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# THE EMPIRICS OF REGIONAL ECONOMIC GROWTH IN ITALY. 1951-1993

Abstract: In this paper, on the basis of an original data base, we have gathered detailed information on the Italian regional growth over the post-war period using several statistical techniques. We have described the evolution of the disparities using, as a measure of regional economic growth, either per capita income and labour productivity, the latter variable also at the sectoral level.
The evidence indicates that labour productivity convergence across the Italian regions was limited to the period 1960-75. This process has been mainly driven by a fall in the industrial dispersion and by a reduction in the share of agriculture. In the past 18 years the convergence process has completely stopped, indeed we have detected a slight increase in the dispersion, arising essentially from the industrial sector and from the southern non-Adriatic regions.
Also per capita income inequality has decreased over the period 1960-75, but mainly among the north-centre regions and it has started to increase again from the mid-1970s. Now the degree of regional wealth inequality in Italy is still the highest within the EU. Per capita income tends to spread according to a two-peaks distribution with all the southern regions but one included in the low polarisation point.

Sintesi: In questo articolo, sulla base di una banca dati originale, abbiamo esaminato in dettaglio la crescita regionale italiana nel dopoguerra, utilizzando diverse tecniche statistiche. L'andamento del divario economico è stato descritto utilizzando, come indicatori di crescita, sia il reddito pro capite che la produttività del lavoro, l'ultima variabile anche a livello dei principali settori di attività.
L'evidenza empirica indica che la convergenza della produttività del lavoro tra le regioni italiane è limitata al periodo 1960-75. Questo processo è stato guidato principalmente da una diminuzione della dispersione nel settore industriale e da una riduzione della quota dell'agricoltura. Negli ultimi 18 anni il processo di convergenza si è completamente arrestato. Abbiamo rilevato invece un lieve incremento della dispersione, derivante essenzialmente dal settore industriale e dalle regioni meridionali non adriatiche.
Anche la disuguaglianza in termini di reddito pro capite è diminuita nel periodo 1960-75, ma principalmente all'interno delle regioni del Centro Nord. Inoltre a partire dalla metà degli anni settanta essa ha ripreso nuovamente a crescere. Oggi il grado di disuguaglianza regionale in Italia è ancora il più alto all'interno dell'Unione Europea. Il reddito pro capite tende a ripartirsi secondo una distribuzione bimodale, con tutte le regioni meridionali, tranne una, collocate nel punto basso di polarizzazione.

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## 1. Introduction

The existence of wealth disparities across the Italian regions is a well known issue and the economic literature has devoted a continuous attention to it.[1] However due to the lack of long time-series data at the regional level, most study has analysed the economic gap gathering the regions into two broader territorial areas (usually the North-Centre and the South). Only recently the renewed interest in the growth issues, together with the availability of new statistical series, has given rise to a fresh stream of studies on economic development across Italian regions.[2]

As regard to the international literature on economic convergence, in recent years it has devoted more attention at the sub-national level.[3] These studies have revealed the existence of huge economic disparities within each country and they have also pointed out that the inequalities at the regional level are often higher than those observed at the country level. For instance, in the European Union the ratio between the wealthiest and the poorest regions is 5.7 while the same ratio equals 2.5 at the country level.[4]

The aim of this paper is to identify the fundamental facts of the regional economic development in Italy over the post-war period, on the basis of a new data base we have collected for the years 1951-93. More specifically we want to address four main questions: (1) How large is the level of inequality across the Italian regions? (2) How are the wealth differentials evolving over time? (3) Is there any change (mobility) in the relative distribution of wealth? (4) How is the convergence pattern at the sectoral level?

To answer these questions the paper examines the distribution of wealth across regions and accounts for the changes of the distribution over specific periods. It also describes the mobility of individual regions in the relative wealth distribution. We believe that a systematic account of what happened in

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[1] The noteworthy contributions by Graziani (1978), Del Monte e Giannola (1979), Faini (1983), Sylos Labini (1985) represent a clear guideline for the understanding of the Italian dualistic economic development. There is also a wide international literature that has addressed the issue of the dualistic structure of the Italian economy; see, among others, Eckaus (1961), Lutz (1962), Chenery (1962).

[2] It is worth recalling, among others, the studies by Paci and Pigliaru (1995, 1997), Mauro and Podrecca (1994), Cellini and Scorcu (1995), Helliwell and Putnam (1995).

[3] Let just remember the studies by Barro and Sala-i-Martin (1991) on the states of the United States, the districts of Japan and some European regions; Neven and Gouyette (1995), Fagerberg and Verspagen (1996), Quah (1996), and Paci (1996) on the European regions and several other papers on regional disparities in single countries. Sala-i-Martin (1996) provides a useful survey of the empirical evidence so far collected at the regional level.

[4] However if we consider the entire set of world's nations, the wealth disparities across them turn out to be much higher than those detected at the regional levels in the developed countries. A complete and helpful report of the wealth distribution across nations can be found in Parente and Prescott (1993).

the last forty years in the Italian regions is important as a factual background either to test for competing growth theories or to define policy measures.

Without a doubt a factual study, like this one, finds its foundation in the quality of the data; this is why we have devoted much effort to collect homogeneous series of data for gross domestic output (GDP), units of labour and population for the twenty Italian regions over the period 1951-93. The data come from different sources and have been made consistent over time and comparable with the new Italian regional economic account. This new data set, presented in details in the Appendix, represents a useful instrument for the economic researchers and it is available under request.

Before starting our analysis, there are at least two preliminary questions that deserve attention. First, which proxy should be used to measure economic inequality? Second, which statistical technique is more appropriate? Let briefly address these issues.

There are two measures commonly used in the studies of economic disparities: labour productivity (GDP/units of labour) and per capita income (GDP/population).[5] The former can be considered a measure of the degree of efficiency of production while the latter relates more to the level of wealth of the entire population. The time-series and cross-section differences in labour productivity are usually interpreted as reflecting disparities in the degree of efficiency of production: capital endowment, technology, other intangible inputs. However as for per capita income, its evolution over time and its cross-section variability do not depend only on those factors but they are also strongly affected by the other elements (economic, social, cultural, demographic) that determine the unemployment and the participation rates. Therefore it may happen that two regions - or countries - perfectly similar as far as the basic productive conditions are concerned show the same level of labour productivity, but still have different wealth conditions if the ratio between non workers and workers is different. For example, Umbria and Sardegna in 1993 display the same productivity index relative to Italy (89), however income per capita index equals 95 for Umbria and only 75 for Sardegna. The reason for this huge difference simply depends on the fact that the former region has a more favourable condition in the unemployment (7%) and participation (40%) rates with respect to the latter which shows respectively 18% and 37% (see Table A3).

[5] We are considering the numerator in the two ratios to be the same so that the differences arise only from the denominator. Of course a better specification of labour productivity would require in the numerator value added instead of GDP, in order to get rid of government transfers and indirect taxation. However such data are not available for the 1950s at the regional level. We have used value added for unit of labour for the period 1960-93 and the results are very similar to those presented here.

In conclusion we want to stress here that the two variables, labour productivity and per capita income, describe different aspects of the economic system and cannot be used as perfect substitute. Since both aspects - production efficiency and population wealth - are interesting we have preferred to document the regional economic development in Italy in terms of both variables in order to emphasise their differences.

The second issue concerns the statistical method. There is a large debate on the literature on which technique is more suitable for assessing the issue of economic disparities. The "classical" methods proposed by Barro and Sala-i-Martin with the so-called beta- and sigma-convergence [Sala-i-Martin (1996a)] or the models of distribution dynamics suggested by Quah (1993, 1996b)? It goes beyond the purpose of this paper to address such methodological problems. We accept the view that each method is capable to highlight specific aspects of the complex process of economic growth. Moreover, our aim is to look for the basic facts of regional growth in Italy thus, we believe, a "stylised fact" to be called so, must be robust to different statistical methods employed. Therefore in our analysis we shall use various techniques to analyse regional disparities across the Italian regions.

The rest of the paper is organised as follows. Section 2 documents the existence and the evolution of the economic regional disparities. Section 3 analyses the changes of the distribution over time and addresses the issue of regions' mobility. In section 4 the econometric results of the beta convergence approach are reported. A more detailed analysis of the disparities at the sectoral level is presented in section 5. Some concluding remarks are put forward in section 6. Our original data base in presented in details in the Appendix.

## 2. Measures of disparities

In this section we address two questions. First, how is the magnitude of the dispersion across the Italian regions? Second, how is its evolution over time?

One common measure of the dispersion in a distribution is the range of the distribution itself. In Figure 1.A and Table 1 (which displays a summary of the statistical evidence discussed in this section) we have reported, as measure of the range, the ratio between the top and the bottom quintiles in the distribution of per capita income and labour productivity. It results that a gap between rich and poor regions does exist and it has decreased over the whole period 1951-93. Examining more specifically the evolution over time, it can be observed that during the 1950s the range remains almost constant, it reaches its peak in 1960 and thus shows a strong reduction until 1975 when it reaches its minimum. In the last two decades the gap does not show a tendency to decline, indeed it remains almost constant with a slight tendency to increase in the last few years. The disparity is higher in terms of per capita income than labour productivity: at the end of the period the Italian citizens of the 4 wealthiest

regions enjoy a per capita income that is almost double than the poorest 4 regions, even though the productivity of the former group is only 50% higher than the latter. It is worth noticing that the overall decrease in the range seems to depend more on a reduction in the relative strength of the top 4 regions rather than in an improvement in the bottom quintile (Table 1.B).

Another widely used measure of dispersion is the standard deviation of a population, also called sigma-convergence. Figure 2 reports the standard deviation of the logarithm of per capita income and labour productivity for our twenty regions. Again the most outstanding result is that all the decrease in the dispersion of both variables is confined in a very short period of time 1960-75.[6] In the following two decades, and especially in the last years, the Italian regions exhibit a slow tendency to diverge and this trend appears stronger for the per capita measure.

Sigma convergence measures the average distance of each region from the national mean, however it may be interesting to analyse separately different groups of regions to detect more precisely the source of dispersion. Figure 3 displays the sigma measure of dispersion within the two groups of north-centre and southern regions and also between them.[7] Looking at per capita income, it is clear that almost all the reduction in the dispersion of the entire population comes from a process of convergence within the regions of the north-centre of Italy. The dispersion among these regions was very high (standard deviation = 0.29) but it has strongly decreased and it is now stable around a value of 0.10. On the other hand the disparities among the southern regions were initially lower (0.13) and they have not changed substantially over the period. Finally the north - south disparity shows an increase in the 1950s, a sharp fall in the 1960s and then a low and constant expansion in the last two decades. The bottom line is that the per capita income gap between north and south of Italy is still there, at the same level it was forty years ago.

The picture in terms of labour productivity is quite different and this fact confirms the importance of analysing both variables. The magnitude and the trend of the differential within the two groups of regions is very similar: a clear reduction until the end of the 1970s, a very low tendency to grow in the last decade. Similarly the productivity gap between north and south has declined until the beginning of the seventies and then it has slightly increased.

The general outcomes on the magnitude and pattern of regional disparities, we have reported on the basis of the sigma measure of dispersion,

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[6] A large part of the decrease in the dispersion is due to a single (very small) region, Valle d'Aosta, that was the top ranking region in Italy in 1951 (see Table A1 and A2) and that shows the lowest growth rate among the Italian regions for both per capita income and labour productivity. However if we exclude Valle d'Aosta, the pattern of the dispersion does not change, we have only a downward shift of the standard deviation for the period 1951-75.

[7] For simplicity, we often refer to the north-centre regions as the northern regions.

hold also if we consider an alternative measure, the rank-size function (Figure 4 and Table 1). This function relates the log level of the variable in each region to its rank in the distribution.[8] A high, absolute, value of the rank coefficient implies a large distance between two regions in consecutive ranks and thus a high degree of disparity. These results confirm the previous findings and thus we do not discuss them in length.

So far it has emerged that regional inequality is still a crucial characteristic of the Italian economic development. But then a question arises. Is this a peculiar feature of the Italian system? In other words, how large are the regional differences in Italy compared to other countries?

To answer these interesting questions let analyse the degree of disparities within six European countries on the basis of the standard deviation of the log levels of per capita income and labour productivity (Table 2).[9] As regards to per capita income it appears that in 1990 the degree of regional inequality in Italy (0.274) is higher than in all the other European countries considered; this result holds at the beginning and also at the end of the period examined. The outcome is slightly different if we consider labour productivity. In this case Italy shows a degree of disparities higher than other industrialised countries (West Germany, France and United Kingdom) but lower than the two southern countries (Spain and Greece). In conclusion, also the international comparison confirms that the problem of regional disparities in Italy is mainly one of per capita wealth inequalities, deriving from a very high ratio between non workers and workers in the Mezzogiorno's regions.

The detailed analysis of the magnitude and the evolution of regional disparities in Italy provided in this section on the basis of several statistical measures allows us to put down a first list of "stylised facts".

*Per capita income.*

1. The degree of regional inequality is very high, even compared to other European countries.
2. All the reduction of disparities took place in a short period (1960-75) and within a specific group of regions (north-centre).
3. The regional income disparities tend to increase in the last two decades.
4. The degree of income inequality between north and south is the same as 40 years ago.

*Labour productivity.*

[8] The rank-size function is defined as: $ln\ y = a + b\ ln\ r$ where $y$ is the wealth variable (per capita income or labour productivity) in descending order and $r$ is the rank of each region in that ordering.

[9] The data come from the CRENoS's data base on European regions [Paci (1996)]. The monetary values are in purchasing parity power and therefore the indices for Italy are not directly comparable with those presented in this paper.

5. Regional disparities in productivity are much lower than in per capita income and they are relatively more closed to the European average.
6. All the reduction of disparities took place in a limited period (1960-75) and involved both north and south regions.
7. The dispersion has been almost stable in the last two decades.

**3. The evolution of the wealth distribution over time**

In this section we analyse the shape of the distribution of per capita income and labour productivity and its change over time and we also address the problem of mobility of each individual region within the distribution.

A first description of these issues is provided in Figure 5 with the plot of the relative indices of the two variables in descending order. The distributions show a high peak for the richest region in 1951; as we have already pointed out this outlier is the small northern region of Valle d'Aosta.[10] The distributions of both per capita income and labour productivity become flatter over time however their shapes show relevant differences. The reduction in the dispersion of per capita income is mainly due to a decrease of the relative wealth of the first richest quartile together with a growth of the second quartile.[11] At the same time the relative position of the bottom poorest quartile has not significantly changed. As far as the labour productivity is concerned the process of convergence appears more evenly distributed across all groups of regions: the initially more productive regions have reduced their relative strength while the opposite trend have characterised the initially less efficient regions.

A more convenient way to assess if the source of inequalities is uniform across regions or if it comes mainly from specific groups of regions is to look at the shape of the rank size function (Figure 6). The shape of the distribution of per capita income in the final year 1993 does not seem to be linear: the slope is much more higher for the poorest ten regions. Moreover the slope of the richest ten regions has fallen over time and even during the last two decades, while it does not seem the case for the less wealth regions. In the previous section we pointed out that the rank-size coefficient actually displays a growth in regional disparities over the years 1975-93; now it is clear that the increase come from the low rank Mezzogiorno's regions. As we have already remarked, the distribution of labour productivity appears more uniform across regions and the reduction in the slope is visible for both high and low productive groups of regions. To test directly the assumption of normality we have

[10] If we exclude Valle d'Aosta we eliminate the left peak in the distribution in 1951 while the rest of the distribution remains unchanged due to the very small weight of this region.

[11] All regions in the first two quartiles are in the north-centre of Italy. Therefore this result confirms what we have previously remarked, that is the reduction in the overall income dispersion is mainly due to a convergence process among the northern and central Italian regions.

reported in Figure 7 the deviations from the normal distribution of the observed cumulative probability of our two distributions. It clearly appears that the assumption of normality is violated for the per capita income that exhibits two peaks below and above the average. The occurrence of a bimodal polarisation process highlights the presence of two different converge clubs in the per capita distribution of wealth across the Italian regions. On the other hand the deviations from the normal distribution are very limited in the case of labour productivity.

So far we have examined statically and dynamically the distribution, but all the procedures we have reported hide the movements of each region within the distribution. However the issue of persistency or mobility of individuals within the population is an important issue to be addressed. In other words it is worth asking: how is the probability of a region to change its position within the distribution in a future period of time?

A first illustration of this issue can be obtained by looking at the distribution of regions in different groups of relative wealth and at its change. We have constructed four states, two below and two above the Italian average and with the two bounded ones with same width; for both variables the grid points are: 80%, 100% and 120% relative to the Italian average (Figure 8). Considering per capita income it appears that at the beginning of the period the regions were quite uniformly distributed in the four states with a slight predominance of the two extremes. In 1993 the poorest group has maintained the same number of regions (all southern regions but Abruzzi), while there has been a strong polarisation in the third state just above the Italian average. This change, from an approximately uniform distribution to a two-peaked one, explains the reduction in the standard deviation we observed in Figure 2 over the entire period 1951-93. Moreover this outcome confirms the bimodality of income distribution we have already emphasised.

A polarisation process around the average characterises the labour productivity: in this case all but 3 regions are concentrated in the two middle states. The convergence toward the national averages was already completed in 1975 when no region had a relative productivity index higher than 120% and only 3 regions had less than 80%. In the remaining 20 years few changes have taken place, most notably a shift from the above-average group to the below-average one.

Let now consider the issue of mobility in a more general framework on the basis of the distribution dynamics matrices proposed by Quah (1993).[12] Let consider four states of relative wealth characterised by an initially similar

[12] Given the limited number of individuals in our population (20 regions) we use this procedure only as descriptive tool and we have not reported the ergodic long run distribution.

number of individuals in each state.[13] Then we can compute a transition matrix where the element $a_{ij}$ indicates the average probability of individuals included in state *i* in the initial year to end in state *j* in the final year. Table 3 reports various transition matrices for different subperiods and for per capita income and labour productivity.

Considering the entire period 1951-93 it is worth noticing a high degree of mobility from one state to another. Only the richest group maintain all its individuals (the entry in the main diagonal is unity). Notable examples of mobility are the 40% of regions initially included in the poorest state that has moved in 1993 in the next group, and the 60% from the third to the fourth state. At the same time there are also probabilities to shift down in the distribution: for example Campania falls from the second to the first group. Considering the various sub-periods let remark that over the years 1960-75 (that is the period of stronger reduction of the income dispersion) the upward mobility of poorer regions is outstanding, 71% and 67% respectively for the first and second state. Moreover it is also interesting the downward shift in the poorest group that occurs over the years 1975-93. Once more the final distribution highlights the presence of two convergence clubs below and above the average, with the average state, 90-110%, characterised by very low frequencies.

As regard to labour productivity, it displays a high degree of mobility too. In this case however, together with an upward mobility, we can detect relevant phenomena of downward mobility. As much as 80% of regions with an initial productivity level greater than 115% of the Italian average, has shifted down in 1993, some of them even below the Italian average. As a result of these up and down movements the distribution of labour productivity ends with the strong polarisation around the average that we have already pointed out. Considering the sub-periods, the most relevant movements have taken place over the 1960-75 period: 83% and 40% of the regions moved up respectively from the first and second state and also all the regions initially in the highest group have shifted down. As we have previously remarked, this was the period of strongest reduction in the dispersion across the Italian region. In the next period 1975-93 the process of polarisation in the middle states shows a slight tendency to decrease due to movements toward the extreme groups.[14]

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[13] The choice of the grid points is obviously arbitrary. We have followed the criteria of including a similar number of individual in each state while leaving the bounded state with the same width. As a result the grid points (as percentage of the Italian average) are: 70, 90, 110 for per capita income and 75, 95, 115 for labour productivity. We have also tried with different grid points but, although the numeric results are slightly different, the qualitative findings do not change.

[14] As a confirm of the high degree of individual mobility within the distribution it is interesting to notice that the only region (Molise) included in the poorest group in 1975 has moved up in 1993 but it has been replaced in the lowest group by two "declining' regions (Calabria and Basilicata).

From the analysis of the transition matrices it thus seems that the process of regional growth in Italy has been characterised by a high degree of individual mobility with relevant phenomena of catching up and falling behind. Let consider some actual examples of individual mobility in the relative distribution (Figure 9). It is possible to detect a whole range of mobility pattern for both per capita income and labour productivity. Initially wealthy regions that decline (Piemonte), together with initially poor that also decline (Sardegna); moreover there are regions that grow, starting either from medium (Veneto) or very low (Abruzzo) positions. From these examples it thus emerges that the Italian regions actually have a rather good chance to move either up or down in the relative distribution.

Let now summarise the main results of this section on the shape and changes of the distribution and on the individual mobility within the distribution itself.

*Per capita income.*

1. The reduction in the dispersion is mainly due to a relative decrease of the richest regions, while the relative position of the poorest has not significantly changed.
2. The income distribution in the final years is highly bimodal with two "convergence clubs" below and above the average.
3. The degree of individual mobility is high.

*Labour productivity.*

4. The reduction in the dispersion is evenly distributed across all groups of regions.
5. The shape of the productivity distribution seems to be normal, although there is still a significant variance around the mean.
6. There is a high degree of up and down mobility of individuals within the distribution.

## 4. Beta-convergence

To conclude our analysis of the aggregate growth process across the Italian regions let consider now another widely used measure: the -convergence. From a Solow's model with Cobb-Douglas technology and exogenous saving rates and technological progress, the unconditional -convergence process can be described by the following linear equation:

$$(1) \qquad (1/T)\log(y_{it}/y_{i,t-T}) = a + b\log(y_{i,t-T}) + u_{it}$$

where y is labour productivity, given the remarks we put forward in the Introduction.. In this approach there is absolute -convergence if the coefficient b < 0, that is if economies that were poor at the beginning of the period are growing on average faster than rich ones. The idea of absolute convergence relies on the assumption that the only difference across economies is their initial level of capital. Therefore to control for other

differences (level of technology, propensities to save, infrastructures, public policies, etc.) a set of additional explanatory variables is usually added in eq. (1) leading to the so called conditional -convergence.

Before looking at the results, let just put forward some warnings on the interpretation of the -convergence approach. (1) A negative and significant coefficient for the initial condition is compatible with both neoclassical and technological diffusion models [Sala-i-Martin (1996)]. In other words there is an observational equivalence in the results of the two models and more research is required to assess which one is the underlined convergence mechanism: decreasing returns to capital or technological catching up. (2) Several contributions [Bernard and Durlauf (1996), Quah (1996b)] have proved that conditional convergence results can mask the presence of the multiple locally-stable convergence clubs predicted by various endogenous growth models. (3) If the aggregate framework is abandoned in favour of a more realistic multi-sectoral approach it has been shown [Paci and Pigliaru (1997)] that the observed process of aggregate convergence can hide important structural change phenomena. (4) To test growth models, based on aggregate production function, only labour productivity should be used as the dependent variable, as we have already remarked in the Introduction. Using per capita income we are simply testing an interesting statistical relationship between the average growth and the initial condition that cannot be considered a test for specific growth models.

Due to these problems, we will use the simple cross-sectional linear estimates as an empirical tool, useful to describe the growth process, without trying to consider them as test of a specific analytical model.

The estimation results for labour productivity are reported in Table 4, while Figure 10 displays the plot of the average growth rate against the initial productivity level. For the whole period there is a significant process of absolute -convergence. The coefficient of the initial condition is negative and highly significant: the model predicts that the less productive regions would grow at a rate of 2.37% higher than the initially more efficient regions. The explanatory power of the regression is very high. However the result for the entire period covers large differences over time. Indeed all the convergence process took place during the period 1960-75 when the catching up coefficient was very significant, the convergence speed was about 6.36% per year and the $R^{2adj}$ at 0.94. Figure 10.C clearly shows how the regions with lower productivity levels have grown much more than the reach ones: the six fastest growing regions are all in southern Italy. On the other hand, in the other two sub-periods, 1951-60 and 1975-93, there is no evidence of a convergence process. From Figure 10.D we can see that in the last period considered there are "poor" regions with high (Molise, Abruzzo, Puglia) and low growth (Calabria, Basilicata) as well as "rich" regions with high (Lombardia, Liguria, Piemonte) and low growth (Trentino, Valle d'Aosta).

The analysis of absolute convergence has emphasised two remarkable - and contrasting - results: the first is the outstanding process of productivity convergence during the 1960s and the first part of the 1970s; the second is that in the past two decades the catching up process was completely absent in Italy. We will discuss later the implications of these findings.

To control for differences across groups of regions we have included two dummy variables.[15] The first, DS, includes the eight southern regions of Mezzogiorno and test the well known dualistic feature of the Italian economic development. The second, DA, includes the seven regions of the Adriatic belt whose strong economic development has been recently emphasised by the literature.[16] The dummy south turns out to be significant and negative for the entire period and for the sub-period 1951-60, signalling that, together with a process of global convergence (the coefficient of the initial condition is still significant), the Mezzogiorno's regions have also converged toward a local lower steady state. The Adriatic dummy is significant and positive when we consider the entire period, confirming that these regions tend to converge to a higher equilibrium level. Moreover the coefficient of DA is significant for the period 1975-93 while this is not the case for the initial productivity level: it means that there is only a local higher growth process among the Adriatic regions. Considering the peculiar performance of the Adriatic belt's regions we have estimated for the period 1975-93 a conditional equation with a dummy that includes only the five non-Adriatic regions of Mezzogiorno. The result indeed show a process of local convergence among this group below the national average.[17] The last interesting point is that during the period of strong global convergence, 1960-75, both dummies are not significant and the speed of convergence is not affected by the inclusion of these control variables. That period was indeed characterised by an outstanding process of absolute convergence.

Now, let us ignore for a while the shortcomings previously listed on the interpretation of the -convergence mechanism and consider the following question. Can we conclude from these results that the observed convergence over the entire period is due to a mechanical process based on the diminishing return to capital? It is really arduous to give a positive answer to this question. First because at the beginning of the 1960s the Italian national government started a massive plan for the industrialisation of the southern regions, so that we cannot really appraise if the relative higher growth of these regions is due to

[15] See the Appendix for the composition of the two groups.

[16] On the evolution of the Italian regional growth along three different patterns see the original contribution of Bagnasco (1977).

[17] It is interesting to notice that the three Adriatic regions of Mezzogiorno show a growth in the labour productivity relative to the centre-north regions over the period 1975-93, while all the remaining five regions display a decline.

market forces or policy measures.[18] Secondly the neoclassical growth model is not capable to explain why, after a limited period of strong reduction of the dispersion, the still high differences in the productivity levels have not induced anymore the less efficient regions to grow faster. In other words, the simple Solow's growth model cannot account for why a mechanical process, driven by market forces, has stopped its normal functioning for a period as long as 18 years. It seems thus that we need to investigate into other factors to interpret the Italian regional development.

Let now turn our attention to the per capita income (Table 5 and Figure 11). The results are similar to the labour productivity case. There is convergence over the entire period, although the catching up speed is now much lower (1.13%) than in the previous case. One more time we must remark that the convergence process is limited to the period 1960-75; moreover in the period 1975-93 the coefficient of the initial income level turns out to be positive, despite not significant, signalling for the presence of a divergence pattern. It is worth noticing that in this case the dummy south is significant and negative in all the sub-period showing a specific pattern of per capita income of the Mezzogiorno's region below the national average.[19]

The scatter diagram highlights the peculiar behaviour of Valle d'Aosta for the per capita income variable; therefore we have also estimated our regression excluding this outlier. The main differences in the estimation results are that for the entire period the catching up process is less strong and significant and the convergence speed is reduced to 0.6%. More important, in the last period, 1975-93, the exclusion of Valle d'Aosta allows to detect a global divergence process occurring across the Italian regions: the coefficient of the initial level of per capita income is indeed positive and significant (t-stat = 3.02) and the annual divergence speed is about 1%. This is a very important result, mainly due to a worsening of the labour market opportunity in the southern regions. The wealth conditions of the Italian regions are diverging and this outcome calls for more effective policy measures.

As before, let summarise the main results of the -convergence analysis.

*Per capita income.*

1. The observed convergence process is limited to the period 1960-75.
2. In the last twenty years we detect a divergence process in the wealth conditions.

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[18] Indeed Paci and Pusceddu (1994) show that the investment incentives granted by the Italian government play a positive role in explaining productivity growth among the Southern regions expecially at the beginning of the 1970s.

[19] Analysing the dispersion of per capita income we have remarked that its overall reduction was mainly due to a convergence process among the north-centre regions. The negative and significant coefficient of the dummy south confirms the previous findings.

3. The Mezzogiorno's regions show a persistent negative pattern with respect to the Italian average.

*Labour productivity*.

4. The global convergence process across the Italian regions is limited to the period 1960-75.
5. There is a local, and above the average, convergence process among the Adriatic regions in 1975-93.

## 5. Sectoral convergence

In this section we analyse the evolution of regional productivity disparities at the sectoral level. This is a very important issue because it allows to better identify the factors that have driven the aggregate convergence of labour productivity shown in the previous sections. However, due to the lack of sectoral regional data, this subject has not received enough attention in the Italian convergence literature.[20] Taking advantage of our broad data-set, we shall examine the trend of productivity disparities across the Italian regions over the period 1960-93 for the main economic sectors: agriculture, industry, private and public services. We shall use value added per worker as proxy to measure sectoral efficiency and to test and convergence.

Let start with the econometric estimates of sectoral -convergence, reported in Tables 6-9. In agriculture there is no evidence of convergence, neither absolute nor conditional; the coefficient of the initial productivity level, although negative, is not statistically significant. However if we have a look to the scatter diagram in Figure 13, where the plot of the average growth rate against the initial productivity level has been reported, we can observe that over the period 1960-75 the results are strongly affected by the performance of Valle D'Aosta. If this region is excluded, it is possible to identify the presence of a slow unconditional convergence across the others. In the next period however, the growth process of productivity seems not to be related anymore to the initial value.

The industrial sector is characterised by both global and local convergence processes. However the result for the entire period masks large differences over time. Indeed unconditional convergence took place only in the period 1960-75, when the coefficient of the initial productivity level was very high and strongly significant (the convergence speed was about 6.4% per year) and the explanatory power of the regression was good ($R^{2adj} = 0.74$). Over the period 1975-93 the estimates reveal only the presence of local convergence across the regions of Mezzogiorno, that are converging along a path that is lower than Italian average.

[20] A notable exception is Paci and Pigliaru (1997) that have evaluated the role of different sectors in determining aggregate convergence over the period 1970-92.

Also in the private services the tendency of the less productive regions to catch up with the more efficient ones took place only before 1975, even tough the speed of convergence was slower (5.2%) than in the industrial sector. Again, during the past two decades, there is not evidence of any process of reduction in the efficiency gap. A similar pattern of productivity differentials can be detected in the public services: the convergence process is limited over the period 1960-75, with a speed (6.9% per year) that is the sectoral highest. For this sector however the estimates for the period 1960-75 reveal not only the presence of an unconditional convergence process but also the existence of two different local convergence clubs: the Adriatic regions grow along a path below the Italian average while the opposite happens for the regions of Mezzogiorno. It is interesting to notice that this is the only case in which the southern regions show an equilibrium pattern that is higher than the Italian average. This result confirms the crucial role of the public sector in sustaining the income levels in the Mezzogiorno.[21]

Let now consider the magnitude of sectoral dispersion and its evolution over time. In Figure 15 we have reported the standard deviation for the four economic sectors. We can see that the highest degree of dispersion is shown in agriculture. Most of aggregate dispersion comes from this sector, in which the difference between the most and least efficient regions have enlarged over the period 1960-93. In industry the average degree of dispersion is lower than that registered in agriculture, moreover it has decreased over time. Even in this case the result for the whole period covers large differences over time: indeed the dispersion shows a strong reduction until 1975 and thereafter a tendency to increase. In the private and public services the productivity levels appear more uniform across Italian regions, moreover the evolution of the dispersion over time seems stable, with only a slight reduction in the public sector over the 1960s.

In conclusion, the reduction in the aggregate dispersion over the period 1960-75, accounted for in the previous sections, seems to be generated by two elements. First a strong fall in the degree of disparity of the industrial productivity: the government-led industrialisation of Mezzogiorno and the opening of this previously protected market have pushed the southern industrial sector toward more efficient conditions.[22] The second element deals

[21] It is worth remembering that in non-market services, value added is simply related to the level of salaries paid to the public employees and not to the unobservable value of the products. Therefore a higher level of labour productivity in the south simply means a higher average level of public wages. Indeed this was a method used by central and local authorities to increase the level of disposable income in the south.

[22] The increase in the Mezzogiorno's labour productivity is brought about by the new capital-intensive firms supported by the financial incentives and by the crowding out of the pre-existing labour-intensive artisan firms in the traditional sectors determined by the opening of the Mezzogiorno's market to the exports of northern firms [Graziani (1978), Faini (1983)]. Whether

with the structural change process of the economy; more precisely the reduction of the share of the highly dispersed agricultural sector in favour of the more concentrated industrial and services sectors.

The analysis of the evolution of productivity disparities at the sectoral level allows us to add other basic facts to our list.

1. The convergence process is limited to the period 1960-75 and involves all sectors but agriculture.
2. Over the period 1975-93 there is not evidence of any process of convergence.
3. The highest degree of dispersion is in agriculture and it tends to slightly enlarge over the period 1960-93.
4. Industry shows the strongest reduction in the dispersion limited to 1960-75, afterward it tends to increase.
5. Private and public services show a low and quite stable degree of productivity dispersion.

## 6. Conclusion

In this paper we have gathered detailed information on the Italian regional growth over the post-war period using several statistical techniques. We have described the evolution of the disparities using, as a measure of regional economic growth, either per capita income and labour productivity, the latter variable both at the aggregate and the sectoral level. Let now put together the various results we have listed at the end of each section, trying to set up a unified picture of the empirics of the economic growth for the Italian regions. We can single out four basic facts.

1) The analysis of labour productivity has shown the existence of a process of absolute convergence and reduction of the dispersion limited to the period 1960-75. This process has involved all territorial areas and it has occurred with a high degree of up and down mobility of individual regions within the distribution. The less efficient regions of Mezzogiorno have partially caught up and the more productive northern regions have lost some of their relative advantage. This process has been mainly driven by a fall in the industrial dispersion and by a reduction in the share of the still highly dispersed agricultural sector.

2) In the past 18 years the productivity convergence process has completely stopped, indeed we have detected a slight increase in the dispersion, arising mainly from the industrial sector and from the southern non-Adriatic regions. The labour productivity distribution does not reveal multi-modal polarisation points; however the variance is still high compared to other industrialised European countries.

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this process has benefited the south or it has only determined a “dependent growth” of the Mezzogiorno’s economy is a crucial and still open issue.

3) As far as per capita income is concerned, there has been a limited period of convergence and reduction of the regional inequality over the years 1960-75. In this case however the convergence process does not appear to be diffused country-wide: it is confined to the already richer north-centre regions while the Mezzogiorno's regions, on average, did not enjoy significant improvements in relative wealth.

4) Starting from the mid-1970s the inequalities started to increase again revealing a divergence pattern across the Italian regions. Per capita income tends to spread according to a two-peaks distribution, where all the southern regions but one are included in the low polarisation point. Nowadays the degree of regional income inequality in Italy is still the highest within the European Union, moreover it is increasingly higher than the productivity disparity due to a worsening of the labour market conditions in the South.

As a corollary of these findings let remark, once again, that the level and the pattern of disparities are different if we consider income per capita or labour productivity. This is a crucial issue too often ignored in the literature, especially in the empirical application of theoretical models, and this shortcoming often induces wrong policy prescriptions.

These are the basic facts of the Italian regional economic growth in the post-war period and they should be used to test the prediction of alternative growth models and the effectiveness of policy measures implemented in the past. Although we leave this complex task to future progress of the research, we want to point out here few remarks.

The first deals with the neoclassical growth model and its prediction of labour productivity convergence driven by the diminishing return to capital mechanism. Our results show that the reduction of dispersion has been completely confined in a very short period of time which was characterised by an enormous policy effort to support the industrialisation of the less productive Mezzogiorno's regions. Moreover the convergence mechanism did not work in the past two decades, despite the productivity dispersion is still high. It seems to us that there is nothing mechanical and continuous in such a process. Therefore our findings suggest that the neoclassical growth model is not able to interpret the case of the Italian regional growth.

At the same time it appears that the prediction of some endogenous growth models of locally stable multiple equilibria does not fit well too. Indeed we detect a high degree of up and down individual mobility within the distribution. More specifically a poverty trap does not seem to exist: among the group of the initially poor southern regions, some have succeeded in escaping - or are still in the process - from the low-level equilibrium club. These are the Adriatic southern regions that have enjoyed the diffusion of growth coming from the northern areas of this belt. As it is well known this economic process is based on the small and medium sized firms and the presence of strong agglomeration economies. Therefore the existence of the gap is not a sufficient

condition for convergence, but it also does not prevent the catching up result under specific favourable conditions.

The last remark concerns the high and increasing degree of inequality in term of per capita income. We have stressed that this fact is the result of the high unemployment and low participation rates that characterise most southern regions. It seems that these regions have succeeded in keeping their productivity growth tied (although still lower in levels) to the more efficient regions, but they have completely failed to ensure adequate working opportunities to their inhabitants. The analysis of the causes and solutions for this problem is now the crucial issue of the regional economic growth in Italy.

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**Tab. 1. Summary of dispersion measures across the Italian regions. 1951-93**

| | 1951 | 1960 | 1975 | 1993 |
|---|---|---|---|---|
| Income per capita | | | | |
| range | 2.7 | 2.76 | 1.83 | 1.92 |
| sigma | 0.355 | 0.372 | 0.231 | 0.262 |
| rank | -0.441 | -0.443 | -0.259 | -0.269 |
| Labour productivity | | | | |
| range | 2.25 | 2.33 | 1.41 | 1.46 |
| sigma | 0,284 | 0.304 | 0.126 | 0.135 |
| rank | -0.334 | -0.344 | -0.133 | -0.154 |

Legenda:
range=interquintile ratio
sigma= standard deviation of log values
rank = coefficient of the rank-size function

**Tab. 2. Regional disparities within European countries (standard deviation of log level in PPP)**

| | Income per capita | | Labour productivity | |
|---|---|---|---|---|
| | 1980 | 1990 | 1980 | 1990 |
| Germany | 0.203 | 0.201 | 0.109 | 0.115 |
| Greece | 0.187 | 0.183 | 0.189 | 0.197 |
| Spain | 0.190 | 0.204 | 0.145 | 0.148 |
| France | 0.138 | 0.158 | 0.105 | 0.101 |
| Italy | 0.264 | 0.274 | 0.130 | 0.140 |
| United Kingdom | 0.105 | 0.117 | 0.052 | 0.050 |

Source: calculation on CRENoS data base: Regio-EU

**Tab. 3. Distribution dynamics across Italian regions**

**A. Per capita income**

| **1951 - 1993** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 0.6 | 0.4 | 0 | 0 |
| 70-90 | 0.2 | 0.4 | 0.2 | 0.2 |
| 90-110 | 0 | 0 | 0.4 | 0.6 |
| > 110 | 0 | 0 | 0 | 1 |
| Initial distr. | 0.25 | 0.25 | 0.25 | 0.25 |
| Final distr. | 0.2 | 0.2 | 0.15 | 0.45 |

| **1951 - 1960** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 1 | 0 | 0 | 0 |
| 70-90 | 0.4 | 0.4 | 0.2 | 0 |
| 90-110 | 0 | 0.2 | 0.4 | 0.4 |
| > 110 | 0 | 0 | 0 | 1 |
| Initial distr. | 0.25 | 0.25 | 0.25 | 0.25 |
| Final distr. | 0.35 | 0.15 | 0.15 | 0.35 |

| **1960 - 1975** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 0.29 | 0.71 | 0 | 0 |
| 70-90 | 0 | 0.33 | 0.67 | 0 |
| 90-110 | 0 | 0 | 1 | 0 |
| > 110 | 0 | 0 | 0.14 | 0.86 |
| Initial distr. | 0.35 | 0.15 | 0.15 | 0.35 |
| Final distr. | 0.10 | 0.30 | 0.30 | 0.30 |

| **1975 - 1993** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 0.5 | 0.5 | 0 | 0 |
| 70-90 | 0.5 | 0.5 | 0 | 0 |
| 90-110 | 0 | 0 | 0.5 | 0.5 |
| > 110 | 0 | 0 | 0 | 1 |
| Initial distr. | 0.10 | 0.30 | 0.30 | 0.30 |
| Final distr. | 0.20 | 0.20 | 0.15 | 0.45 |

**B. Labour productivity**

| **1951 - 1993** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 0.5 | 0.5 | 0 | 0 |
| 70-90 | 0 | 0.67 | 0.33 | 0 |
| 90-110 | 0 | 0.2 | 0.8 | 0 |
| > 110 | 0 | 0.4 | 0.4 | 0.2 |
| Initial distr. | 0.2 | 0.3 | 0.25 | 0.25 |
| Final distr. | 0.1 | 0.45 | 0.4 | 0.05 |

| **1951 - 1960** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 1 | 0 | 0 | 0 |
| 70-90 | 0.33 | 0.5 | 0.17 | 0 |
| 90-110 | 0 | 0.4 | 0.4 | 0.2 |
| > 110 | 0 | 0 | 0.4 | 0.6 |
| Initial distr. | 0.20 | 0.30 | 0.25 | 0.25 |
| Final distr. | 0.30 | 0.25 | 0.25 | 0.20 |

| **1960 - 1975** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 0.17 | 0.83 | 0 | 0 |
| 70-90 | 0 | 0.6 | 0.4 | 0 |
| 90-110 | 0 | 0 | 1 | 0 |
| > 110 | 0 | 0 | 1 | 0 |
| Initial distr. | 0.30 | 0.25 | 0.25 | 0.20 |
| Final distr. | 0.05 | 0.40 | 0.55 | 0.00 |

| **1975 - 1993** | Final year | | | |
|---|---|---|---|---|
| Initial year | < 70 | 70-90 | 90-110 | > 110 |
| < 70 | 0 | 1 | 0 | 0 |
| 70-90 | 0.24 | 0.63 | 0.13 | 0 |
| 90-110 | 0 | 0.27 | 0.64 | 0.09 |
| > 110 | 0 | 0 | 0 | 0 |
| Initial distr. | 0.05 | 0.40 | 0.55 | 0.00 |
| Final distr. | 0.10 | 0.45 | 0.40 | 0.05 |

**Tab. 4. Labour productivity convergence across the Italian regions. 1951-93**

Dependent variable: GDP per worker, annual average growth rate
$y_0$ = log GDP per worker, initial year; DS = Dummy South; DA = Dummy Adriatic
Estimation method: OLS; Number of observations: 20; t-statistics in parentheses

| Periods | Constant | $y_0$ | DS | DA | $R^{2\ adj}$ | $F_{test}$ |
|---|---|---|---|---|---|---|
| 1951-93 | 0.07<br>(17.54) | -0.015<br>(-8.79)[a] | | | 0.80 | 77.3 [a] |
| 1951-60 | 0.03<br>(1.61) | 0.002<br>(0.18) | | | -0.05 | 0.0 |
| 1960-75 | 0.16<br>(25.43) | -0.041<br>(-17.18)[a] | | | 0.94 | 295.0 [a] |
| 1975-93 | 0.03<br>(1.32) | -0.003<br>(-0.43) | | | -0.04 | 0.2 |
| 1951-93 | 0.08<br>(15.23) | -0.019<br>(-8.96)[a] | -0.003<br>(-2.58)[a] | | 0.85 | 54.2 [a] |
| 1951-60 | 0.08<br>(2.76) | -0.016<br>(-1.36) | -0.014<br>(-2.12)[b] | | 0.12 | 2.3 |
| 1960-75 | 0.16<br>(15.45) | -0.043<br>(-11.33)[a] | -0.002<br>(-0.47) | | 0.94 | 144.0 [a] |
| 1975-93 | 0.07<br>(2.09) | -0.014<br>(-1.49) | -0.004<br>(-1.58) | | 0.04 | 1.35 |
| 1951-93 | 0.06<br>(17.10) | -0.014<br>(-8.58)[a] | | 0.002<br>(2.33)[b] | 0.84 | 50.9 [a] |
| 1951-60 | 0.03<br>(1.14) | 0.004<br>(0.43) | | 0.005<br>(0.84) | -0.07 | 0.4 |
| 1960-75 | 0.16<br>(23.49) | -0.041<br>(-16.2)[a] | | -0.000<br>(-0.11) | 0.94 | 139.4 [a] |
| 1975-93 | 0.01<br>(0.76) | 0.001<br>(0.20) | | 0.004<br>(3.05)[a] | 0.28 | 4.8[b] |

a = significant at 1%b = significant at 5%

**Tab. 5. Per capita income convergence across the Italian regions. 1951-93**

Dependent variable: GDP per capita, annual average growth rate
$y_0$ = log GDP per capita, initial year; DS = Dummy South; DA = Dummy Adriatic
Estimation method: OLS; Number of observations: 20; t-statistics in parentheses

| Periods | Constant | $y_0$ | DS | DA | $R^{2\ adj}$ | $F_{test}$ |
|---|---|---|---|---|---|---|
| 1951-93 | 0.05<br>(13.42) | -0.009<br>(-3.96)[a] | | | 0.44 | 15.7 [a] |
| 1951-60 | 0.03<br>(3.16) | 0.001<br>(0.13) | | | -0.1 | 0.02 |
| 1960-75 | 0.09<br>(17.53) | -0.027<br>(-9.26)[a] | | | 0.82 | 85.7 [a] |
| 1975-93 | 0.01<br>(1.09) | 0.005<br>(1.19) | | | 0.02 | 1.4 |
| 1951-93 | 0.06<br>(18.02) | -0.019<br>(-9.03)[a] | -0.009<br>(-6.06)[a] | | 0.81 | 41.7 [a] |
| 1951-60 | 0.08<br>(5.51) | -0.025<br>(-2.81)[a] | -0.024<br>(-3.82)[a] | | 0.40 | 7.3 [b] |
| 1960-75 | 0.12<br>(12.84) | -0.040<br>(-8.77)[a] | -0.011<br>(-3.29)[a] | | 0.88 | 71.7 [a] |
| 1975-93 | 0.06<br>(2.60) | -0.015<br>(-1.57) | -0.010<br>(-2.31)[b] | | 0.21 | 3.5 [b] |
| 1951-93 | 0.04<br>(12.93) | -0.008<br>(-3.66)[a] | | 0.004<br>(2.68)[a] | 0.58 | 14.1 [a] |
| 1951-60 | 0.027<br>(2.34) | 0.004<br>(0.52) | | 0.008<br>(1.39) | -0.0 | 1.0 |
| 1960-75 | 0.09<br>(17.12) | -0.026<br>(-9.39)[a] | | 0.004<br>(1.90) | 0.84 | 51.0 [a] |
| 1975-93 | 0.01<br>(0.93) | 0.005<br>(1.38) | | 0.004<br>(2.00)[b] | 0.16 | 2.8 |

a = significant at 1% b = significant at 5%

**Tab. 6. Agriculture. Productivity convergence across the Italian regions. 1960-93**

Dependent variable: value added per worker, annual average growth rate
$y_0$ = log value added per worker, initial year; DS = Dummy South;
DA = Dummy Adriatic
Estimation method: OLS; Number of observations: 20; t-statistics in parentheses

| Periods | Constant | $y_0$ | DS | DA | $R^{2\,adj}$ | $F_{test}$ |
|---|---|---|---|---|---|---|
| 1960-93 | 0.06 | -0.008 | | | 0.05 | 2.0 |
| | (7.77) | (-1.42) | | | | |
| 1960-75 | 0.08 | -0.009 | | | 0.01 | 1.2 |
| | (7.02) | (-1.08) | | | | |
| 1975-93 | 0.06 | -0.010 | | | 0.01 | 1.2 |
| | (2.84) | (-1.09) | | | | |
| 1960-93 | 0.07 | -0.011 | -0.003 | | 0.01 | 1.1 |
| | (6.22) | (-1.48) | (-0.57) | | | |
| 1960-75 | 0.07 | -0.004 | 0.006 | | 0.01 | 1.1 |
| | (4.76) | (-0.41) | (0.97) | | | |
| 1975-93 | 0.07 | -0.014 | -0.007 | | 0.03 | 1.3 |
| | (3.10) | (-1.44) | (-1.18) | | | |
| 1960-93 | 0.06 | -0.007 | | 0.006 | 0.12 | 2.3 |
| | (7.50) | (-1.38) | | (1.55) | | |
| 1960-75 | 0.08 | -0.009 | | 0.003 | -0.04 | 0.7 |
| | (6.58) | (-1.03) | | (0.47) | | |
| 1975-93 | 0.06 | -0.010 | | 0.009 | 0.07 | 1.7 |
| | (2.78) | (-1.13) | | (1.45) | | |

a = significant at 1%b = significant at 5%

**Tab. 7. Industry. Productivity convergence across the Italian regions. 1960-93**

Dependent variable: value added per worker, annual average growth rate
$y_0$ = log value added per worker, initial year; DS = Dummy South;
DA = Dummy Adriatic
Estimation method: OLS; Number of observations: 20; t-statistics in parentheses

| Periods | Constant | $y_0$ | DS | DA | $R^{2\ adj}$ | $F_{test}$ |
|---|---|---|---|---|---|---|
| 1960-93 | 0.08<br>(8.00) | -0.016<br>(-4.40)[a] | | | 0.49 | 19.3 [a] |
| 1960-75 | 0.15<br>(10.38) | -0.041<br>(-7.42)[a] | | | 0.74 | 55.1 [a] |
| 1975-93 | 0.07<br>(1.44) | -0.012<br>(-0.84) | | | -0.02 | 0.7 |
| 1960-93 | 0.09<br>(9.04) | -0.021<br>(-5.65)[a] | -0.005<br>(-2.58)[a] | | 0.61 | 16.0 [a] |
| 1960-75 | 0.14<br>(8.04) | -0.038<br>(-5.91)[a] | 0.004<br>(1.04) | | 0.74 | 28.2 [a] |
| 1975-93 | 0.10<br>(2.89) | -0.022<br>(-1.99) | -0.012<br>(-3.95)[a] | | 0.44 | 8.4[a] |
| 1960-93 | 0.07<br>(6.77) | -0.014<br>(-3.60)[a] | | 0.004<br>(1.81) | 0.55 | 12.5 [a] |
| 1960-75 | 0.15<br>(8.83) | -0.039<br>(-6.46)[a] | | 0.003<br>(0.82) | 0.74 | 27.4 [a] |
| 1975-93 | 0.06<br>(1.28) | -0.010<br>(-0.73) | | 0.002<br>(0.57) | -0.06 | 0.5 |

a = significant at 1%b = significant at 5%

**Tab. 8. Private services. Productivity convergence across the Italian regions. 1960-93**

Dependent variable: value added per worker, annual average growth rate
$y_0$ = log value added per worker, initial year; DS = Dummy South;
DA = Dummy Adriatic
Estimation method: OLS; Number of observations: 20; t-statistics in parentheses

| Periods | Constant | $y_0$ | DS | DA | $R^{2\,adj}$ | $F_{test}$ |
|---|---|---|---|---|---|---|
| 1960-93 | 0.07 | -0.015 | | | 0.23 | 6.6 [a] |
| | (3.73) | (-2.58)[a] | | | | |
| 1960-75 | 0.15 | -0.036 | | | 0.40 | 13.9 [a] |
| | (4.90) | (-3.72)[a] | | | | |
| 1975-93 | 0.01 | -0.001 | | | -0.06 | 0.0 |
| | (0.33) | (-0.09) | | | | |
| 1960-93 | 0.08 | -0.019 | -0.001 | | 0.21 | 3.6 [b] |
| | (3.43) | (-2.53)[b] | (-0.80) | | | |
| 1960-75 | 0.14 | -0.034 | 0.001 | | 0.37 | 6.6 [a] |
| | (3.65) | (-2.79)[a] | (0.25) | | | |
| 1975-93 | 0.03 | -0.006 | -0.002 | | 0.01 | 1.1 |
| | (0.80) | (-0.54) | (-1.46) | | | |
| 1960-93 | 0.07 | -0.015 | | 0.001 | 0.19 | 3.3 [b] |
| | (3.66) | (-2.53)[b] | | (0.49) | | |
| 1960-75 | 0.15 | -0.036 | | -0.001 | 0.37 | 6.7 [a] |
| | (4.77) | (-3.62)[a] | | (-0.34) | | |
| 1975-93 | 0.01 | -0.001 | | 0.002 | -0.05 | 0.6 |
| | (0.27) | (-0.04) | | (1.06) | | |

a = significant at 1%b = significant at 5%

**Tab. 9. Public services. Productivity convergence across the Italian regions. 1960-93**

Dependent variable: value added per worker, annual average growth rate
$y_0$ = log value added per worker, initial year DS = Dummy South; DA = Dummy Adriatic
Estimation method: OLS; Number of observations: 20; t-statistics in parentheses

| Periods | Constant | $y_0$ | DS | DA | $R^{2\,adj}$ | $F_{test}$ |
|---|---|---|---|---|---|---|
| 1960-93 | 0.07<br>(6.02) | -0.022<br>(-5.14)[a] | | | 0.57 | 26.4 [a] |
| 1960-75 | 0.15<br>(5.97) | -0.043<br>(-4.99)[a] | | | 0.56 | 24.9 [a] |
| 1975-93 | 0.06<br>(1.89) | -0.019<br>(-1.90) | | | 0.12 | 3.6 |
| 1960-93 | 0.08<br>(6.25) | -0.024<br>(-5.37)[a] | 0.001<br>(1.30) | | 0.59 | 14.6 [a] |
| 1960-75 | 0.17<br>(8.53) | -0.051<br>(-7.35)[a] | 0.006<br>(3.69)[a] | | 0.74 | 28.0 [a] |
| 1975-93 | 0.05<br>(0.98) | -0.014<br>(-0.96) | -0.001<br>(-0.51) | | 0.08 | 1.9 |
| 1960-93 | 0.07<br>(5.84) | -0.021<br>(-4.88)[a] | | -0.001<br>(-1.32) | 0.59 | 14.6 [a] |
| 1960-75 | 0.14<br>(6.16) | -0.039<br>(-4.99)[a] | | -0.005<br>(-2.28)[b] | 0.64 | 18.0 [a] |
| 1975-93 | 0.06<br>(1.75) | -0.019<br>(-1.77) | | -0.000<br>(-0.01) | 0.07 | 1.7 |

a = significant at 1%b = significant at 5%

**Fig. 1. The range across the Italian regions. 1951-93**

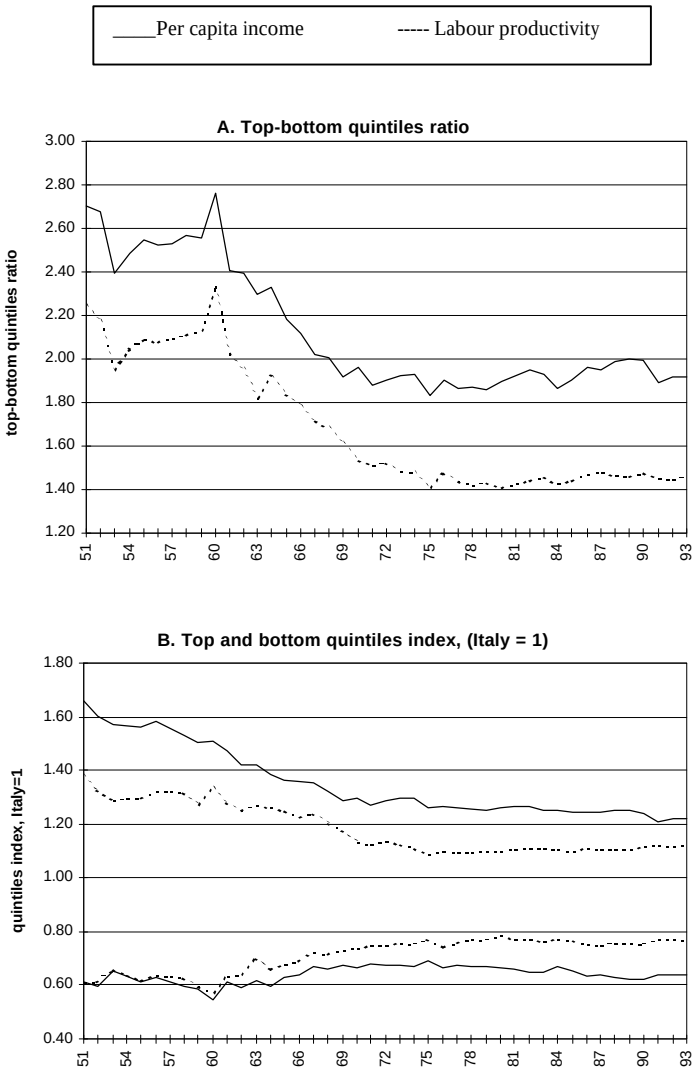
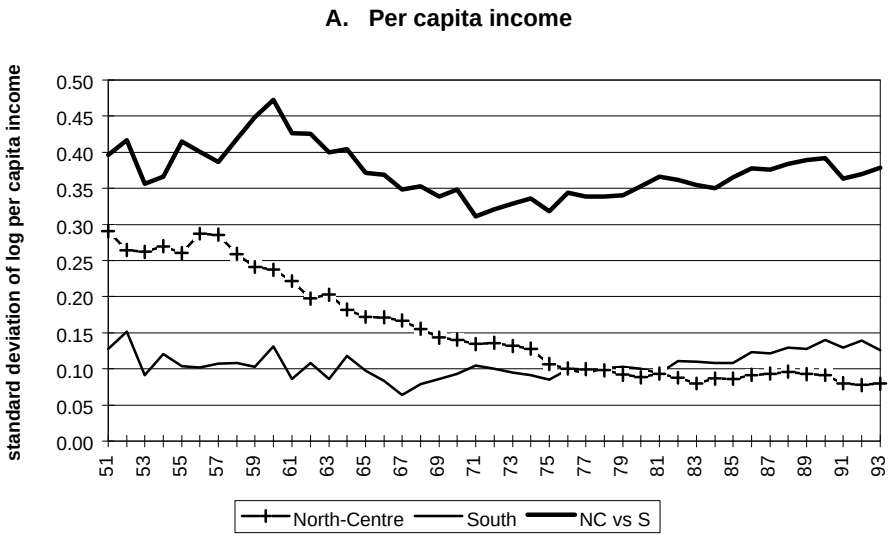


**Fig. 2. The standard deviation across the Italian regions. 1951-93**

**Fig. 3. The standard deviation within groups of Italian regions. 1951-93**



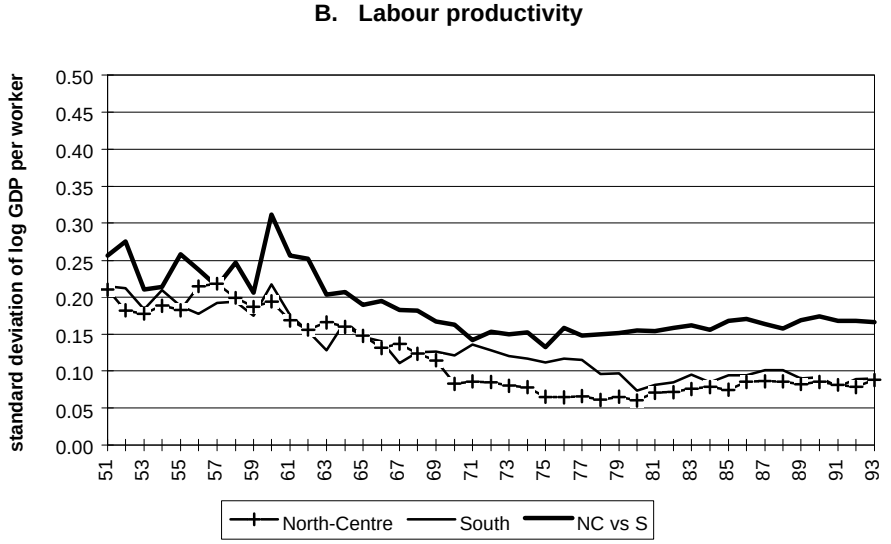
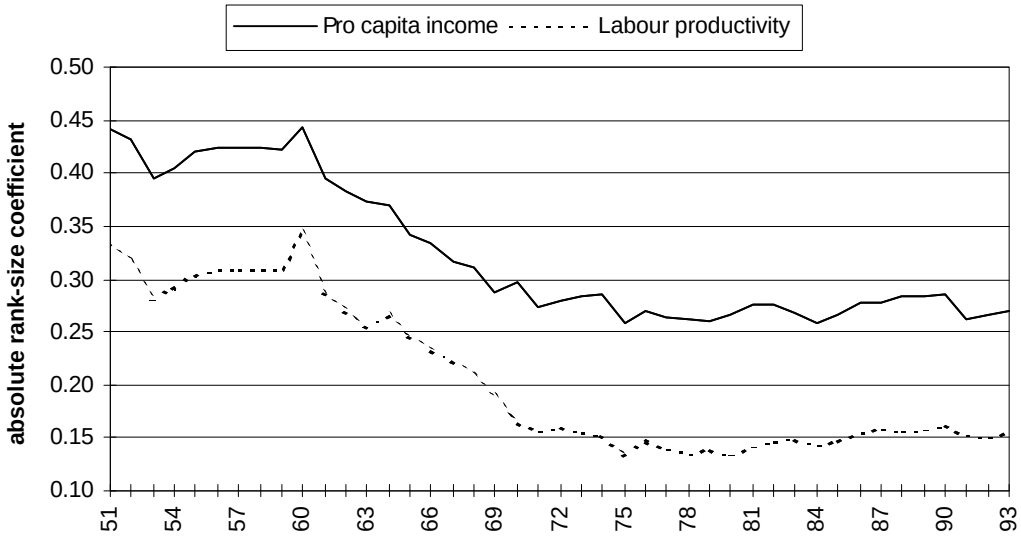
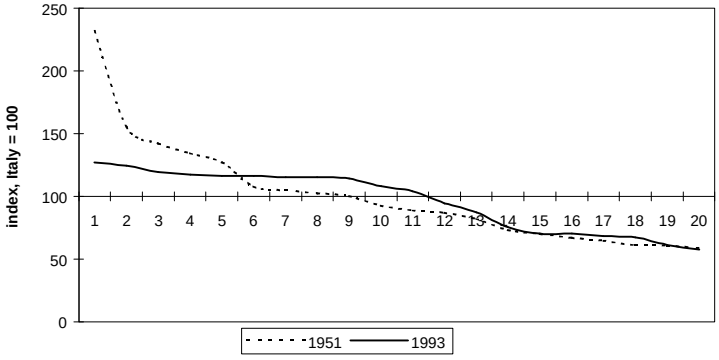



**Fig. 4. Rank-size coefficient across the Italian regions. 1951-93**



## Fig. 5. Shape of the distribution for the Italian regions

**A. Income per capita**
**(st.dev.: 1951=0.355 , 1993=0.262)**




**B. Labour productivity**
**(st.dev: 1951=0.284 , 1993=0.135)**

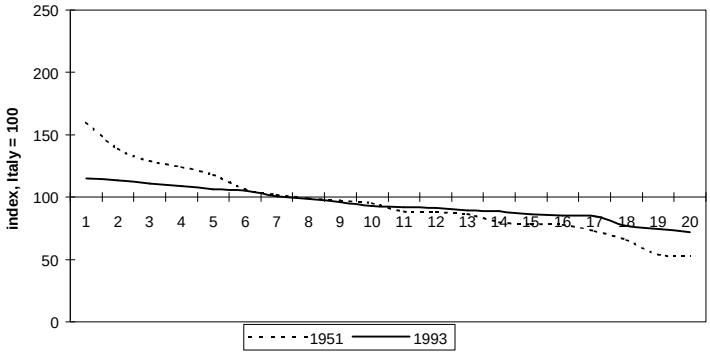
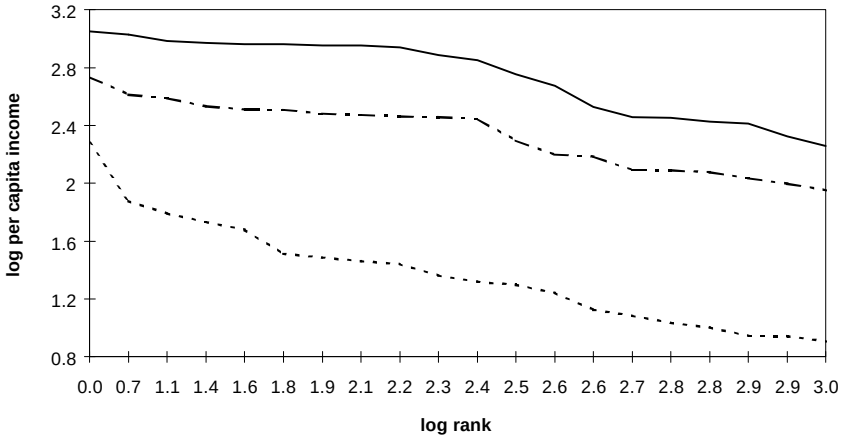


**Fig. 6. The rank size function for the Italian regions**

**A. Per capita income**




**B. Labour productivity**

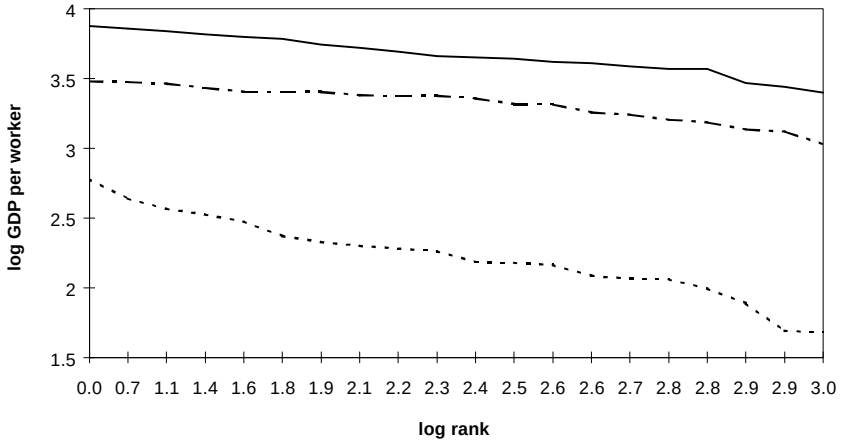


**Fig. 7. Normal probability plot for the Italian regions. 1993**

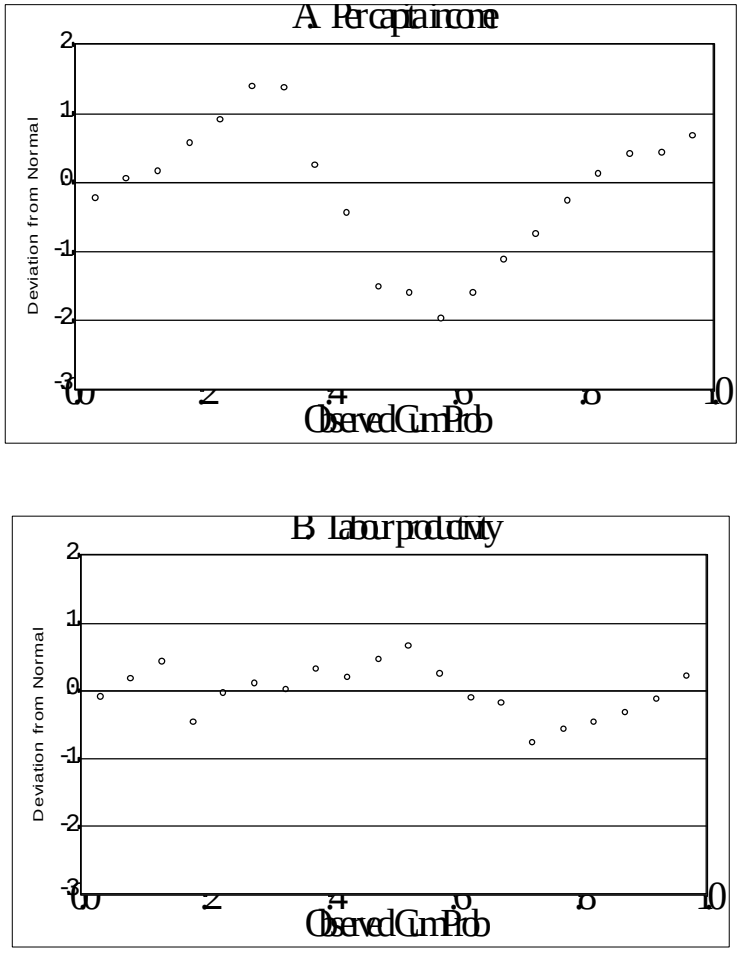
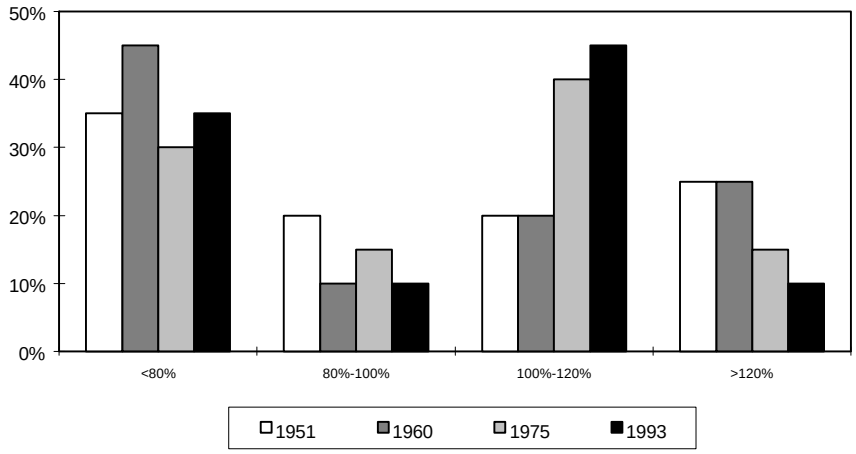


**Fig. 8. Mobility in the distribution of wealth of the Italian regions.**

**A. Per capita income**




**B. Labour productivity**

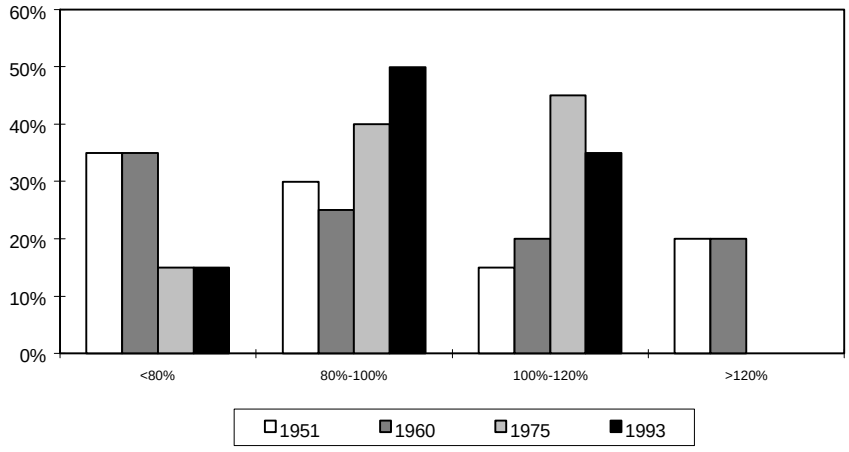
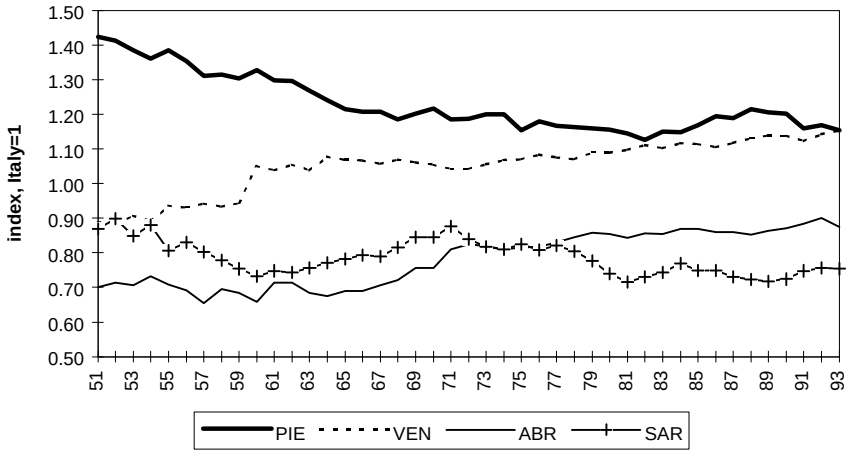


**Fig. 9. Patterns of disparities in selected Italian regions. 1951-93**

**A. Per capita income**




**B. Labour productivity**

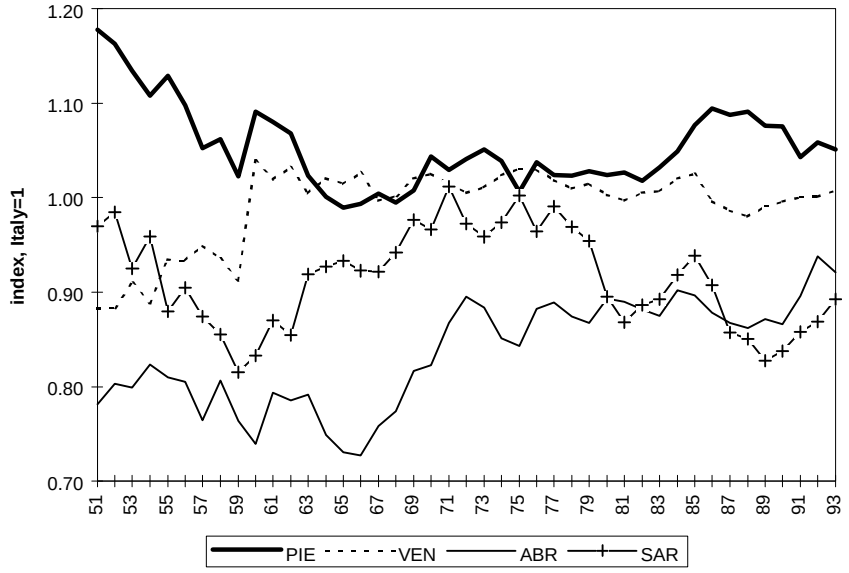


**Fig. 10. Labour productivity convergence across the Italian regions**

vertical axis = percentage annual average growth rate of GDP per worker
horizontal axis = log of initial level of GDP per worker

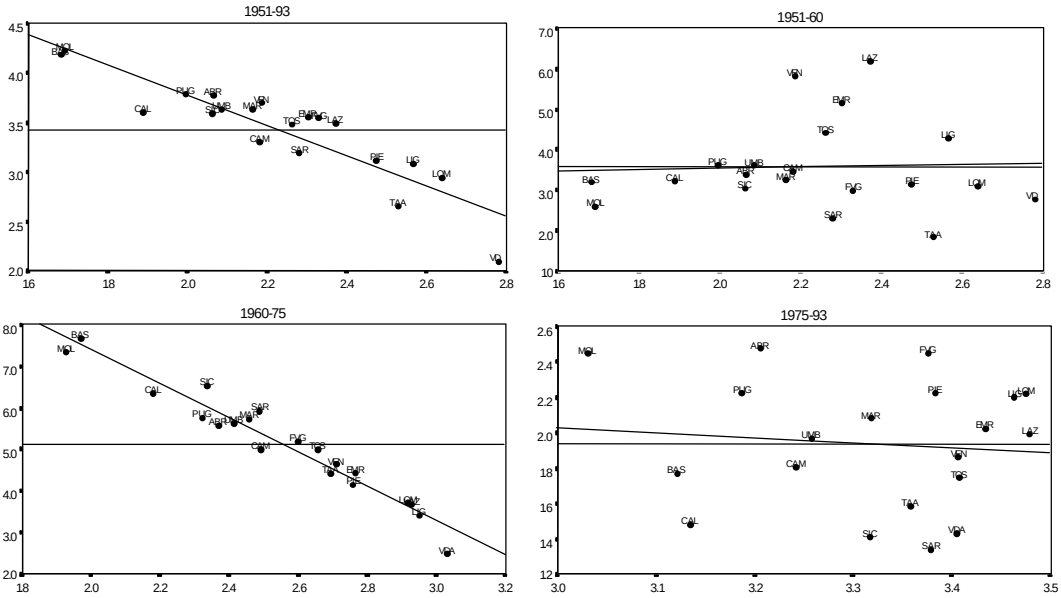


**Fig. 11. Per capita income convergence across the Italian regions**

vertical axis = percentage annual average growth rate of GDP per capita
horizontal axis = log of initial level of GDP per capita

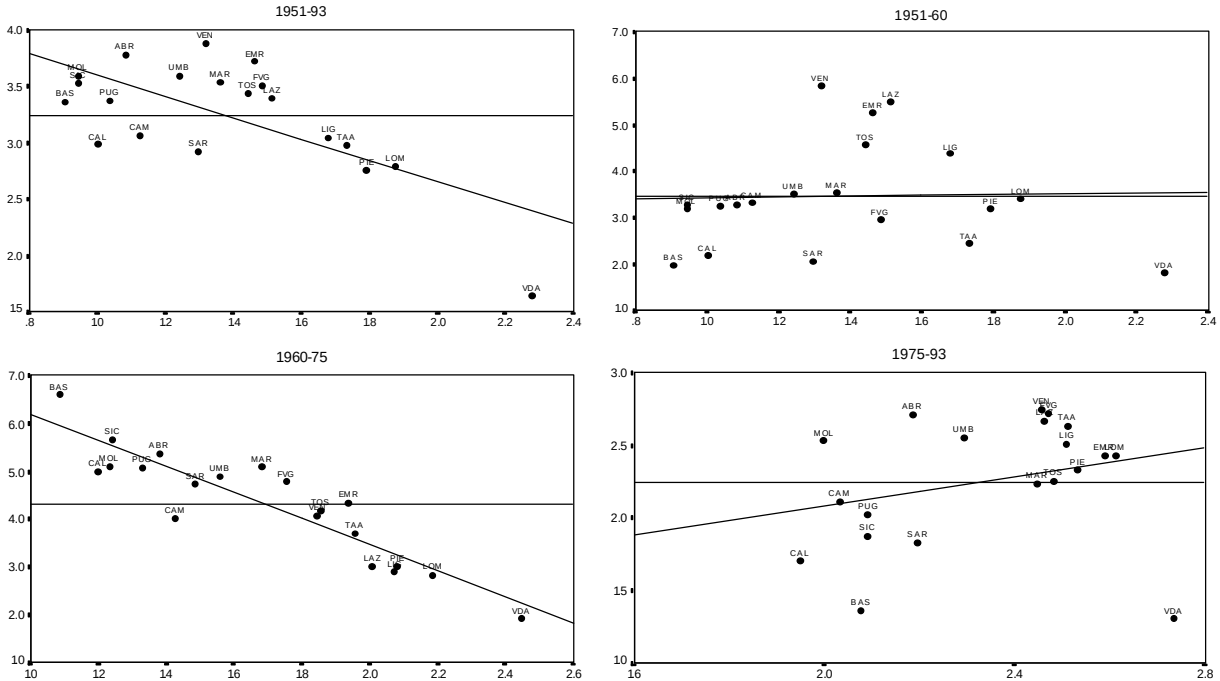


**Fig. 12. Sectoral labour productivity convergence across the Italian regions. 1960-93**

vertical axis = percentage annual average growth rate of value added per worker
horizontal axis = log of initial level of value added per worker

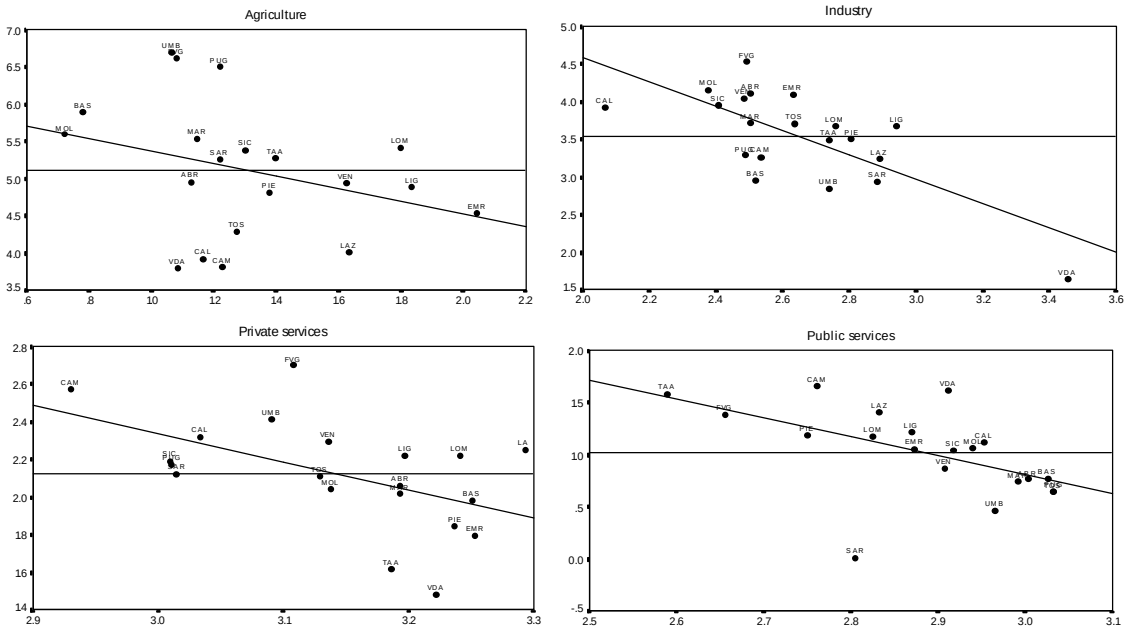


**Fig. 12. Sectoral labour productivity convergence across the Italian regions. 1960-93**

vertical axis = percentage annual average growth rate of value added per worker
horizontal axis = log of initial level of value added per worker

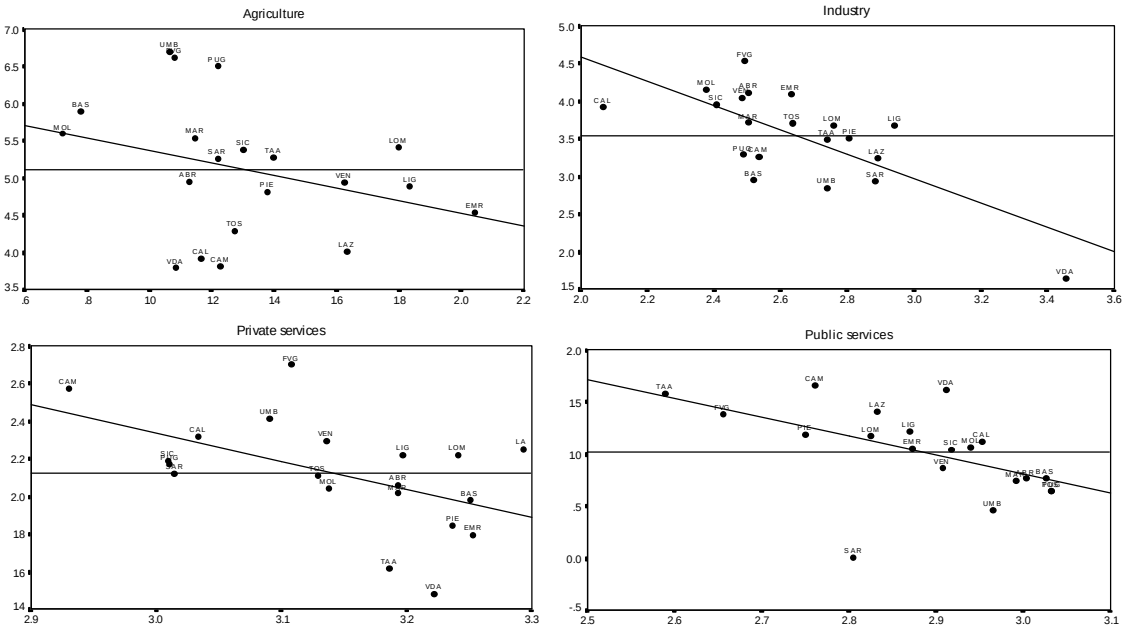


**Fig. 13. Sectoral labour productivity convergence across the Italian regions. 1960-75**

vertical axis = percentage annual average growth rate of value added per worker
horizontal axis = log of initial level of value added per worker

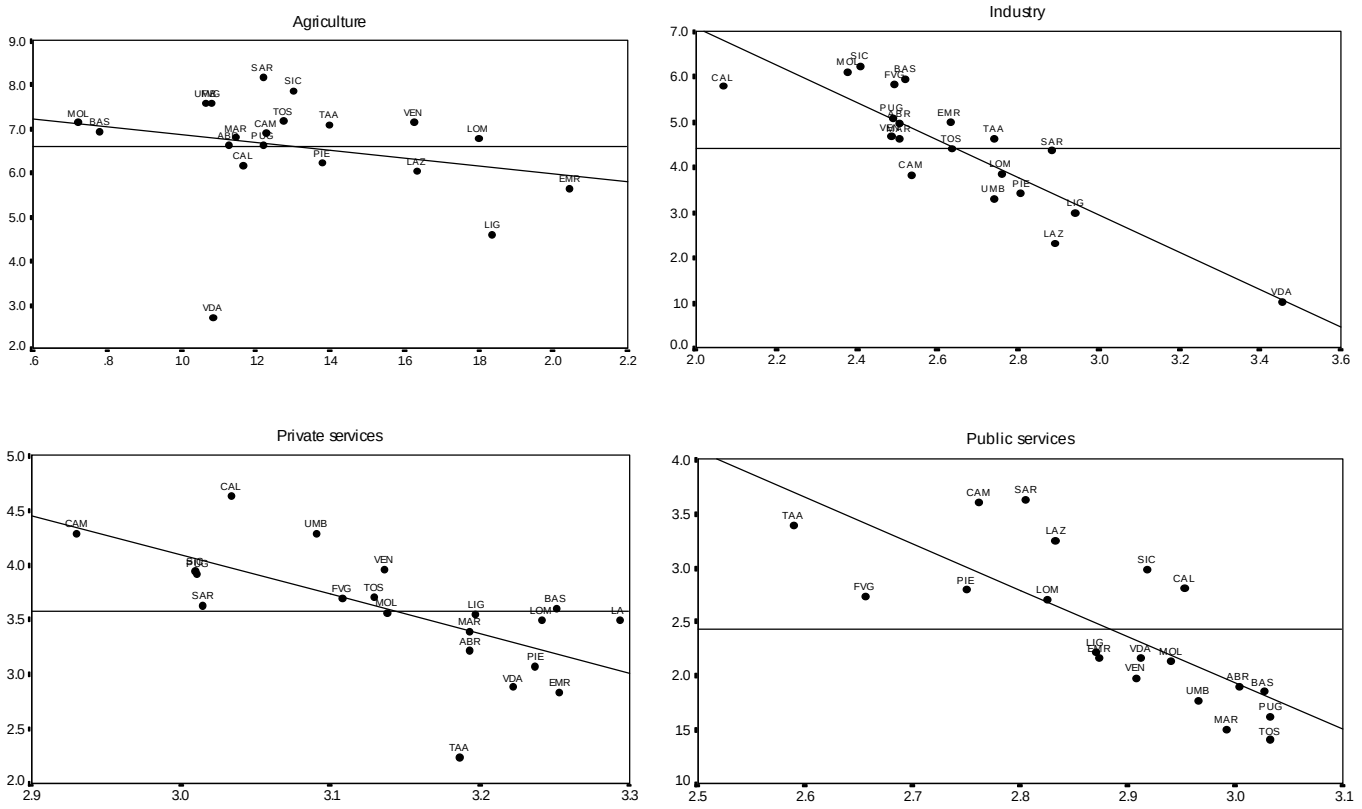


**Fig. 14. Sectoral labour productivity convergence across the Italian regions. 1975-93**

vertical axis = percentage annual average growth rate of value added per worker
horizontal axis = log of initial level of value added per worker

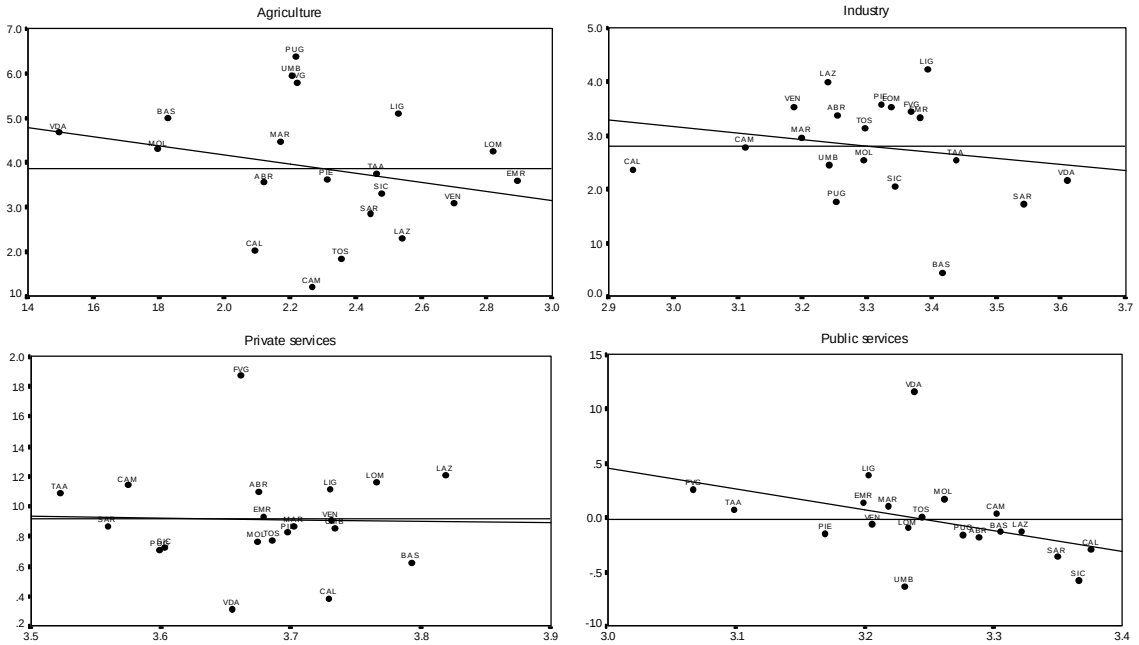
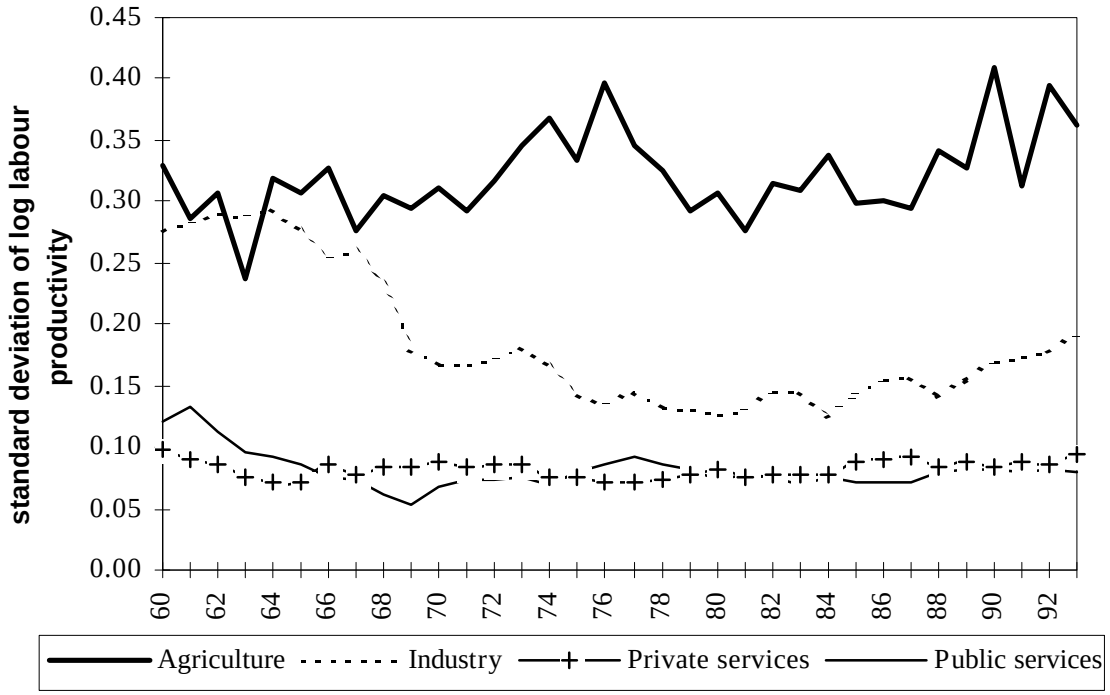


**Fig. 15. The sectoral standard deviation across the Italian regions. 1960-1993.**



## Appendix

In this Appendix we describe in details the database of the Italian regions set up by CRENoS, analysing the variables, their source, the deflators and the techniques we have used to made homogeneous the different series . The database is available under request.

*A. Regions.*

The 20 Italian regions are the following. The letter in parentheses indicates the inclusion in the group of Adriatic (A) or Southern (S) regions.

| | | | | | |
|---|---|---|---|---|---|
| PIE | Piemonte | | MAR | Marche | (A) |
| VDA | Valle D'Aosta | | LAZ | Lazio | |
| LIG | Liguria | | CAM | Campania | (S) |
| LOM | Lombardia | | ABR | Abruzzo | (S, A) |
| TAA | Trentino Alto Adige | | MOL | Molise | (S, A) |
| VEN | Veneto | (A) | PUG | Puglia | (S, A) |
| FVG | Friuli Venezia Giulia | (A) | BAS | Basilicata | (S) |
| EMR | Emilia Romagna | (A) | CAL | Calabria | (S) |
| TOS | Toscana | | SIC | Sicilia | (S) |
| UMB | Umbria | | SAR | Sardegna | (S) |

*B. Variables.*

For the years 1951-1993 we have gathered the following variables at the regional level: Gross Domestic Product at market prices, Population, Units of labour. For the period 1960-93 we have also collected the series of Value Added for the four main economic sectors (agriculture, industry, private and public services). GDP and Value Added are available both at current and at constant 1985 prices. Units of labour are also split at the sectoral level.

*C. Sources.*

*Gross Domestic Product and Value Added:*

- 1951-62, G. Tagliacarne, *Moneta e Credito*, Banca Nazionale del Lavoro, 1961-65;
- 1963-69, UNIONCAMERE, *I Conti Economici Regionali, 1963-70*, Milan: Franco Angeli, 1972;
- 1970-79, SVIMEZ, *I conti del Centro-Nord e del Mezzogiorno nel ventennio 1970-1989*, Bologna: il Mulino, 1993;
- 1980-93, ISTAT, *Conti Economici Regionali*, various years.

*Population*:

- 1951-59, ISTAT, *Sommario storico di statistiche sulla popolazione 1951-87*;
- 1960-93, ISTAT, *Annuario Statistico Italiano*, various years.

*Units of labour:*

- 1951-59, ISTAT, *Occupazione in Italia negli anni 1951-65, Industria*, and *Agricoltura, Attività terziarie e Pubblica Amministrazione*, Supplementi straordinari al Bollettino Mensile di Statistica, 1966;
- 1960-69, ISTAT, *Occupati per attività economica e regione 1960-1970*;
- 1970-79, SVIMEZ, *op. cit.*;
- 1980-92, ISTAT, *Conti Economici Regionali*, various years.

*Deflators:*

- 1951-59, index of the cost of living at the regional level, ISTAT, *Annuario Statistico Italiano*, and *Bollettino Mensile di Statistica,* 1951-61;
- 1960-69, index of consumption prices at the regional level, Padoa Schioppa (1988);
- 1970-79, price index of GDP and Value Added at the regional and sectoral level, SVIMEZ, *op. cit.*;
- 1980-93, price index of GDP and Value Added at the regional and sectoral level, ISTAT *Conti Economici Regionali*, various years.

For all variables we have obtained homogeneous series for the whole period by linking the earlier data to the official series published by ISTAT. To link different series, we have set them in a row by a shift of the intercept. All monetary variables have been calculated in constant values at 1985 prices.

Until 1963 Molise was not established as a region. Therefore, over the period 1951-63, we have considered the data of Campobasso's province, that was i

**Tab. A1. Growth of GDP per capita in the Italian regions. 1951-1993**

| | Annual average rates of growth | | | | Index (Italy = 100) | | | |
|---|---|---|---|---|---|---|---|---|
| REGIONS | 1951-60 | 1960-75 | 1975-93 | 1951-93 | 1951 | 1960 | 1975 | 1993 |
| Piemonte | 3.21 | 3.02 | 2.33 | 2.76 | 142 | 133 | 115 | 115 |
| Valle D'Aosta | 1.84 | 1.93 | 1.31 | 1.64 | 232 | 191 | 141 | 118 |
| Lombardia | 3.41 | 2.85 | 2.44 | 2.79 | 155 | 148 | 125 | 127 |
| Trentino A. A. | 2.47 | 3.71 | 2.64 | 2.99 | 134 | 117 | 113 | 119 |
| Veneto | 5.85 | 4.08 | 2.75 | 3.89 | 89 | 105 | 107 | 115 |
| Friuli V. G. | 2.98 | 4.78 | 2.72 | 3.51 | 105 | 96 | 109 | 116 |
| Liguria | 4.38 | 2.90 | 2.51 | 3.05 | 127 | 132 | 113 | 116 |
| Emilia Romagna | 5.27 | 4.34 | 2.44 | 3.72 | 103 | 115 | 122 | 124 |
| Toscana | 4.59 | 4.18 | 2.25 | 3.44 | 100 | 106 | 110 | 108 |
| Umbria | 3.52 | 4.90 | 2.56 | 3.60 | 82 | 79 | 91 | 95 |
| Marche | 3.56 | 5.10 | 2.24 | 3.54 | 93 | 89 | 106 | 104 |
| Lazio | 5.50 | 3.03 | 2.67 | 3.40 | 108 | 124 | 108 | 114 |
| Abruzzo | 3.28 | 5.38 | 2.71 | 3.79 | 70 | 66 | 82 | 87 |
| Molise | 3.21 | 5.11 | 2.53 | 3.60 | 61 | 57 | 68 | 70 |
| Campania | 3.35 | 4.04 | 2.12 | 3.07 | 73 | 69 | 70 | 67 |
| Puglia | 3.26 | 5.08 | 2.02 | 3.38 | 67 | 63 | 74 | 70 |
| Basilicata | 1.99 | 6.61 | 1.37 | 3.37 | 59 | 49 | 73 | 62 |
| Calabria | 2.20 | 5.00 | 1.71 | 2.99 | 65 | 55 | 64 | 58 |
| Sicilia | 3.29 | 5.67 | 1.88 | 3.54 | 61 | 57 | 74 | 68 |
| Sardegna | 2.08 | 4.74 | 1.83 | 2.92 | 87 | 73 | 82 | 75 |
| North-Centre | 4.26 | 3.54 | 2.48 | 3.24 | 119 | 122 | 115 | 118 |
| Adriatic belt | 4.57 | 4.58 | 2.45 | 3.67 | 87 | 91 | 100 | 103 |
| South | 3.06 | 4.99 | 2.01 | 3.30 | 68 | 63 | 73 | 69 |
| Italy | 3.98 | 3.96 | 2.33 | 3.26 | 100 | 100 | 100 | 100 |

**Tab. A2. Growth of GDP per worker in the Italian regions . 1951-1993**

| | Annual average rates of growth | | | | Index (Italy = 100) | | | |
|---|---|---|---|---|---|---|---|---|
| REGIONS | 1951-60 | 1960-75 | 1975-93 | 1951-93 | 1951 | 1960 | 1975 | 1993 |
| Piemonte | 3.15 | 4.16 | 2.23 | 3.12 | 118 | 109 | 101 | 105 |
| Valle D'Aosta | 2.80 | 2.48 | 1.43 | 2.10 | 160 | 144 | 103 | 93 |
| Lombardia | 3.10 | 3.72 | 2.22 | 2.94 | 139 | 128 | 110 | 115 |
| Trentino A. A. | 1.85 | 4.43 | 1.59 | 2.66 | 124 | 102 | 98 | 91 |
| Veneto | 5.81 | 4.64 | 1.86 | 3.70 | 88 | 104 | 103 | 101 |
| Friuli V. G. | 3.00 | 5.18 | 2.45 | 3.54 | 102 | 93 | 100 | 109 |
| Liguria | 4.28 | 3.42 | 2.20 | 3.08 | 129 | 132 | 109 | 113 |
| Emilia Romagna | 5.15 | 4.45 | 2.02 | 3.56 | 99 | 110 | 106 | 107 |
| Toscana | 4.42 | 5.00 | 1.74 | 3.48 | 95 | 99 | 103 | 99 |
| Umbria | 3.62 | 5.64 | 1.97 | 3.63 | 80 | 77 | 89 | 89 |
| Marche | 3.25 | 5.73 | 2.08 | 3.64 | 86 | 81 | 94 | 96 |
| Lazio | 6.19 | 3.67 | 1.99 | 3.49 | 106 | 129 | 111 | 111 |
| Abruzzo | 3.39 | 5.57 | 2.48 | 3.78 | 78 | 74 | 84 | 92 |
| Molise | 2.61 | 7.35 | 2.45 | 4.23 | 54 | 48 | 71 | 77 |
| Campania | 3.46 | 5.00 | 1.81 | 3.30 | 88 | 84 | 87 | 85 |
| Puglia | 3.63 | 5.77 | 2.23 | 3.79 | 73 | 70 | 83 | 86 |
| Basilicata | 3.20 | 7.68 | 1.77 | 4.19 | 53 | 50 | 77 | 74 |
| Calabria | 3.24 | 6.35 | 1.48 | 3.60 | 66 | 61 | 79 | 72 |
| Sicilia | 3.06 | 6.53 | 1.41 | 3.60 | 78 | 72 | 94 | 85 |
| Sardegna | 2.31 | 5.94 | 1.34 | 3.19 | 97 | 83 | 100 | 89 |
| North-Centre | 4.18 | 4.24 | 2.06 | 3.29 | 111 | 113 | 105 | 107 |
| Adriatic belt | 4.58 | 5.06 | 2.09 | 3.69 | 87 | 92 | 97 | 99 |
| South | 3.31 | 5.92 | 1.79 | 3.59 | 77 | 73 | 87 | 84 |
| Italy | 4.00 | 4.70 | 1.99 | 3.39 | 100 | 100 | 100 | 100 |

**Tab. A3. Labour market statistics in the Italian regions. 1952-93**

| | Unemployment rate | | | | Participation rate | | | | Ratio non workers / workers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REGIONS | 1952 | 1960 | 1975 | 1993 | 1952 | 1960 | 1975 | 1993 | 1952 | 1960 | 1975 | 1993 |
| Piemonte | 5.6 | 3.6 | 3.7 | 7.1 | 45.8 | 49.2 | 41.4 | 43.0 | 1.31 | 1.11 | 1.51 | 1.51 |
| Valle D'Aosta | 5.6 | 3.1 | 0.0 | 4.6 | 55.3 | 46.5 | 39.2 | 46.1 | 0.92 | 1.22 | 1.55 | 1.27 |
| Lombardia | 6.7 | 3.4 | 2.8 | 5.8 | 46.3 | 47.1 | 40.4 | 43.9 | 1.31 | 1.20 | 1.55 | 1.42 |
| Trentino A. A. | 3.7 | 4.6 | 2.9 | 4.1 | 40.3 | 48.2 | 36.6 | 43.9 | 1.58 | 1.17 | 1.81 | 1.38 |
| Veneto | 8.4 | 5.8 | 4.3 | 5.4 | 41.5 | 43.4 | 38.7 | 43.0 | 1.63 | 1.45 | 1.70 | 1.46 |
| Friuli V. G. | 5.0 | 9.9 | 3.6 | 7.0 | 40.7 | 45.2 | 37.4 | 40.8 | 1.59 | 1.46 | 1.77 | 1.63 |
| Liguria | 7.1 | 4.9 | 5.5 | 9.2 | 43.6 | 44.4 | 38.4 | 39.5 | 1.47 | 1.37 | 1.76 | 1.79 |
| Emilia Romagna | 6.6 | 6.4 | 5.0 | 6.0 | 47.8 | 47.8 | 44.4 | 45.9 | 1.24 | 1.24 | 1.37 | 1.32 |
| Toscana | 7.1 | 4.8 | 4.4 | 8.1 | 44.5 | 49.5 | 39.9 | 42.4 | 1.42 | 1.12 | 1.62 | 1.57 |
| Umbria | 6.4 | 6.2 | 7.0 | 7.1 | 42.9 | 46.5 | 39.9 | 40.1 | 1.49 | 1.29 | 1.69 | 1.69 |
| Marche | 5.9 | 4.0 | 3.9 | 6.7 | 47.1 | 50.5 | 43.8 | 42.1 | 1.26 | 1.06 | 1.38 | 1.55 |
| Lazio | 8.4 | 6.9 | 7.8 | 9.9 | 37.8 | 38.0 | 35.1 | 39.7 | 1.89 | 1.83 | 2.09 | 1.79 |
| Abruzzo | 6.2 | 6.5 | 6.7 | 8.9 | 37.3 | 41.0 | 37.2 | 38.4 | 1.86 | 1.61 | 1.88 | 1.86 |
| Molise | 6.2 | 1.5 | 7.5 | 13.1 | 47.0 | 51.4 | 38.1 | 39.2 | 1.27 | 0.97 | 1.83 | 1.94 |
| Campania | 6.5 | 7.7 | 9.3 | 19.6 | 36.9 | 40.1 | 33.7 | 34.5 | 1.90 | 1.70 | 2.28 | 2.60 |
| Puglia | 7.4 | 6.1 | 8.3 | 14.0 | 36.0 | 38.1 | 35.1 | 34.3 | 2.00 | 1.80 | 2.11 | 2.39 |
| Basilicata | 3.6 | 10.1 | 8.4 | 15.0 | 39.3 | 41.5 | 36.2 | 35.0 | 1.64 | 1.68 | 2.02 | 2.36 |
| Calabria | 3.8 | 7.5 | 13.2 | 20.2 | 35.0 | 37.8 | 33.1 | 35.3 | 1.97 | 1.86 | 2.48 | 2.55 |
| Sicilia | 6.7 | 5.4 | 7.6 | 19.7 | 32.2 | 34.0 | 31.4 | 33.5 | 2.33 | 2.11 | 2.44 | 2.71 |
| Sardegna | 7.3 | 7.2 | 9.4 | 18.4 | 32.1 | 35.1 | 30.8 | 36.8 | 2.36 | 2.07 | 2.59 | 2.33 |
| North-Centre | 6.8 | 5.0 | 4.4 | 8.9 | 44.1 | 46.1 | 39.8 | 43.7 | 1.4 | 1.3 | 1.6 | 1.5 |
| Adriatic belt | 7.0 | 6.1 | 5.5 | 10.3 | 42.0 | 44.0 | 39.5 | 42.1 | 1.6 | 1.4 | 1.7 | 1.7 |
| South | 6.3 | 6.7 | 8.9 | 23.1 | 35.3 | 37.9 | 33.5 | 37.5 | 2.0 | 1.8 | 2.3 | 2.5 |
| Italy | 6.6 | 5.6 | 5.8 | 13.6 | 40.8 | 43.0 | 37.6 | 41.4 | 1.6 | 1.5 | 1.8 | 1.8 |