich ones, is not particularly high also if capital is scarce.

Lucas (1988, 1990) and Romer’s (1986, 1994) models reach the same conclusions based on the concept of knowledge acquisition by the experience (learning by doing) with increasing performances of scale for the economic system, but with constant performance for the single firm.

An other interesting approach that deals particularly with the relationships between the economic growth and the backward regions in the integration process is the so called “new economic geography” (Krugman, 1991; Krugman and Venables, 1994).

As the obstacles to trade among the regions with different development levels drop, the productive activities tend towards the location in more developed and richer regions in order to take full advantages in the scale economies. The concentration of the demand attracts the concentration of the supply, originating a virtuous circle. The firms become localized where there is higher demand and this increases the income and then the demand. When this process produces an increase in the relative wages in comparison to the less developed regions the trend can be inverted in the course of time. The economic activities can become localized in the areas with smaller development levels in order to exploit the lowest production costs. The productivity rises and later also the wages. In according to this approach the advantages of the integration process are not simply and unambiguously identified. They for the peripheral regions can assume a “U” shape. In any case, in the long run there are advantages in the integration process for all the regions, because everywhere the real income increases (Krugman and Venables, 1990).

3. EXPLANATORY VARIABLES AND SAMPLE

The choice of the explanatory variables has been based on their suitability to estimate the economic and agricultural per capita income in the areas composing the sample; and the availability of a significant data for the 1980s and the 1990s.

Per capita GDP in Purchasing Power Parity (rRGDPp/hd/hd) has been used to evaluate the economic convergence process³.

For the agricultural sector the value added in Purchasing Power Parity is not available. Thus, the gross value added in ECU, deflated by the 1986 agricultural producer price, and divided by the agricultural labour work units (rGAVA/AWU) has been introduced. Following the literature, the paper assumes rGAVA/AWU as a proxy of the average sectoral income even if it is a productivity indicator.

The variables are from EUROSTAT (various years) data appropriately elaborated.

The choice of the sample has referred to the level of territorial disaggregation and to its composition.

As far as the former aspect is concerned, according to the available data, a statistically significant sample has been built up using the regions at NUTS2 level. It has the advantage to carry out a more satisfactory analysis compared to those frequently based on Member States articulation (citare). The composition of the sample is crucially dependent on the availability of the agricultural data⁴. The regions analysed are listed in Table 1.

As previously specified, the paper wants to verify the process of convergence not only with reference to a fixed sample in terms of composition but also to EU widening over time.

In the case of the fixed sample, the analysis has been based on 70 regions of the EU-10 and convergence has been checked in the period 1982-1994. The last regional data available refer to 1994. Furthermore, a panel cannot be built up due to gaps in the time series.

The convergence process at the EU widening refers the previously selected 70 regions of the EU-10 from 1982 to 1986 and to 88 regions of the EU-12 (70 regions of EU-10 plus 18 Spanish regions and Portugal) from 1986 to 1994 (Table 1).

Table 1 – The sample

	Regions		Regions		Regions		Regions
1	Schleswig Holstein	23	Acquitaine	46	Puglia	68	Scotland
2	Niedersachsen	24	Midi Pyrennes	47	Basilicata	69	Northern Ireland
3	Nordrhein Westfalen	25	Limousin	48	Calabria	70	Greece
4	Hessen	26	Rhone Alpes	49	Sicilia		EUROPE 10

³ The cohesion has been also verified on the base of the per capita GDP in ECU deflated by the 1986 consumption price index. These results are not presented as the former variable seems to have a better explanatory capacity (Bernini Carri, Sassi, 1998)

⁴ The agricultural data gets the time period and the sample shorter, reducing the explanatory capacity of the indices adopted.

5	Rheinland Pfalz	27	Auvergne	50	Sardegna	71	Galicia
6	Baden Wurtemberg	28	Languedoc Rous.	51	Noord Nederland	72	Asturias
7	Bayern	29	Provence Alpes C. Az.	52	Oost Nederland	73	Cantabria
8	Saarland	30	Corse	53	West Nederland	74	Pais Vasco
9	Ile de France	31	Piemonte	54	Zuid Nederland	75	Navarra
10	Champagne Ardenne	32	Valle d'Aosta	55	Luxembourg	76	La Rioja
11	Picardie	33	Liguria	56	Belgium	77	Argon
12	Haute Normandie	34	Lombardia	57	Denmark	78	Catalana
13	Centre	35	Trentino Alto Adige	58	Ireland	79	Comunidad Val.
14	Basse Normandie	36	Veneto	59	North	80	Islas Baleares
15	Bourgogne	37	Friuli Venezia Giulia	60	Yorkshire e Humb.	81	Madrid
16	Nord Pas de Calais	38	Emilia Romagna	61	East Midlands	82	Castilla y Leon
17	Lorraine	39	Toscana	62	East Anglia	83	Castilla la Mancha
18	Alsace	40	Umbria	63	South East	84	Extremadura
19	Franche Compte	41	Marche	64	South West	85	Andalucia
20	Pays de la Loire	42	Lazio	65	West Midlands	86	Murcia
21	Bretagne	43	Abruzzo	66	North West	87	Canarias
22	Poitou Charentes	44	Molise	67	Wales	88	Portugal
		45	Campania				EUROPE 12

4. METHODOLOGY

4.1. PARAMETRIC APPROACH

As the literature suggests, the process of economic and agricultural cohesion has been based on the disparity indices and the standard deviation (Σ -convergence) approach (Leonardi, 1995).

The former estimates the convergence with respect to the extremities of the sample. A disparity index compares the ratio between the performance of a sub-group of the richest regions with that of a sub-group of the poorest regions at the initial and the final year. If its value decreases (increases), then a convergence (divergence) process is in action.

For the economic and the agricultural sector three types of disparity indices have been evaluated. They compare, for each of the two explanatory variables, the value of:

- The best region to the worst (1/1);
- The ten best regions to the ten worst regions (10/10);
- The twenty-five best regions to the twenty-five worst regions (25/25)

in relation to the extreme years of the time period considered, that is:

- 1982, 1986 and 1994 for the 70 EU-10 regions;
- 1996 and 1994 for the 88 EU-12 regions.

This approach does not explain the dynamic of all the areas analysed. To overcome this constraint the standard deviation approach has been introduced. It is a more formal synthetic indicator of the convergence phenomenon and is based on the ratio (V_i) between the standard deviation in the initial year and that in the final year. If V_i is more (less) than one, the regions of the sample are more (less) cohesive over time.

In order to supplement the parametric analysis, the β -convergence has been evaluated. It verifies the neoclassical model: the per capita growth rate is indirectly correlated to the initial level of per capita income in economies similar in terms of preferences and technologies. Furthermore, the approach estimates how faster is the process of convergence towards an equilibrium income level.

Following Barro and Sala-I-Martin (1991), the parameter of convergence (β) has been evaluated by a cross-country regression of a version of the traditional neoclassical equation⁵, that is:

$$\frac{1}{T} \log \left[\frac{y_{i,j,t}}{y_{i,j,0}} \right] = B - \left(\frac{1 - e^{-\beta T}}{T} \right) \log(y_{i,j,0}) + \mu_{i,j,T} \quad (B)$$

with the rate of growth of the annual average agricultural or economic income from 0 to t, the dependent variable; T the number of years composing the time period; j the region; μ the stochastic term; and B a constant⁶.

In some analysis the coefficient $(1 - e^{-\beta T})/T$ is the convergence indicator⁷. However, for a given β , it decreases when T increases and for a sufficiently long time period it tends to vanish. For these reasons also β has been estimated from that coefficient. $\beta > 0$ shows a process of convergence. Thus, the parameter of convergence has to present a negative sign to support the neoclassical model (Barro, 1991; Baumol, 1986; Barro, Sala-I-Martin, 1992; Quah, 1993).

To verify the convergence hypothesis, the literature suggests some specific tests⁸. Because of the very low goodness of fit of the estimated equations, they have not been applied.

4.2. PARAMETRIC APPROACH VS. NON PARAMETRIC APPROACH

Despite the advantages connected to the use of synthetic indicators, the parametric approach presents many constraints.

Among them, its unsuitability to underline the existence of a significant subgroup of regions with a different dynamics of growth from that of the average of the sample (Bernard, Durlauf, 1995; Quah,

⁵ The traditional neoclassical model is based on the following equation :

$$\log[y_t] = \log[y_0] e^{-\beta t} + \log[y^*] [1 - e^{-\beta t}]$$

with y^* the per capita income corresponding to the steady state.

⁶ The constant B is given by

$$B = x + [(1 - e^{-\beta T})/T] [\log(y_j^*) + x_0]$$

With x the rate of technological progress that, as the per capita income of equilibrium, is exogenous.

The coefficient B shifts because of the trend in technology with a change in the starting data and the sample.

⁷ See Cellini (1997).

⁸ See Lichtenberg (1994) and Caree and Klomp (1997).

1997). For example, when the disparity index underlines a state of convergence inside the sample there could be a clustering of the very poor regions and of the very rich regions and a vanishing of the middle-income class. In this case the hypothesis of convergence is verified only within a specific subgroup of regions but it is difficult to argue with reference to the full sample even if the average income gap has reduced over time.

As to the β -convergence, it firstly assumes the unrealistic hypothesis of a stable economic growth (Quah, 1993). Furthermore, it is characterised by a systematic tendency towards 2 percent that the literature has proved to be connected not only to reasons of convergence but mainly to the use of a data of heterogeneous units under the assumption that they have been generated from an identical stochastic process (Canova, Marcet, 1995; Pesaran, Smith, 1995; Boggio, Serravalli, 1999).

The Σ -convergence could represent an alternative but because its theoretical constraints⁹ a non-parametric approach has been preferred. The latter, analysing the dynamics of the explanatory variables in the single regions, integrates the parametric approach overcoming the above mentioned limits. From this point of view, the two approaches are not alternative but complementary in expressing a more complete judgement on the process of convergence within the EU regions. The parametric approach give an information on the average dynamic of the sample while the non parametric underlines the movements of the single regions respect to the initial state.

4.3. NON-PARAMETRIC APPROACH

The non-parametric approach refers to the transition matrix and the cartographic representation¹⁰. The transition matrix points out the dynamic of each region from the initial to the final class of income in order to verify the degree of persistence and mobility of the sample analysed. Particularly, in the persistence state the poor or rich regions stay poor or rich over time, while in the other cases there is mobility (convergence or divergence), that is the rich regions get less rich and vice versa (Boggio, Serravalli, 1999).

The transition matrix is squared with the initial classes of income on the rows and the final ones on the columns.

The dynamics within the matrix depends crucially on the wideness of the income classes. On the base of the value assumed by the RGDPp/hd and RGAVA/AWU in index value with 100 the EU average, a wideness of 25 has been assumed suitable.

⁹ See Sala-I-Martin (1995) and Quah (1996a, 1996b, 1997)

¹⁰ For sake of brevity, the cartographic representation is not presented.

The entries on the main diagonal of the matrix point out a situation of persistence, while those outside of convergence or divergence state.

Particularly, six typologies of mobility can be underlined as in the example shows in Table 2. They correspond to the areas:

- I – the poor regions get rich;
- II a – the rich regions get richer;
- II b – the rich regions get less rich;
- III – the rich regions get poor;
- IV a – the poor regions get less poor;
- IV b – the poor regions get poorer.

Table 2 – Example of transition matrix

	25-50	50-75	75-100	100-125	125-150
25-50		IV a		I	
50-75	IV b				
75-100					
100-125					II a
125-150		III		II b	

— EU average

4.4. INTERRELATIONSHIP BETWEEN AGRICULTURAL AND ECONOMIC CONVERGENCE

Combining the comparison between:

- The rate of change in RGDPp/hd or RGAVA/AWU from 1986 to 1994 of each region and the EU average;
- The rGDPp/hd or rGAVA/AWU in 1994 of each region and the EU average;
- The rGDPp/hd or rGAVA/AWU in 1986 of each region and the EU average;

six typologies of territorial units have been obtained (Table 3).

Table 3 – Typologies of regions for the representation of the dynamic aspect of the process of convergence

Typology of region	rGAVA/AWU or	Δ rGAVA/AWU or	rGAVA/AWU or

	rGDPp/hd 1986	Δ rGDPp/hd 1986-94	rGDPp/hd 1994
Rich and dynamic	> EU average	> EU average	> EU average
Rich but stagnant	> EU average	< EU average	> EU average
Rich because dynamic	< EU average	> EU average	> EU average
Poor and stagnant	< EU average	< EU average	< EU average
Poor but dynamic	< EU average	> EU average	< EU average
Poor because stagnant	> EU average	< EU average	< EU average

On the base of this classification and in order to analyse the possible relation between the agricultural and economic process of convergence a synthetic index of correlation, the Spearman's coefficient, has been introduced. It allows to underline the concordance or discordance within territorial agricultural systems in terms of economic and agricultural performance.

The coefficient has been estimated for the enlarged sample with reference to:

- The rGDPp/hd and rGAVA/AWU rate of change from 1986 to 1994;
- The rGDPp/hd and rGAVA/AWU value in 1986 and in 1994.

The coefficient assumes values between +1, maximum concordance, and -1, maximum discordance.

5. THE PROCESS OF ECONOMIC CONVERGENCE

The disparity index and the standard deviation approaches referred to a fixed sample (70 regions), underline a weak dynamic of convergence for the overall economy (Table 4).

Table 4 - The parametric approach indices for the economic sector

70 regions				% Variations		
Disparity indices	1982	1986	1994	1982/86	1986/94	1982/94
1/1	2,99	2,99	2,76	0,00	-7,69	-7,69
10/10	2,02	1,91	1,91	-5,45	0,00	-5,45
25/25	1,52	1,49	1,50	-1,97	0,67	-1,32
Vi				1,06	0,95	1,01
88 regions						
Disparity indices						
1/1		3,46	3,15		-8,96	
10/10		2,23	2,17		-2,69	
25/25		1,76	1,71		-2,84	
Vi					1,01	

The intensity of the process in the 70 regions reduces over time.

The only exception is the 1/1 disparity index. It shows a more marked reduction in the rGDPp/hd gap, tendency that reflects the dynamic of the 1986/94. In the previous period (1982/86) there is no significant variation.

However, in general the cohesion is the result of the forces acting during the 1982/86. From 1986 to 1994 a divergence process seems to prevail.

In the case of 88 regions the intensity of the process is higher than that of the same period but referred to a sample of 70 regions, emphasising the major influence of the regions last joining the EU over the convergence dynamic. Nevertheless, the absolute values suggest a widening of the rGDPp/hd gap.

The same conclusion is supported by the estimation of the β -convergence that also shows a weak connection between the economic rate of growth and the corresponding initial level (Table 5).

The parameter of convergence, even characterised by a negative sign confirming the convergence hypothesis and a significant t-Student, has a very low R^2 .

The annual speed of adjustment toward convergence is 1.4 per cent in the case of 88 regions and 1.9 per cent in that of 70 regions. The results are fairly in line with those by Barro and Sala-i-Martin for the USA (around 2%) but need to be explained keeping into account the limits previously underlined.

Table 5 - β - convergence for the economic system

70 regions, T=12					
	Constant	Coefficient	β	F(1, 68)	R2
	0,228	-0,019	0,205	13,4***	0,164
t-student	4,883***	-3,659***			
88 regions, T=8					
	Constant	Coefficient	β	F (1, 86)	R2
	0,187	-0,014	0,109	10,96***	0,113
t-student	4,634***	-3,322***			

* significant at 90% ** significant at 95% *** significant at 99%

The transition matrix confirms the limited mobility of the regions from the initial and the final class of income, showing a process of persistence (Table 6 and 7).

The time period analysed seems not to be characterised by a precise turning point towards a stronger economic cohesion within the EU regions. Even if by the parametric approach the regional disparities seem to be stabilized (EU, 1991), or in the best case show a modest improvement, the

non-parametric approach undermines that the performance of the poor regions has not increased enough to overcome some rich regions, the performance of the rich regions has not grown so little to be overcome by some poor region, and last rich regions have got richer than the best poor regions (Boggio, Serravalli, 1999).

6. THE PROCESS OF AGRICULTURAL CONVERGENCE

Following the parametric approach, in the European agriculture the process of convergence seems to be more significant than in the overall economy with the agricultural performance getting close to the economic one (Table 8). The only exception is the 10/10 disparity index referred to 70 regions.

Table 8 – The parametric approach indices for the agricultural sector

70 regions				% variation		
	1982	1986	1994	1982/86	1986/94	1982/94
Disparity index						
1/1	7,16	6,62	6,54	-7,54	-1,21	-8,66
10/10	3,74	3,46	3,89	-7,49	12,43	4,01
25/25	2,64	2,36	2,48	-10,61	5,08	-6,06
Vi				1,14	1,01	1,15
88 regions						
Disparity index						
1/1		20,44	12,93		-36,74	
10/10		5,7	5,29		-7,19	
25/25		3,14	3,03		-3,50	
Vi					1,14	

For the 70 regions, likewise in the economy as a whole, the rate of convergence in the period 1982-1994 is crucially influenced by the strengthening of the process in the 1982-1986. In fact, in the 1986-1994 a sensible reduction in the rate of cohesion is found.

During the period analysed, the widening of the EU seems to have better benefited the last entrant regions in the agricultural sector than in the overall economy.

Despite the absolute value of the convergence indices increases, particularly the gap between the poorest and the richest region, the intensity of convergence is stronger in the case of 88 regions. It shows the fact that a relatively better performance was realized by the regions of recent integration (Spanish regions and Portugal) that were able to take advantage of the new opportunities resulting from joining the EU¹¹.

¹¹ The more favorable influence could be due to a higher level of agricultural prices in the EU or to a stronger structural change in the joining regions induced by the CAP or th both factors. However, this analysis is not the objet of the paper.

The result is supported by the analysis of the typology of the agricultural convergence. With reference to the 88 regions and on the base of the 25/25 disparity index, the increase in the rGAVA/AWU from 1986 to 1994 is 11.3 per cent in the 25 richest regions and 38.4 per cent in the 25 poorest regions. Considering the dynamic of the two variables composing the rGAVA/AWU, in the 25 richest regions the increase in the explanatory variable is the result of a decrease in the agricultural value added moreover less than that in the sectoral labour units, while in the 25 poorest regions the numerator increases and the denominator decreases. Thus, the relatively more sustained growth of the 25 poorest regions could be explained in terms of a process of labour force reallocation and of an increase in its productivity.

Furthermore, the composition of the sample has changed over the time period analysed. In the 1994 some of the French, English and, particularly, Spanish regions thanks to their more consistent dynamic of growth get out from the “poorest 25” club, substituted, among the other, by six Italian regions. Thus, in 1994, fourteen out of the twenty-five poorest regions are Italians.

The β -convergence confirms these results (Table 9).

Table 9 - β -coefficient for the agricultural sector

	Constant	Coefficient	β	F (1, 86)	R2
70 regions, T=12					
	0,129	-0,012	0,142	6,154**	0,082
t-student	2,626**	-2,48**			
88 regions, T=8					
	0,609	-0,021	0,150	1,13*	0,13
t-student	3,249***	-1,064**			

* significant at 90% ** significant at 95% *** significant at 99%

The coefficient has always a negative sign, in line with the convergence hypothesis, and is statistically significant. However, the R^2 is low, lower than that of the economy. This means that the agricultural convergence process cannot be explained only in terms of initial levels of productivity but other variables have to be introduced.

As to the annual rate of convergence, it increases at the widening of the EU but its value, similar to the that of the GDP, need to be interpreted with prudence at the light of the previously underlined limits.

The non-parametric approach shows a higher degree of mobility in the agricultural sector than in the overall economy with the widening of the cloud of the entries around the diagonal (Table 10 and 11). Furthermore, it suggests that only the poor regions get poorer and the rich regions richer.

7. DYNAMIC AND STAGNANT REGIONS

According to the Spearman's coefficient the economic and agricultural development at regional level are not correlated: the regions responsible for the cohesion in the agricultural sector are not the same that have promoted that process in the economic sector. Considering the average rate of growth of the two explanatory variables during the period 1986-1994, the coefficient assumes the very low value of 0.034.

The Spearman's coefficient evaluated in 1986 and in 1994 among the agricultural and economic income levels, gives the values of 0.52 and 0.31 respectively, underlining a reduction of the intensity of correlation between the two development paths over time.

This trend can be partly explained by the decreasing influence of the primary sector in the economic income formation, a specific phenomenon of the state of "maturity" that characterizes the EU. However, it could also be explained in terms of more complex interactions among regions that refer to the end of the agricultural sector as a reservoir of labour force for the economy that brake up the economic-agricultural growth nexus¹². Thus, each sectors seems to have specific determinants of growth whose characterization requires suitable analysis at territorial and productive sector level. Particularly, the paths of development underlined seem to be more complex than those point out in the Merlo's work (1994) for the 1980s.

8. CONCLUSION

Despite the limits connected to the crude methods applied, the parametric and non-parametric approaches achieve interesting results.

By parametric approach, the analysis of the regional dynamics of the agricultural per capita value added leads to two main conclusions:

- Even if in a very limited terms, the regional agricultural differences have reduced more than the economic ones. The reason should be linked to the increase in the chances connected to a widest market in a sector where the regions last joining the EU hold substantial comparative advantages. However, the intensity of the process seems to reduce over time;
- The results do not fully confirm the hypothesis that the CAP, with its different protection between continental and Mediterranean products and among farms, has increased the regions and countries disparities.

¹² For example, Ireland is a case of significant symmetry between the AVA end GDP in the initial year and their dynamic of growth, while the opposite case is that of some French and English regions. Also the case of the Spanish regions and Portugal is interesting. Their joining the EU positively affected the agricultural growth but not the economic one, at least since the 1994.

The non parametric approach allows to better understand the characters of the process. It shows, particularly for the agricultural sector, a situation well far from a well defined convergence. There is a strong probability for the poorest agricultural regions to stay poor and for the richest to remain rich. Furthermore, the middle income classes are characterised by a high degree of mobility among regions. However, this trend is not in the direction of a clear final state of convergence. The weak process underlined by the parametric approach is explained by the movement of few regions.

Also for the economic sector the process of convergence is not clearly defined. The non-parametric approach underlines a less polarisation and a persistence on the main diagonal of the transition matrix, that is the probability for the regions to remain close to the initial class of income over time.

The mixed results achieved by the two approaches and particularly the low R^2 underlined by the β -convergence, seem to stimulate an in-depth analysis of the determinants of the agricultural growth in order to verify the conditional convergence and to explain the reduction of the intensity of correlation between the agricultural and economic growth inside a same region.

During the period under analysis the EU regions have not realised a clear process of convergence. At the light of this results seems to be justified the recent policy implementation both in agricultural and economic interventions aimed at better supporting the convergence process.

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