MAIN PATTERNS OF ECONOMIC GROWTH IN OECD COUNTRIES

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En el cuarto trimestre de 1991, la Dirección General de Planificación abrió una línea de estudio sobre el crecimiento comparado de la economía española y convergencia con las economías más desarrolladas. Hasta la fecha se han publicado otros seis documentos de trabajo dentro de este programa:

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D-93005: "Technological Differences and Convergence in the OECD". Javier Andrés y José E. Boscá.

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Abstract

This paper provides a comprehensive account of the most salient features of long run macroeconomic performance in the OECD from 1960 to 1990. Using the constant returns model as an organizing framework, we confirm the importance of capital accumulation for growth and find evidence of a limited catching-up process among OECD economies. However, this process is not stable across countries nor across time periods, and seems to have been severely affected by the unequal response of countries to the short run macroeconomic shocks of the late seventies and eighties. Many aspects of the OECD growth process cannot be explained within the limits of the exogenous growth model and suggest the necessity of an alternative theoretical framework.

Resumen

En este artículo se aborda una descripción detallada de los principales rasgos del proceso de crecimiento en la OCDE entre 1960 y 1990. Tomando el modelo de rendimientos constantes como marco de referencia, se confirma la importancia de la acumulación de capital para promover el crecimiento a largo plazo, asi como la existencia de un proceso de convergencia limitada entre los países de la OCDE. Este proceso no es, sin embargo, estable en el tiempo ni entre países y ha sido fuertemente influido por la respuesta desigual a las perturbaciones macroeconómicas de finales de los años setenta y de los ochenta. Por otra parte, muchos aspectos del comportamiento a largo plazo de las economías de la OCDE no encuentran una explicación adecuada en el marco del modelo de crecimiento exógeno y precisan de un marco analítico alternativo.

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I. Introduction and basic facts.

Much effort has been devoted in recent times to study some of the most prominent features of medium term macroeconomic performance in the OECD, exploiting both the time and the cross section dimension of data sets. The analysis of comparative unemployment experiences (Layard and Nickell (1992)) and, to a lesser extent, of business cycle phenomena (Danthine and Donaldson (1993) and Backus, Kehoe and Kydland (1993)), are examples of such approaches. In this paper we focus on the long run traying to establish the most relevant facts of the growth process in the OECD. There are three main motivations for this exercise. First, welfare depends mainly on per capita income growth over the long run. Second, there is a renewed interest in growth models among macroeconomists, partially due to the important theoretical developments over the last decade. Finally, the OECD is the club of the richest countries in the world who share many economic and political institutions and it presents an adequate balance of common institutional features and varying macroeconomic experiences for which an homogeneous data set can be assembled.

There is a well established result in the empirical literature of growth concerning the pattern of convergence among OECD economies (Barro and Sala-i-Martín (1991), Mankiw et al. (1992)). Working with a homogeneous sample, we have found in a series of papers (Andrés et al. (1994a), Andrés and Boscá (1994)) that underlying the convergence process there are some puzzling facts that do not fit very well with the canonical growth model. In this paper we present a comprehensive picture of these facts and of the long run evolution of the OECD economies. We describe the differential evolution of per capita and per worker GDP, and try to asses the relative importance of alternative engines of growth as well as its correlation with unemployment and the distribution of income. We

also provide some explanations for the interruption in the convergence process from 1975 onwards, with a specific reference to the importance of the short run macroeconomic environment.

The Solow constant returns to scale framework (Solow (1956)) will be used as guideline throughout the paper, mainly to decide which variables and relationships to look at and to set up simple partitioned regression analysis. Although subject to many criticisms, this framework does not appear *prima facie* at odds with some of the features of the long run evolution of the OECD economies. In Figure 1.1 we compare two of these features across world economic regions. As can be seen in panel a) the OECD and Asia are the only regions with substantial and steady growth during the sample period[1]. Furthermore, the share of GDP devoted to increase the capital stock is higher and far more stable in the OECD than in other regions (panel b)). However, the Solow framework is just an starting point; in what follows we shall not subscribe to, nor we aim to test, any particular theory of growth. If any, the results uncover many aspects that have a difficult explanation within the constant returns to scale framework, suggesting the necessity of a broader view. The paper is organized as follows. In section II we present the basic facts of the evolution of growth rates for the OECD during the period 1960-1990. We compute dispersion and 'convergence' measures and their time evolution, and analyze the relation of growth rates with their main determinants. In section III we look at some of these facts in more detail, disaggregating across groups of countries and across shorter time periods. In section IV the correlation pattern among growth and

[1] Data in this figure are from the *Penn World Table 5.5*, an updated version of Summers and Heston's (1991) data set.

medium term macroeconomic indicators is analyzed. In section V we conclude with some remarks about what we have learnt from this exercise and how it can be used to suggest avenues for further empirical and theoretical research.

The most salient patterns we find in the data can be summarized as follows. The OECD presents a unique record of sustained growth and narrowing differentials as compared with other regions in the world. To achieve this (over and above the contribution of well established economic and political institutions) OECD countries have devoted a significant and rather stable proportion of GDP to accumulate physical and human capital. There has been persistence in growth rates, although poorer countries have grown faster than the richer ones. Catching-up has proceeded faster in productivity than in per capita terms, due mainly to persistent differences in participation rates as well as to the unequal unemployment experiences during the seventies and the eighties. There is, on the other hand, some weak evidence of a negative correlation among growth and the distribution of income whereby those countries with higher inequality (after controlling by initial income) display lower growth rates.

The process of catching-up has not been stable along time nor across countries. It seems to have come to an end or, at least, it looks much weaker since 1975 to date. Similarly, the changing ranking of countries both in per capita and per worker GDP posses interesting questions to the study. The first has remained rather stable since 1960, in particular at the two ends of the distribution; differences among middle income countries have become insignificant, while a few countries have experienced large swings. The productivity ranking has been far less stable, with a significant number of

countries overtaking some of the most productive ones in 1960. Growth and convergence have gone hand in hand in such a way that during the recession OECD incomes have ceased to approach and have even started to diverge again. A stable macroeconomic environment has proved to be of crucial importance too. More or less persistent supply and demand shocks have prevented OECD countries not only to grow faster but also to continue the convergence process. Poor countries grew faster than average until 1975, and the opposite has happened since (at least until 1985). In fact convergence among the eighteen more advanced countries in the OECD has proceeded at a steady rate since 1960 all along until 1990.

II. Growth and convergence.

In Table 2.1 we present the basic information on growth rates in both per capita income and productivity[2]. The average rate of growth of income per capita (per worker) was 2.97 (2.84) for the OECD, and slightly higher for the European Union (EU), 3.09 (3.18) and the G7, 3.05 (2.85); while the six poorest countries in 1990 (OECD(6) hereafter: Turkey, Portugal, Greece, Ireland, Spain and New Zealand) grew at a faster rate, 3.26 (3.61). This growth process has been based in reasonable high investment/GDP rates (19.5), as well as in low population growth rates (0.8) and in a substantial investment in human capital (with 72.38 and 19.57 averages in secondary and university enrollment rates). Average growth has been far from homogeneous. Differences in accumulation rates explain part but not the whole of these differences. Some countries' relative success can be

[2] Data in this table and hereafter come mainly from OECD statistics using OECD PPP's. See Doménech and Dabán (1994) and Andrés, Doménech and Molinas (1994) for further details.

explained by relatively high savings rates; this is the case of Japan (5.39 growth rate and 25.21 savings rate), Finland (3.45 and 27.18), Norway (3.23 and 29.66) among the fast growers, and Great Britain (2.16 and 12.2) and New Zealand (1.31 and 14.24) among the slow growers. Variations in enrollment rates are even sharper and at first glance its correlation with growth rates is less clear; countries with very high enrollment rates (such as Denmark and USA) have grown less than others with much less human capital investment (Turkey, Portugal or Italy).

Perhaps the single most discussed issue in the growth literature during the recent years is whether the differences in per capita incomes and/or productivity across countries have narrowed or not along the growth process. A first look at the information in Table 2.1 suggests that the distance of most countries with respect to USA in income, and particularly in productivity levels, has fallen in relative terms, although with very different country experiences[3]. A related issue is whether differences in (human and physical) accumulation rates account for differences in growth rates, or rather there is a genuine catching-up effect whereby poorer countries grow faster than richer ones due to higher investment opportunities. Barro and Sala-i-Martín (1991, 1992) have proposed two ways of presenting the information about the long run path of relative incomes: σ and β convergence. The measure of σ convergence is the time

[3] Consider, for instance, the cases of Germany, Canada, Australia and the United Kingdom, with similar per capita incomes in 1960. Whereas Canada and Germany got very close to the USA level by 1990 (about the 85 per cent), the other two countries were still well below it (less than 75 per cent). This different pattern is also clear in other cases like Japan (30 per cent in 1960 and up to 80 per cent in 1990), Switzerland (stabilized around 96 per cent) and New Zealand (with a substantial worsening in its relative position).

change of the estimated variance of the variable of interest, and does not incorporate any prior about what the relevant model of the economy is. As such, it is only a crude measure of convergence, since the estimated variance of income across countries is contaminated by the variance of the shocks hitting the economy at any particular point in time[4]. Hence, even if the economies were truly getting closer in the long run, this statistic has a lower bound given by the variance of these shocks.

The evolution of the standard deviation of (the log of) per capita income and productivity across OECD countries is displayed in Figure 2.1. Both series start from a similar level in 1960, and since then there has been a steady reduction in dispersion until 1974, although much faster in output per worker than in output per capita. Afterwards, convergence in output per worker has proceeded at a slower rate, whereas that in per capita income has ceased to do so. For the period as a whole, the standard deviation of output per worker has fallen a 43 per cent, whereas the dispersion of per capita income has done so only a 33 per cent. As Figure 2.1 shows this fall in the dispersion of incomes is not a worldwide pattern (see also Parente and Prescott (1993)), in fact, it is very much an OECD feature. Starting from comparable levels in 1960, dispersion in 1990 was much higher in Asia and Africa and has remained roughly constant in Latin America. The fall in dispersion points towards a clear pattern of convergence within the OECD, that has been brought about by the increased integration of goods and financial markets, as well as by the expansion of world trade. All these forces have led to an intensive technological catching-up as

[4] In addition, the standard deviation is a single parameter that does not capture some interesting aspects of the distribution dynamics (Quah (1993a)).

reflected in the steady and sizable fall dispersion in productivity. However, a much slower convergence in the demographic structure and in participation rates has resulted in a more limited convergence in income per capita. Besides, the unequal impact of macroeconomic shocks in the seventies and eighties might explain the interruption in the convergence process in per capita incomes in the OECD from 1974 onwards.

The different pattern in per capita income and productivity reflects a fundamental difference among more and less advanced countries. The decline in the dispersion of productivity has gone hand in hand with a sharp increase in the dispersion of employment rates. Some lagged countries have managed to close the gap with the most advanced ones in productivity terms at the cost of very low employment rates. These economies (most notably Spain) have achieved substantial output gains with very low employment creation. This might be explained by the inadequacy of the supply of human capital to the new skills requirements or by the inability of factor markets to allocate the excess supply of labour (or both).

The notion of σ convergence does not isolate the different factors that contribute to growth, and hence that may lead different economies to fall apart or to get close in the long run. For these purposes the notion of β convergence can be more informative: it is a measure of the speed at which each country's income moves towards its steady-state once it has been pushed away from it due to a particular shock. It can be obtained from a regression model like (1), in which y is output per capita (or per worker), x^* is its steady-state growth rate (which in this model corresponds to the rate of labour augmenting technological progress), $\hat{y}$ is output per capita (or per worker) in efficiency units and y^* its

steady-state value; finally, T is the period of time considered, β is the convergence rate and u is the error term.

$$(1/T)\ \log(y_{it}/y_{i,t-T}) = x_i^* + (1/T)\ (1-e^{-\beta T})\ \log(\hat{y}_i^*/\hat{y}_{i,t-T}) + u_{it} \qquad (1)$$

This measure has four major limitations for our purposes. First, it is not model free, in fact it is only valid in a model with a well defined steady-state and a saddle path dynamic structure, as the constant returns to scale exogenous growth model. More important though, β convergence is a single country implication of the model whose interpretation in a multi-country setting is not straightforward. Third, year averages hide much useful information contained in annual growth rates, not least because it imposes a particular structure to the long run component of per capita income which has not been usually tested but that is against the intuition of stochastic growth models[5]. Finally, as Quah (1993b) has made clear, a parameter like β estimated from multi-country cross section models after time averaging the data, is bound to deliver very little information; in particular, a positive $\hat{\beta}$ may be consistent with a non degenerate distribution of incomes in the long run.

Nevertheless, the model in (1) can still carry out some meaningful information about the determinants of the growth rate, in particular in the OECD sample, where the restrictive assumptions of the canonical growth are more likely to be met. A first look at the autocorrelation pattern of growth rates,

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[5] This is particularly serious when thirty years averages are taken. It should be noticed that this procedure is equivalent to assume a deterministic linear trend structure for the long run component of income (see Quah (1993b)).

uncover another specific feature of the OECD that is not inconsistent with the implication of the exogenous growth model. As Easterly et al. (1993) have pointed out, there is very little persistence in growth rates at a worldwide level, with the exception of the OECD, in which growth rates follow a first order autocorrelation process with declining persistence. Low persistence is difficult to explain in endogenous growth models, in which structural country characteristics determine the growth rates. Similarly, persistence should be high in exogenous growth models until countries approach their steady-state and start to bounce around it, following temporary idiosyncratic shocks. As Table 2.2 makes clear, persistence is quite substantial for the OECD as a whole and it declines steadily from 1960 to 1990; the virtual absence of inertia during 1980-85, and to a lesser extent 1985-1990, can be explained by the increase in macroeconomic turbulence during these years. Persistence is higher and declines by less, in productivity than in income per capita. This means that the productivity catching-up process still goes on, although somehow hidden in per capita terms due to different unemployment and participation experiences across countries.

The declining pattern of autocorrelation in growth rates might be compatible with an endogenous or an exogenous growth model, depending on whether growth rates present a positive or a negative correlation pattern with initial income levels. This is what the β convergence concept is useful for. The absolute convergence version of the model assumes that $y^*_{i,t}$ is either constant or, at least, uncorrelated with $y_{i,t-1}$ and hence that it can be included in the error term and still obtain a consistent estimate of β in (1). Nevertheless, the advantage of the β convergence model is that it allows us to relate growth rates with its main determinants in a well specified model. Figure 2.2 gives a first

hint of an unambiguous negative correlation among growth and initial levels of per capita income in 1960[6], after controlling by the variables behind the (unobservable) steady-state (savings rate, human capital accumulation and population growth). The relation is unambiguously negative and significant; according to this relation it is clear that low income countries in 1960 have enjoyed, on average, higher growth rates[7]. However, nothing in this picture implies that absolute differences have in fact shrunk during these years.

The partial correlation[8] among growth, savings and human capital accumulation is represented in Figures 2.3 and 2.4. The correlation among growth and investment is positive and significant, and it remains so after controlling for initial income, population growth and schooling. This result is stable along the sample period, although it is heavily influenced by the experience of Japan, New Zealand and Great Britain. In particular, the case of Japan with extraordinary high rates of savings and growth during the sample period, has a strong influence in this result. The same significant positive correlation is found between growth and schooling after controlling for the initial income, savings and population growth. Unlike the case of physical capital, this correlation does not hold all along the sample period, vanishing from 1980 onwards[9].

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[6] A very similar picture is obtained using output per worker instead.
[7] Similar results are found in Mankiw et al. (1992), Dolado et al. (1993), Andres et al (1994a) among others.
[8] Given the descriptive aim of this paper we have chosen to present these partial correlations using the technique of partitioned regression. We avoid then issues of simultaneity and reverse causality that we have addressed elsewhere (Andrés et al. (1994a)).
[9] Once the secondary schooling rates become very high in all countries, their variance might not be big enough as to explain differences in income levels. This suggests that maybe some other human capital proxy could be more

These partial correlations[10] do not necessarily imply any sort of causation running from the accumulation rates to growth. In fact, some recent studies suggest that this correlation might be weak if individual country effects are taken in account (Cohen (1993)) and that the direction of causality might be running from growth to capital accumulation (Blömstrom, Lipsey and Zejan (1993)). What they indicate though is that the information contained in the steady-state proxies might be relevant and should be incorporated in the β convergence analysis as is done in Figure 2.2.

III. On Stability of Growth and Convergence within the OECD.

In the previous section we got a picture of the main features of the long run evolution of the OECD as a whole which was quite consistent with what standard growth models lead us to expect. However, underlying these basic relationships, there are many empirical results that deserve a more careful interpretation and a broader theoretical framework. In this section we discuss some of them which arise naturally when we look at the data from a more dissagregated perspective. This dissagregation proceeds both across countries and along time. The motivation to do so lies in two hints of structural instability in our sample, both across country groups and across shorter time

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informative for the OECD in recent times (e.g.: university enrolment rates).

[10] The correlation among growth and population growth is negative as expected, but is not reported here to save space.

periods. Let us first analyze in more detail the process of growth and convergence along time.

In Figure 3.1 we have drawn again the σ convergence line, this time against the theoretical σ convergence (see Barro and Sala i Martin (1991)) that we would expect if the β coefficient we obtained were stable all along the sample period. The nature of the structural break which has taken place in the process of convergence is suggested by the fact that the observed sigma declined faster than the theoretical one until the mid seventies, and much more slowly thereafter. It might be argued that these lines display such unequal behviour due to the increased variance of the medium term macroeconomic shocks, that is not removed in the σ convergence calculation. This could make compatible the stability of the simple exogenous growth interpretation with the observed lack of convergence (which considers short and long run movements in output as being orthogonal each other).

The obvious alternative explanation for the discrepancy among observed and predicted σ convergence is a change in the convergence rate. The information contained in Table 2.1 indicates that this might well be the case. During the 1975-85 decade, the OECD average growth rate fell down to a 2.1 per cent annual rate (from 3.41 during the 1960-75 and 1985-90 period); the drop was even more dramatic among the poorest countries (from 4.09 to 1.59 per cent). Alongside with this slowdown, convergence ceased to proceed any further. Only Austria, Canada, Germany, Denmark, Finland, Iceland, Italy, Japan and Norway kept their catching-up process with respect to USA productivity levels. Some countries simply managed to keep their relative position constant, while others were less fortunate and suffer a deterioration in relative real incomes (Spain,

Netherlands, New Zealand, Sweden, Switzerland). This first hint of a slowdown in the rate of convergence associated to the overall fall in growth rates is corroborated by the low correlation among growth and initial conditions that we find during the 1975-85 decade. β estimates in Table 3.1 display a clear pattern; they are high until 1975 to become smaller or even non significant until 1985 and recover a little since then. This is true regardless of whether we control for the accumulation rates or we do not. The worldwide recession has had different impact across OECD economies. The interpretation of this apparent fall in the convergence rate across OECD economies should be made with caution. Strictly speaking, what $\hat{\beta}$ indicates is the (OECD average) speed at which each country moves to its steady growth path if, for whatever reason, it is away from it. A fall in the convergence rate might be due to a homogeneous fall in the speed at which each country returns to its potential output, or rather to a sharp deterioration in macroeconomic performance in some particular countries, in relation with what their accumulation rates could indicate. The question is then whether we do face a time structural break or rather a cross-country one.

The β convergence model does not fully capture the determinants of cross country variations in growth rates. The natural way to analyze the presence of systematic components in the residuals is to explore their structure across country groups chosen according to income levels. At first sight, these residuals series do not look totally asystematic. In fact, they underpredict the growth rate of most richest countries in 1990 (United States, Canada, Luxembourg and Japan) and overpredict the performance of the poorest (Turkey, Greece, Portugal, Ireland, New Zealand, Spain, etc.), suggesting that some important

omitted variable is needed to explain the final income ranking[11]. Table 3.2 shows the average residual across different country groups, as well as its correlation with initial per capita income. The conditional convergence regression overpredicts the performance of the poorest countries in 1990 (OECD(6)) and, even more significantly, systematically underpredicts the rate of growth of the seven largest countries (G7), both in per capita and per worker GDP. Furthermore, the correlation of the residual with initial income is negative within these two groups, and for the OECD as a whole, which confirms the presence of some pattern in the residuals. It should be noticed that the conditional convergence regression brings together the two sources of growth in the Solow model: the determinants of the long run position of the economy (capital accumulation and technical progress), and the scope for catching-up (measured by the initial conditions). The behaviour of the residuals indicate that rich countries have grown over and above, whereas poor country did less, than what these two components taken together explain.

The analysis of σ-convergence reveals some of these differences across countries. In Figure 3.2 we can appreciate different convergence processes among the richest (OECD(18) and G7) and the poorest OECD countries (OECD(6)). Convergence in per capita incomes and in productivity has proceed among the 18 richest countries in the OECD at roughly the same speed since 1960, slowing down at the end only to the extent that income differences are very small. A similar picture is obtained for the most exclusive G7 club, whereas the evolution within the EU (not shown) resembles much more that of the OECD as a whole. These

[11] See Andrés and Boscá (1994) for a more detailed analysis of this issue.

results taken together point towards the particularly bad performance of the six poorest countries in the OECD since 1975, as the cause of the interruption in the convergence process. In Figure 3.2 we can appreciate how such break in the trend is completely accounted for by the behaviour of the OECD(6). Figure 3.3 shows the comparative performance of OECD(6) and G-7 in terms of the cyclical component obtained using the Hodrick-Prescott filter[12]. The former group improved its relative position during the first part of the sample period, but it has been loosing ground steadly since 1975. Large swings in growth rates among poorer countries are responsible for these differential performance. A weaker productive structure leads to a greater variance in cyclical fluctuations and to long lasting negative effects of economic recessions. As we saw in Table 2.2, the autocorrelation patterns are very different across economic regions. Although the inertia in growth rates decreased all over the OECD during the deepest stagnation period (1980-85), it has been always higher among rich than among poor country groups. This fact could be compatible with a steady impulse for growth in the most advanced countries, which would suggest an interpretation of the growth process closer to the endogenous growth approach, as opposed to the exogenous growth one we gave in the previous section (on the basis of the OECD experience as a whole). Alternatively, macroeconomic shocks might have had more impact upon the most fragile productive structures within the OECD, bringing the period of fast catching-up to an end. We shall return to this in the next section.

[12] Following Hodrick and Prescott (1980), as we are using annual data, we employ a value of 400 for the smoothing parameter.

Differences in the long run economic performance across individual countries, can be better appreciated looking at the change in rankings in both per capita income (Figure 3.4a) and productivity (Figure 3.4b) from 1960 to 1990. There are several interesting facts in the evolution of these rankings. First, the overall change in the ranking from 1960 to 1990 is much more pronounced in productivity than in income per capita; the rank correlation coefficient between 1990 and 1960 is 0.62 in income whereas it falls to 0.51 in productivity. Two periods account for most changes in the ranking which was fairly stable until 1975 and then again from 1980 to 1985. However, this low correlation coefficient should not be interpreted as indicating high mobility in the ranking, at least as far as income per capita is concerned. In Figure 3.4a we appreciate three well defined groups of countries. On the one hand, income differences among middle income countries have become almost insignificant with ten countries in a range of $500 per capita; small differences among countries bias the rank coefficient downwards. At the two ends of the distribution, the ranking is quite stable, with three countries always at the top (USA, Switzerland and Luxembourg) and five of them always at the bottom (Spain, Ireland, Portugal, Greece and Turkey). In fact, absolute difference among these countries and the OECD average have increased sharply. Finally, there is a small group of significant swings with economic 'miracles', such as Japan, and 'disasters'[13] as New Zealand and, to a lesser extent, Great Britain. Changes in the productivity ranking are quite different, and reflect true mobility in relation to the relative position in 1960. USA, at the top, and Greece, Portugal and Turkey, at the bottom, still keep their positions unaltered. However, the

[13] In Parente and Prescott's (1993) terminology.

list of miracles and disasters is now larger. Spain, Japan, Ireland, Italy, France, Belgium and Germany have significantly improved their relative productivity, whereas New Zealand, Denmark, Great Britain, Sweden, Iceland and the Netherlands, have worsened substantially in relative terms.

IV. Growth, Income Distribution and Macroeconomic Performance.

The Role of Macroeconomic Factors on Growth

So far we have been dealing with variables suggested by the growth literature to account for the long run performance of OECD economies. However, there are several reasons to consider another influences coming from shorter run macroeconomic shocks both nominal and real. First, observed growth and accumulation rates incorporate both permanent and transitory components, the latter being not necessarily short lived; therefore it seems wise trying to control for other causes of economic fluctuations. Second, the new growth literature has suggested various channels through which growth can be affected by or associated to exports, inflation, public spending, etc.. Finally, the whole issue of the relation among growth and shorter term macroeconomic fluctuations is still inconclusive[14] and leaves open the question of whether we can improve our understanding of the long run evolution of OECD economies by looking at medium term macroeconomic indicators.

In this section we include six such indicators, partly due to space and data availability limitations, partly because these are the most commonly

[14] A theoretical discussion of this issue is contained in Stadler (1990), Aghion and Saint-Paul (1993) and Stiglitz (1993).

mentioned in the literature (e.g. Grier and Tullock (1989), Kormendi and Meguire (1985), Fischer (1991, 1993), Andrés, Doménech and Molinas (1994b)): exports growth, inflation rate, money growth and its variance, public spending and public deficit. While growth is expected to have a positive correlation with exports growth, its relation with inflation and money growth is ambiguous. On the one hand, nominal impulses may boost demand and hence growth, at least in the short run, mainly if they contribute to lower real interest rates. However, rapid price changes might induce inefficiencies in the allocation of resources; in particular nominal variability generates uncertainty that may in turn reduce investment. Public spending has also ambiguous effects upon growth depending both on its composition and its starting level. Finally, higher public deficits may boost demand in the short run, although to the extent that they affect the intertemporal allocation of resources and crowd-out private investment they may have long lasting negative effects. Lower growth, on the other hand, induces higher deficits.

In Table 4.1 we present a summary of the main features of the medium term indicators of OECD economies. A first look at the table, hints the way in which some of these variables are correlated with growth. The outstanding performance of Japan seems associated with a rapidly expanding growth sector (10.65 per cent annual rate of exports growth), while lower than average growth in New Zealand, Switzerland and the United Kingdom may be partially explained by a continuous deterioration in competitiveness and a significantly lower than average rate of growth of exports (around 4.5 per cent). On the other hand, the overall deterioration in macroeconomic stance during the 1975-85 decade is well captured by the latest eight columns, which show the widespread fall in exports growth and increase in inflation and public deficits during the recession. The most

salient feature is the extraordinary increase in inflation rates among the less advanced countries (OECD(6)). The increase in inflation rates is far more moderate among the richest countries with the exception of Iceland and, to a lesser extent, France, Italy and the United Kingdom.

We have explored the contemporaneous and lag-lead total correlations among all the variables considered in the analysis for the six five year averages between 1960 and 1990. The overall picture is consistent with the expected signs, and suggests a clear pattern for those variables whose correlations we could not sign on a priori grounds. Growth and public consumption are negatively correlated (-0.12), while public surpluses (as percentage of GDP) are positively correlated with growth (0.15). Inflation and money growth have opposite and the most likely signs (-0.14 and 0.09 respectively). Money growth can be thought to contribute to increase demand, at least over the short run, and hence the positive sign might be picking up a business cycle effect. But while money is positively associated with growth, money growth variability (-0.20) and inflation are not, which suggests that there is something more than a pure short run association. Furthermore, the high correlation among money growth and inflation (0.88) and money growth and variability (0.63) indicates that the eventual impact of nominal variables upon growth should be analyzed taking all these variables together. Finally, the association among growth and exports appears strong and positive (0.60).

Nevertheless, a more careful look at the contemporaneous correlations leaves many open questions. We find some surprising total correlation among investment and macroeconomic variables. The influence of inflation, public sector size, and money upon growth is meant to work mainly through their impact

upon either capital accumulation or the efficiency with which capital is used in production. Therefore, we should expect a pattern of correlation among investment and macroeconomic indicators similar to that with growth rates. In fact the opposite is true. Investment rates seem to be higher in economies with larger public sector and deficits (correlations beeig 0.30 and 0.40 respectively). Investment and inflation are only weakly (but if any positively (0.05)) correlated and the same is true (although with a low negative correlation coefficient (-0.05)) between investment and money growth. This would suggest that if some causal relationship is found running from the fiscal stance to growth, it must be working through the efficiency of capital rather than through the accumulation rate itself. The impact of nominal variability is a different matter; its correlation with investment (-0.19) is as strong as with growth, which suggests that accumulation of physical capital is strongly negatively affected by uncertainty and that this effect carries over income growth.

Lagged correlations contribute to complete the picture. Persistence of macroeconomic shocks is in general as high as that of accumulation rates[15]. Only exports growth and money growth variance display less inertia than income growth itself (their autocorrelation coefficients being 0.40 and 0.26 respectively). It is not surprising then that the correlation of growth with lagged variables follows a similar pattern than with current ones. In this case though this pattern also holds, and if any much stronger, for the correlation of these variables with investment, with the only exception of money volatility. Taken

[15] Which reinforces the convenience of looking at the effect of these variables from a long run perspective.

together with the contemporaneous correlation above, this would point towards a dynamic influence of macroeconomic shocks upon investment and a current impact on the efficiency of capital use, both influences leading to a strong long run association among macroeconomic shocks and growth. Lead correlations also reveal a puzzle of the empirics of growth that has been pointed out by some authors (Blömstrom, Lipsey and Zejan (1993)). We find that the correlation of current growth with future investment (0.41) is stronger than the contemporaneous (0.27) and lagged one (0.19). The same happens (although less pronounced since correlations are in general weaker) with respect to human capital accumulation. What this indicates is that accumulation rates are not exogenous to the growth process itself, and that it might well be the case that causality runs from growth to investment rather than in the other way round. Something similar can be said about the relation of growth with the fiscal stance, but not with exports and inflation. A more complete analysis, beyond the scope of this paper, is needed to trace out the dynamic relationships among these variables.

The regression analysis that follows will try to fill the gap between the simple correlation analysis stated before, and the β convergence analysis without controlling for macroeconomic performance factors of previous sections. We have estimated the convergence equation including macroeconomics variables, and we have used the estimated coefficients to express the change of the rate of growth of per capita GDP in terms of the rates of growth of the different regressors[16], so that we are able to evaluate the contribution of each variable

[16] Initial income, investment rate, secondary enrollment rate, population growth, exports growth, inflation rate, money growth and its variance, and lagged public deficit.

to the explanation of the variation of per capita growth rates between different subperiods. Taking equation (1) as a benchmark we can analyze three distinct sources of growth in per capita income. First, there is a catching-up term, that is when the economy grows behind or below its steady-state growth rate due to its distance to the long run equilibrium. Second, the economy can grow because saving rates or population growth rates may change. And third, there are a variety of shocks that can move the economy in either direction. We have augmented this equation to include the possibility of medium term macroeconomic factors affecting the growth rates in the long run. In Table 4.3 we summarize our findings, showing in the left hand side the explanation given by our estimated model to the growth slowdown of the 1975-85 period compared to the decade before, and confronting in the right hand side the evolution of growth rates between the 1985-90 and 1975-85 periods.

The first column tells us the observed reduction in average growth rates between the two reference periods. The OECD as a whole grew on average 1.29 points less in the second decade, though this slowdown is not homogenous across country groups (2.49 points in the OECD(6) and only 0.98 in the G-7). Countries like Spain (3.79), Greece (3.51), Portugal (3.05) or Turkey (2.86) suffered at most the world crisis, inclusive taking into account that they where among the fast growers in the first decade. In the following columns the contribution of some of our variables to the slowdown explanation is quantified. We are going to keep our attention basically on four variables. In the second column we observe that for the OECD as a whole, 0.11 points of the slowdown are due to the catching-up process (transitional dynamics to the steady-state), i.e. countries tend to grow slower the closer they are to their long run equilibrium. This source of slowdown seems not to be very important, and if something can be said,

it is that poor countries were slightly more affected than richer ones, possibly because they were far away from their long run equilibrium. The third column displays results quite similar to the previous ones, investment efforts declined in the OECD, bringing down the rates of growth. The impact was higher in the EU than in both the G-7 and the OECD(6), but again explaining only a small fraction of the overall slowdown.

The next variables in our analysis belong to the macroeconomic performance indicators category. We show only the explanatory power of inflation rates (column 4) and exports growth (column 5), which accounts for most of the influence of our set of macroeconomic factors. The first important fact to be noticed is that these two macroeconomic indicators display a significant explantory power relative to both the catching-up term and the investment rate (0.64 points of the slowdown are explained by the increase in inflation rates and 0.35 points by the reduction in exports growth). More important though is to compare these figures across country groups. We can appreciate that inflation has been especially harmful in poor countries (1.63 points of OECD(6)'s slowdown compared with only 0.29 points of G-7's slowdown). The opposite is true for exports growth performance, where richer countries suffered at most (0.56 points of G-7's slowdown compared with 0.06 points of OECD(6)'s slowdown). Finally, there is another conclussion to be drawn from the left hand side part of the table. According to the estimated parameters of our convergence regression the model overpredicts the slowdown between the to reference decades for the OECD(6), and underpredicts it for the G-7 (the residuals beeing -1.06 and 0.29 respectively). In other words, poor countries did it better than what the model predicts in the first decade, while richer countries did so during the crisis.

In the right hand side of the table we show the same exercise for the differences in growth rates between the 1985-90 and the 1975-85 periods. In this case growth rates increased between the two reference periods. The OECD as a whole grew on average 0.41 points more in the second period, being the OECD(6) and the EU significantly higher than average growers. It is interesting to compare the explanatory power of the variables with the previous ones. As far as the catching-up and the investment rates is concerned, there are not big differences, although investment fell in the OECD(6) and the EU, but not in the G-7. Nevertheless, these variables explain again only a moderate part of the differences in growth rates. The observed pattern of macroeconomic factors shows important differences with the previous one. The reduction in inflation contributed quite possitively to the increase in growth rates both in the OECD(6) and the EU, but in this case the same happened with the richer countries (and to a much larger extent in relative terms). Similarly, the EU and the G-7 countries where able to benefit from increases in their trade performance, while poor countries still suffered from a reduction in their exports activities. Finally, the residuals show a similar pattern as the previous one: the model underpredicts the increase in growth rates between the two periods for the OECD(6) and overpredicts it for the G-7. This result is consistent with the evidence presented in Section 2.

The β convergence equation including the above mentioned macroeconomic variables allows us to make an additional exercise. Using the estimated coefficients of these variables we can compute their aggregate growth contribution, and the standard deviation of such an index across OECD countries. Figure 4.1 shows the five years moving averages of both variables. As we can observe macroeconomic variables have a positive contribution to economic growth

from mid sixties to mid seventies and in the second half of the last decade. However, OECD counties faced the crisis implementing more heterogenous policies than in the period before the economic recession.

The Role of Income Distribution on Growth

Some authors have suggested a negative influence of unequal income distribution upon growth. Althgough this is an old question in economics, only recently the empirical relation between both variables has been analyzed. Persson and Tabellini (1991) indicate that, as economic growth is largely determined by the usable accumulation of knowledge in production, societies with important distributional conflicts allow less private appropriation, less accumulation and therefore less growth. Galor and Zeira (1993) have shown that, under credit retioning, inequalities in income distribution affect long run growth through investment in human capital. Also, Easterly and Rebelo (1993) examine the emprirical relation between fiscal policy variables and inequality in income distribution, concluding that countries with greater inequality before 1970 implement higher levels of public expenditure in education as a fraction of GDP from 1970 to 1988.

Using World Bank data, there are different inequality indicators for OECD countries in different benchmark years, although the number of observations available for each country differs. In fact for four OECD countries (Luxembourg, Iceland, Austria and Greece) there is no available information at all. The best results are obtained using the 1960-90 average ratio between the income share of the richest 20 per cent of the population and the corresponding share of the poorest quintile. This variable ranges from 16.1 in Turkey to 4.7 in Japan and, excluding Turkey, it has an average of 6.7, similar to Asia (6.8) and very much

lower than Africa (13.7) and Latin America (15.3). Inequality seems to be negatively correlated with growth in GDP per capita, although it is not statistically significant in the (conditional) convergence equation. However, this variable presents some interesting partial correlations with other variables. In particular, inequality in OECD seems to be negatively correlated with initial per capita income and with the 1960-90 average goverment consumption to GDP ratio, whereas it has a high positive correlation with inflation and, to a lesser extent, with human capital. In fact, the negative correlation between growth and inequality disapears when we include inflation in the convergence equation. This indicates that, at least in OECD countries, the results suggested by Person and Tabellini (1991) or Easterly and Rebelo (1993) could not hold in a more complete framework, where the relation between the different variables and the directions of causality are properly analyzed.

V. Summary and final remarks.

The purpose of this paper was to uncover the features of the long run performance of OECD economies. Since 1960 there has been a sizable reduction in the dispersion of productivity levels within the OECD, alongside with a similar, although less pronounced, pattern in per capita income. This process of narrowing differentials can be explained by two facts which distinguish the OECD from other world economic regions (Africa, Latin America, Asia (except Japan)): a negative correlation among growth rates and initial conditions (yesterday's poorer countries are more likely to growth faster today) and high persistence in growth rates (countries with higher growth today are more likely to growth faster tomorrow). The fall in dispersion proceeded quite rapidly until 1975 and virtually stopped since then, mainly due to the much worse performance of the

OECD poorest countries during the recession. Growth differentials are partially accounted for by the two forces considered in traditional growth models: accumulation of both physical and human capital are positively correlated with growth rates and so is the distance from initial conditions with respect to potential income levels. However this framework leaves many facts of the recent OECD growth process unexplained.

One of these facts is the relation among convergence and growth. Countries have been catching-up quicker in fast growth than in low growth periods. What this suggests is that poorer countries are the principal beneficiaries of worldwide fast growth times and suffer the most during the recession. The long period of convergence has brought about significant changes in the ranking of countries according to productivity levels with some significant failures and successes. Nevertheless, with the exception of Japan and New Zealand, the per capita income ranking has remained relatively stable with frequent movements among middle income countries (due to minor changes in income) and high persistence at both ends of the distribution, with differences getting bigger in absolute value.

Another unexplained fact is the relation to middle term macroeconomic factors. The inclusion in the analysis of such variables does not help to correct the inability of exogenous growth models to explain the differences across country groups in the growth process, in particular, the performance of poorer and richer countries in the sample. Since we have made no explicit use of any particular theoretical model, we cannot draw proper policy implications out of the analysis above. However some of the patterns discussed throughout the paper give some clues of which the most important growth promoting policy issues

could be. Macroeconomic stability is a necessary environment for sustained growth, specially for those countries with weaker productive structures. Inflation and uncertainty reduce growth mainly trough their impact upon investment. The fall in trade and in exports associated to widespread recessions has a negative multiplier effect. Over and above macroeconomic stability, physical and human capital are the basic engines of growth. Hence saving and accumulation prone policies are wise measures to take.

However, to the extent that the basic exogenous growth framework, that we have loosely followed in this paper, gives an incomplete account of the OECD experience, there might be other important determinants of growth that we have missed out in our analysis. At this stage, though, it is difficult to infer very much about the long run evolution of the wealth distribution across countries on the basis of the model of a single country (Quah (1993c)), without explicit account of factor mobility and spillovers (Lucas (1993)). Similarly, to the extent that the experience in the OECD is neither of steady convergence nor of divergence, it does not fit well in the narrow framework of models with a single steady-state characterization. Finally, the recent OECD growth experience fits rather poorly in a model of competitive market clearing, in particular in the labour market (Aghion and Howitt (1993), Bean and Pissarides (1993)). As much as it is difficult to consider in isolation two long run issues which have always taken to be closely linked as growth and distribution of income (Galor and Zeira (1993)). The differential behaviour of countries that have led to changes in the ranking analyzed in the paper, might hold some of the keys to uncover these ultimate growth determinants. Country specificities and initial conditions (Azariadis and Drazen (1990)) might determine the long run path of the economy, to a greater extent than the aggregate constant returns to scale production

function might suggest. At the same time the correlation among policy variables and growth rates would, if corroborated by more elaborated studies, imply the existence of some mechanism of endogenous growth.

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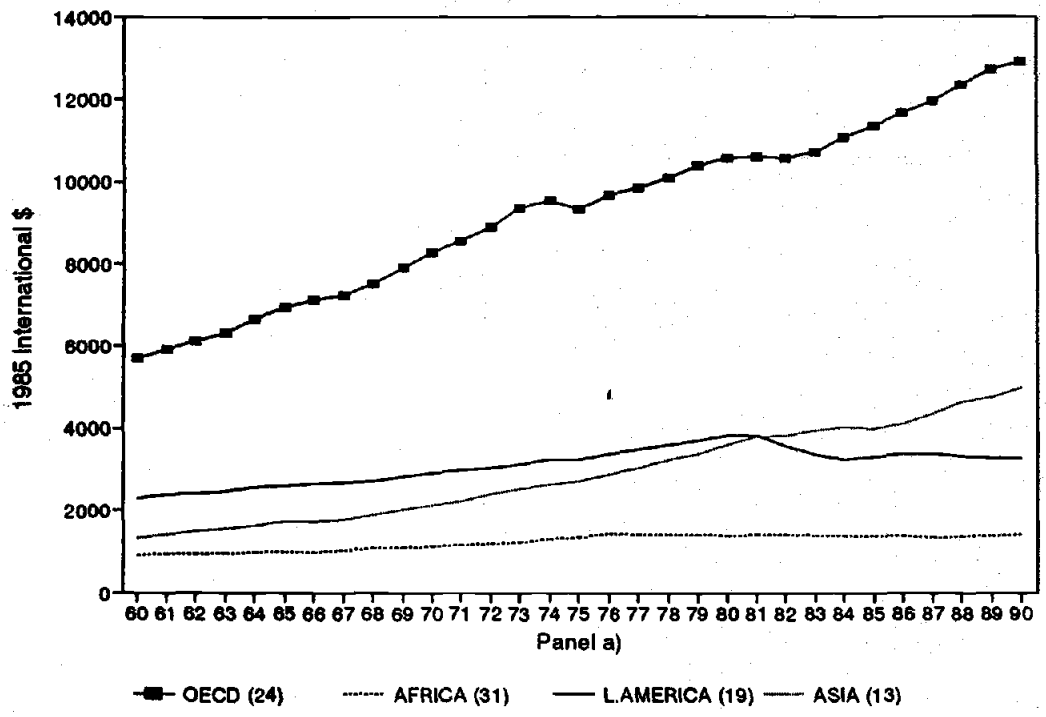
TABLES AND FIGURES

FIGURE 1.1
GDP PER CAPITA ACROSS WORLD REGIONS



RATIO INVESTMENT/GDP
(5 years moving averages)

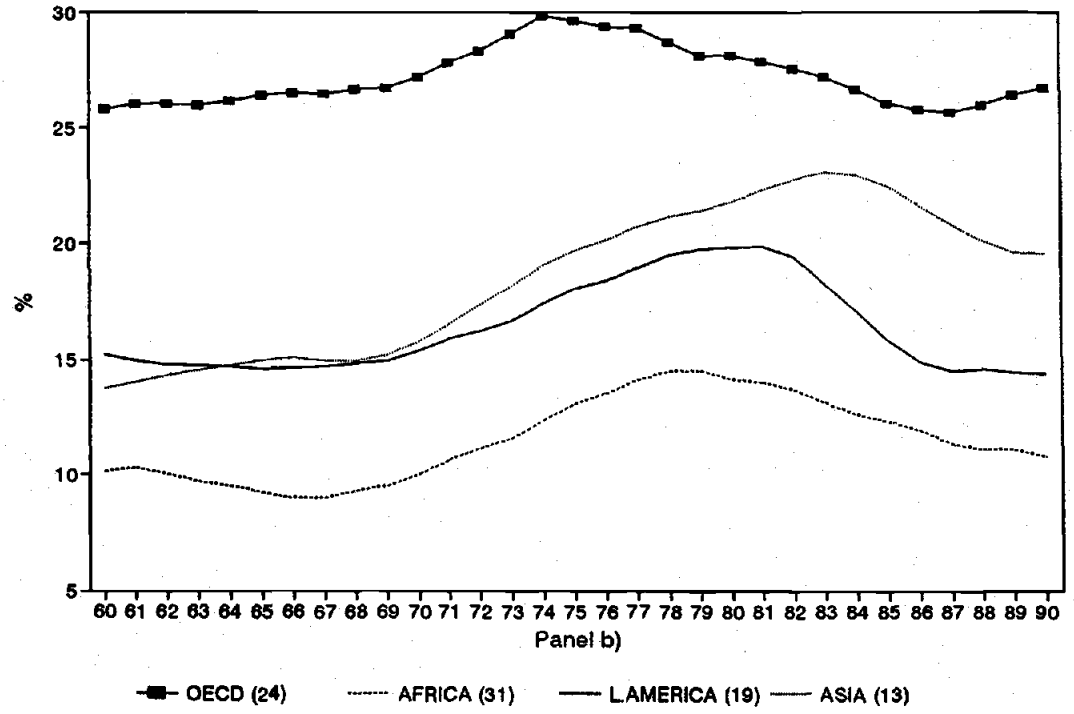


FIGURE 2.1
SIGMA CONVERGENCE ACROSS WORLD REGIONS

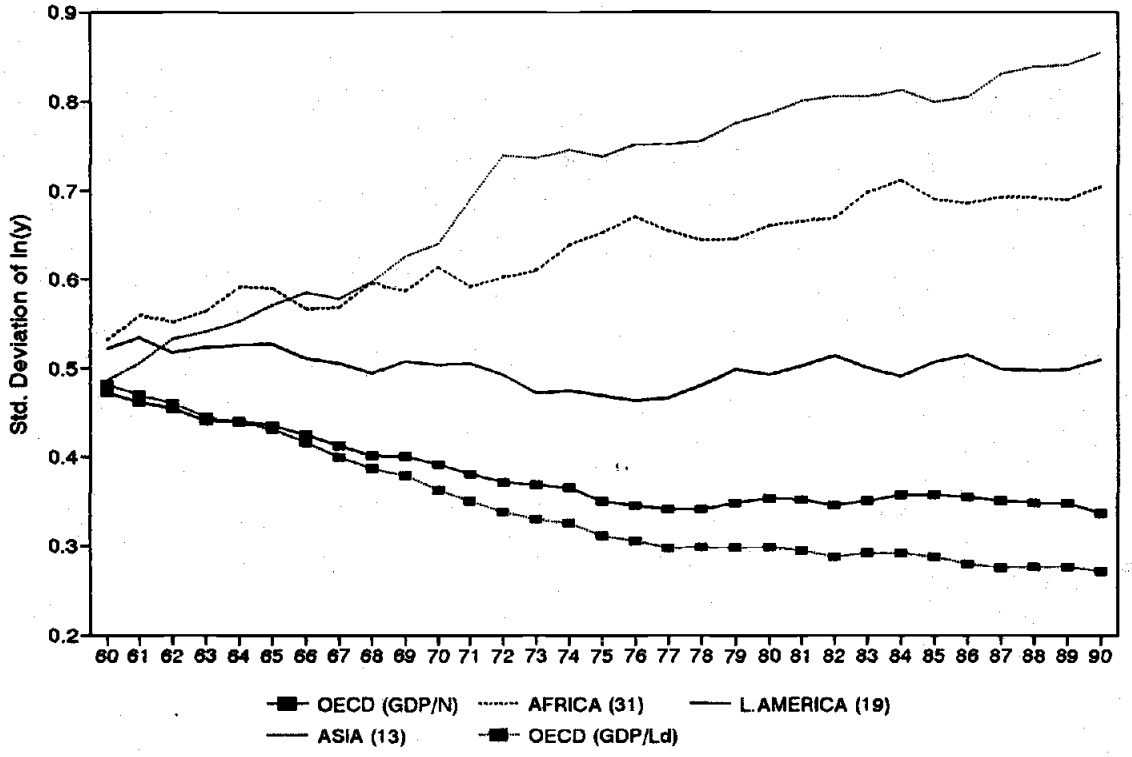
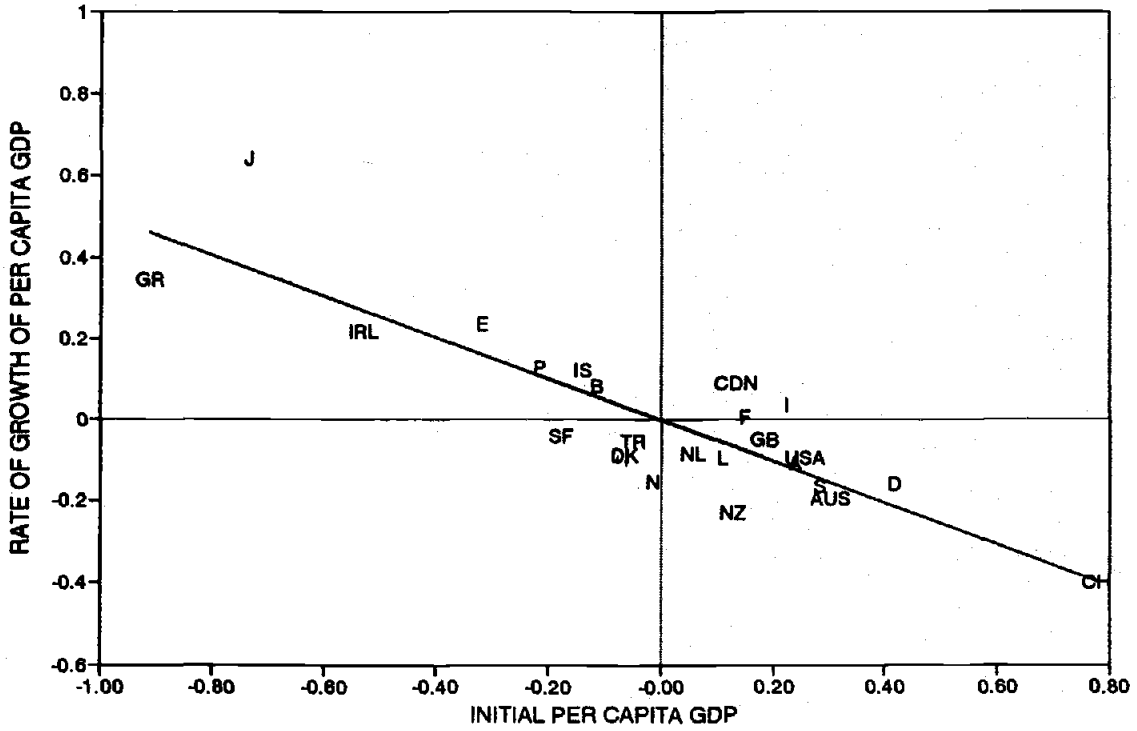
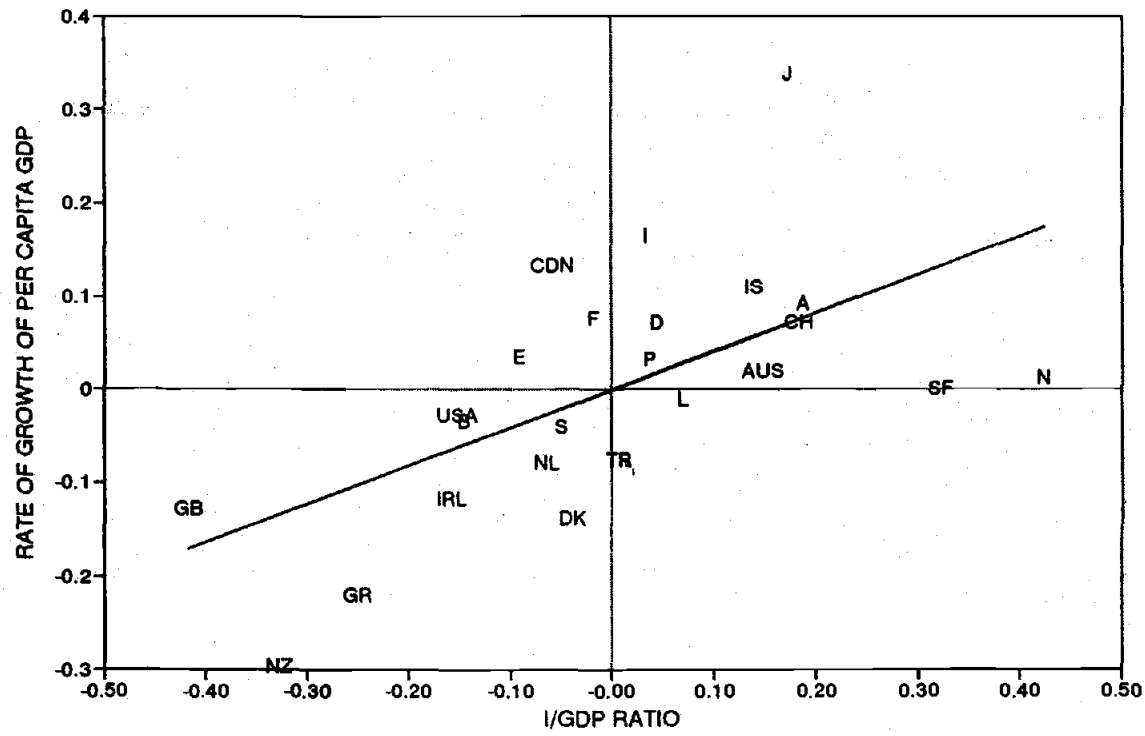


FIGURE 2.2
ß CONVERGENCE IN OECD COUNTRIES 1960-90



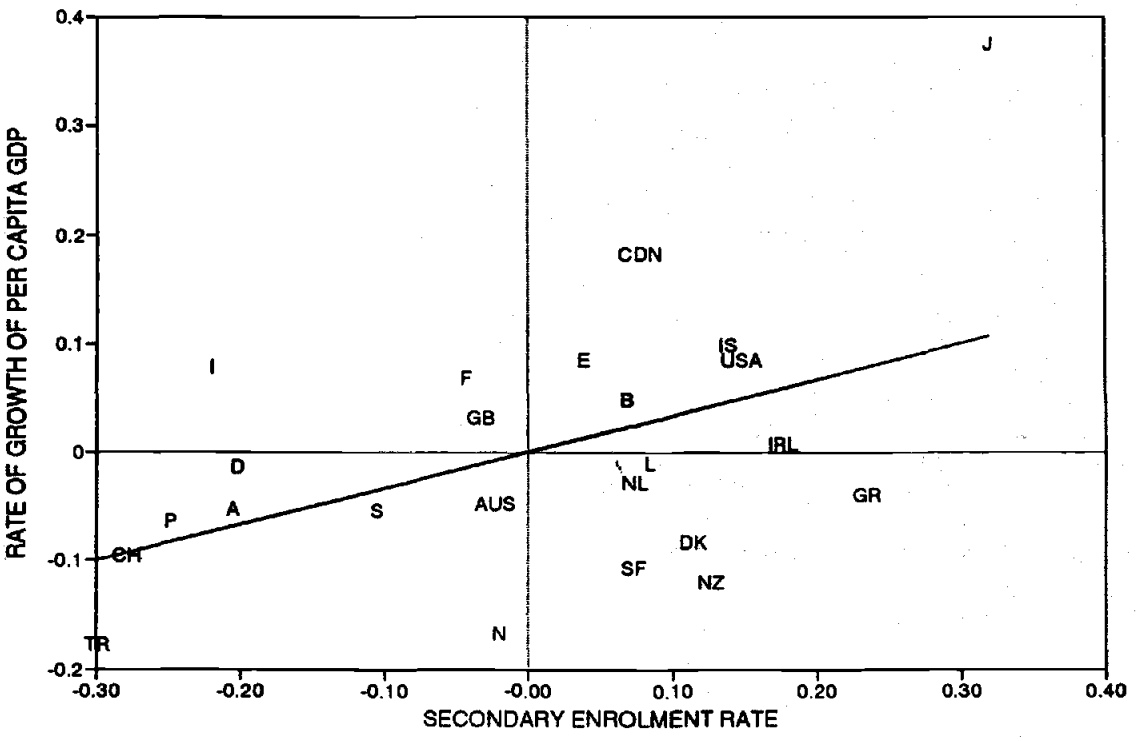
Steady State Orthogonal Components.

FIGURE 2.3
CORRELATION I/Y vs. GROWTH



Orthogonal Components to Initial Income and other Steady State Variables.

FIGURE 2.4
CORRELATION HUMAN CAPITAL vs. GROWTH



Orthogonal Components to Initial Income and other Steady State Variables.

FIGURE 3.1
SIGMA CONVERGENCE IN OECD

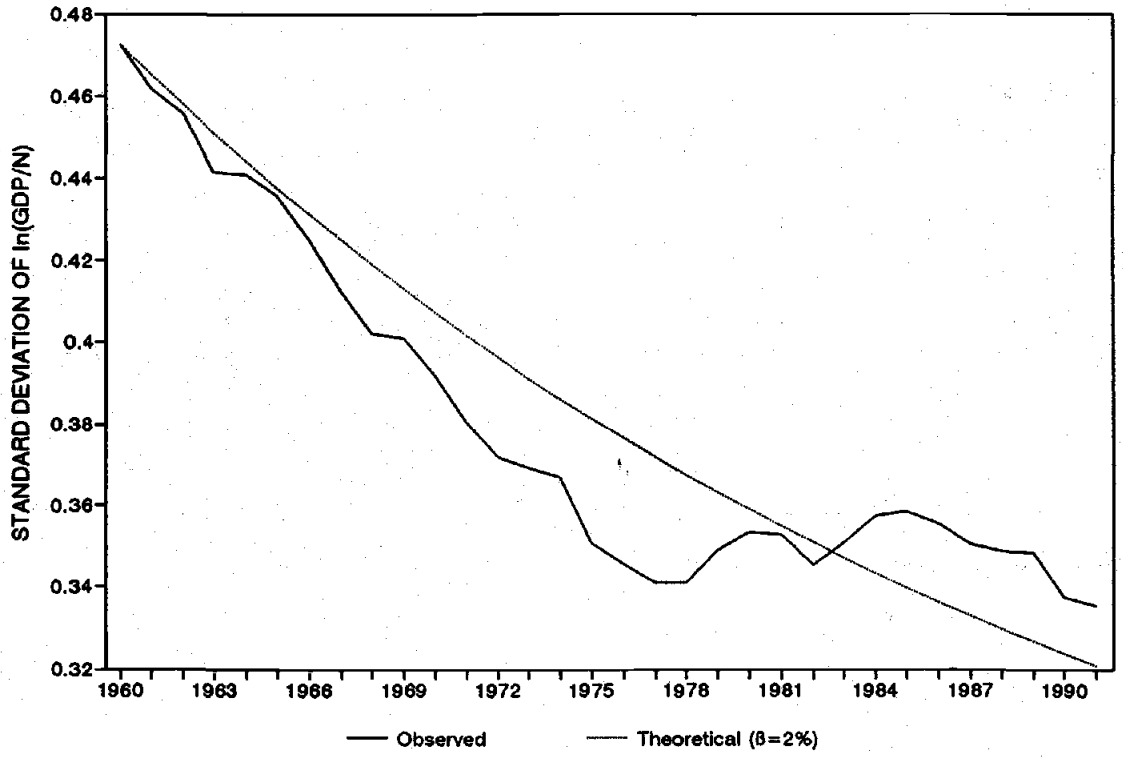


FIGURE 3.2
SIGMA CONVERGENCE ACROSS COUNTRY GROUPS

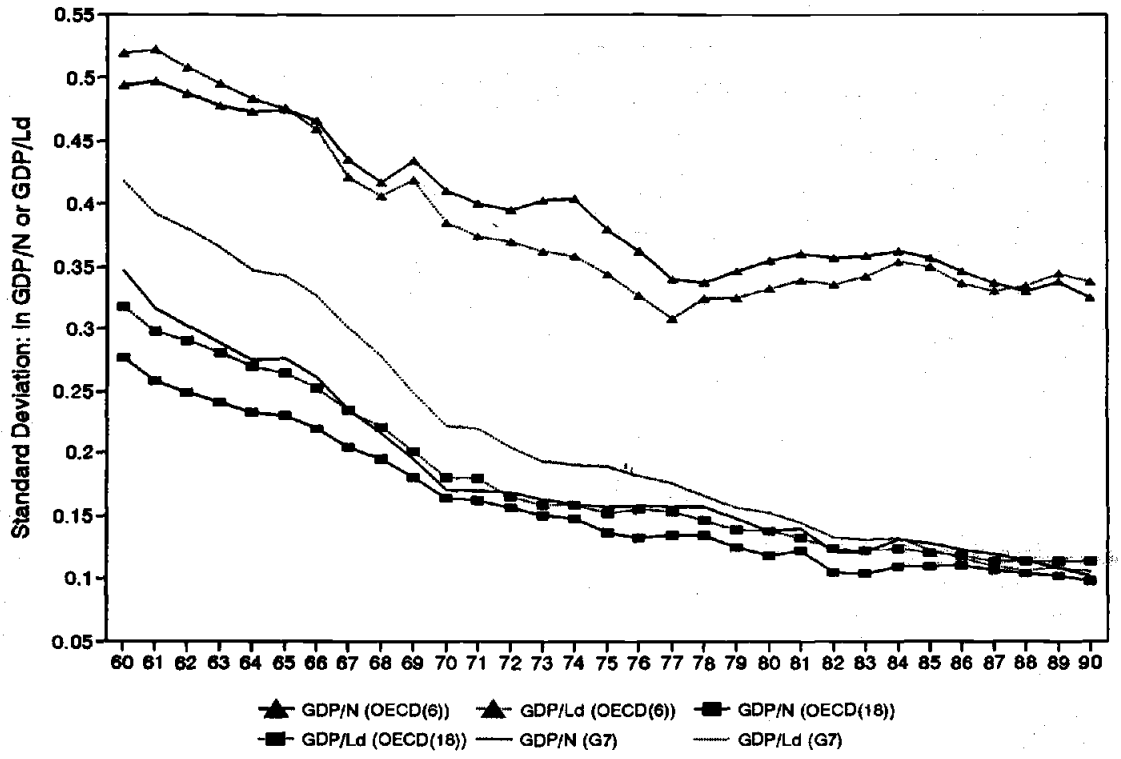


FIGURE 3.3
CYCLE AND DIFFERENCES IN GDP PER CAPITA

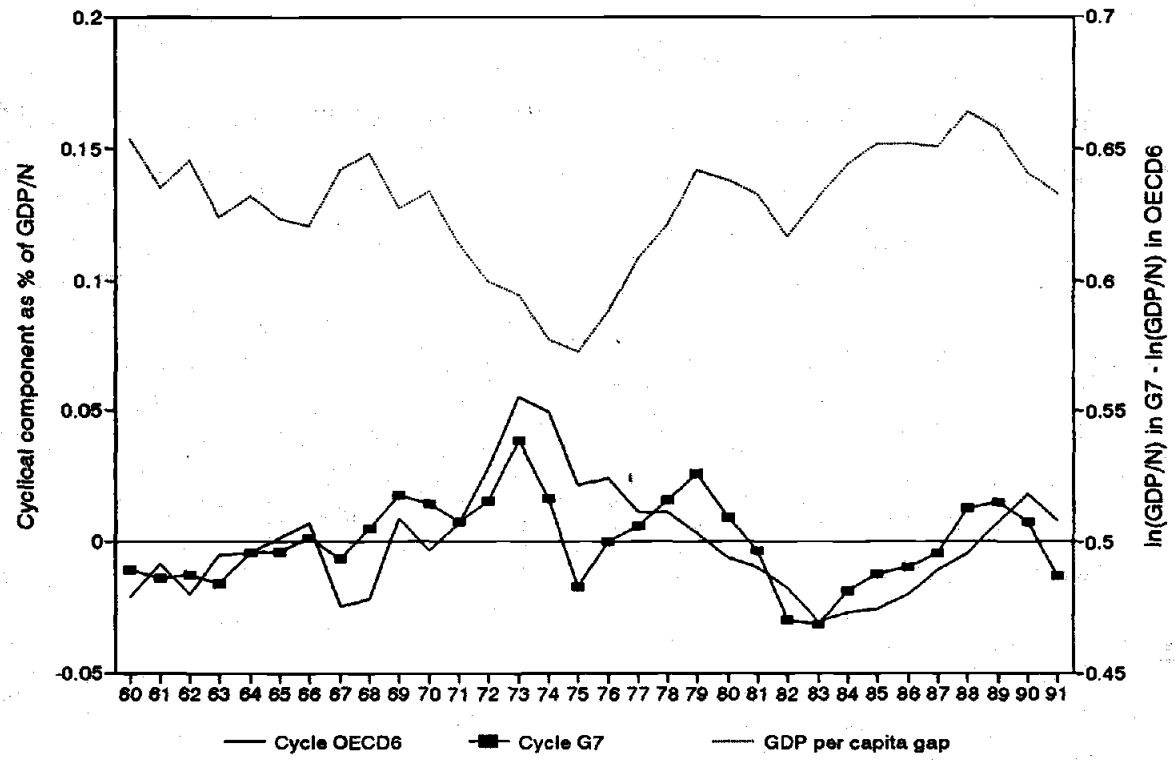
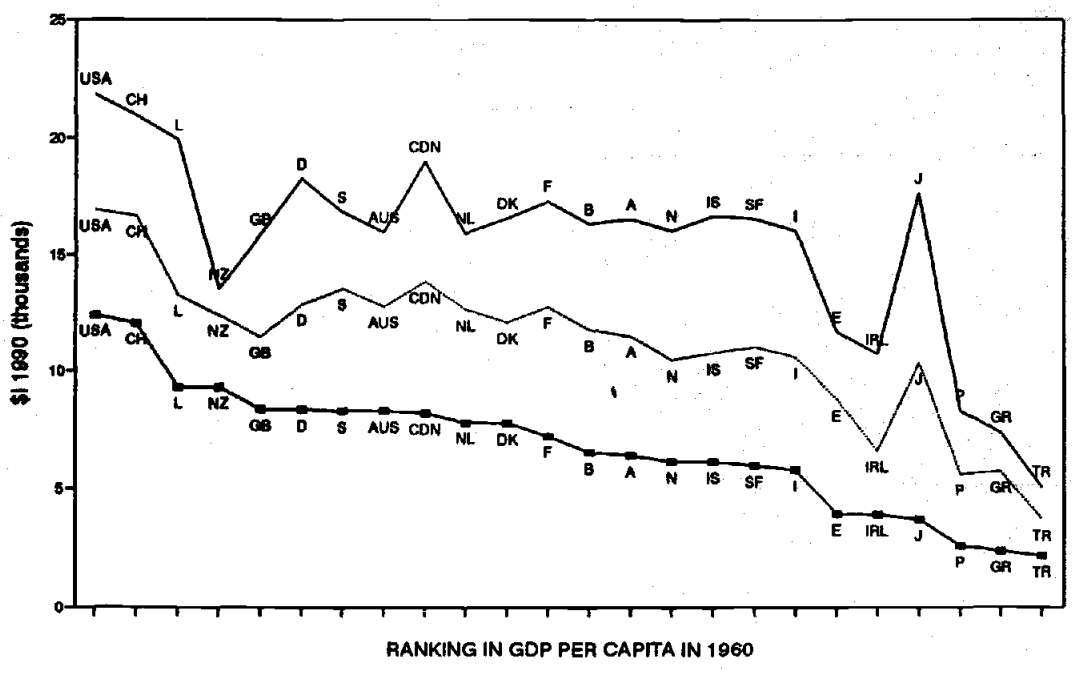


FIGURE 3.4
RANKING BY GDP PER CAPITA



RANKING IN PRODUCTIVITY

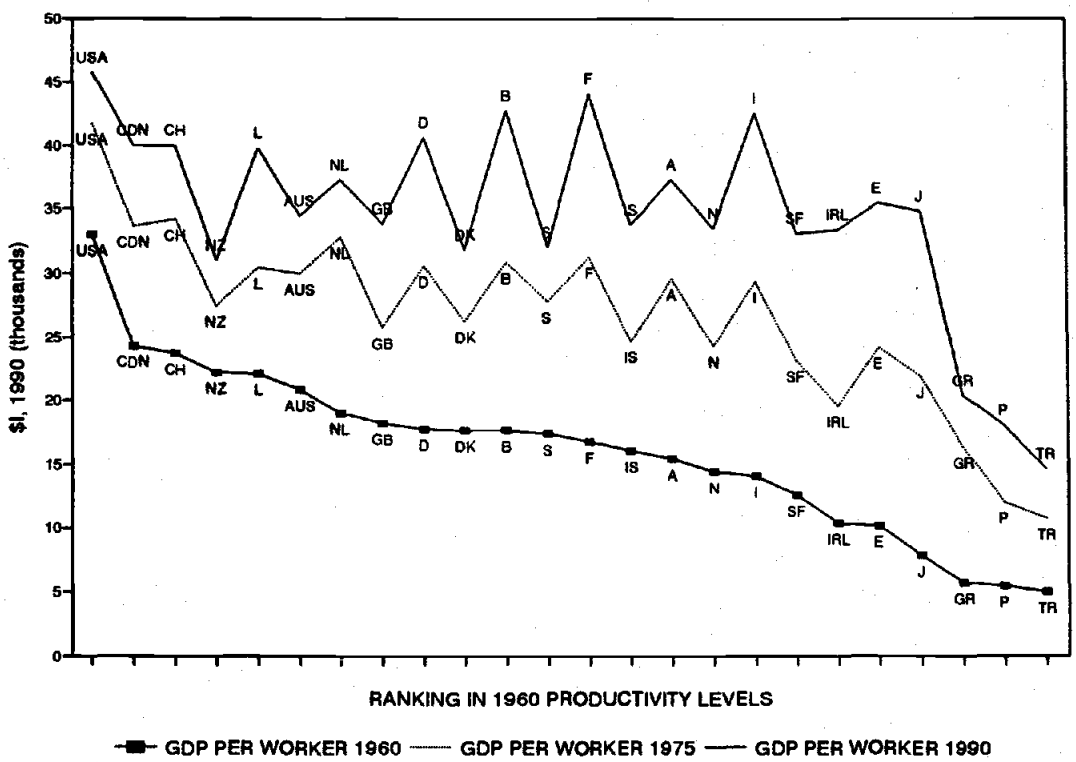


FIGURE 4.1
CONVERGENCE IN MACROECONOMIC INDICATORS

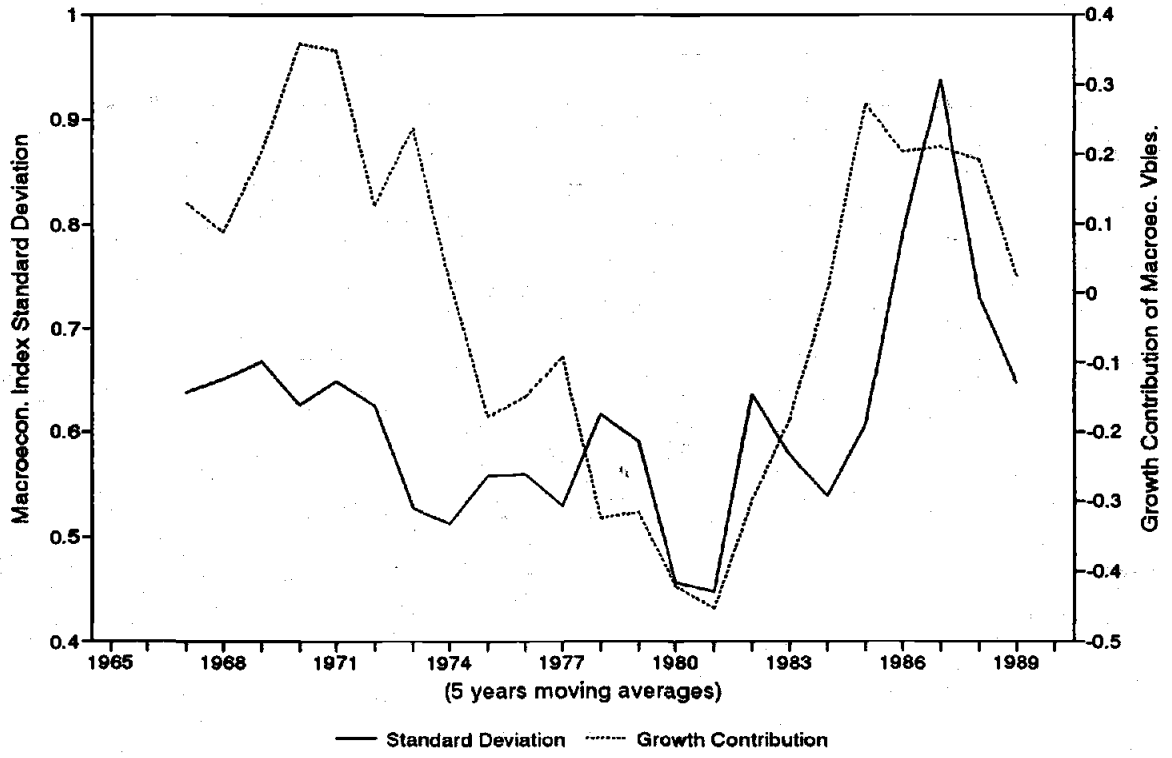


Table 2.1

1960-1990 AVERAGES

COUNTRY	Rates of growth (%)			GDP/N		GDP/L		Real	Nominal	Enrolment rates		1960-1975 and 1985-1990 AVERAGES			1975-1985 AVERAGES				
	GDP/N	GDP/L	N	1960	1990	1960	1990	I/GDP	I/GDP	2nd.	3rd.	Rates of growth (%) GDP/N	GDP/L	Real I/GDP	Rates of growth (%) GDP/N	GDP/L	GDP/L 1975	GDP/L 1985	Real I/GDP
				(USA=100)		(USA=100)											(USA=100)		
Australia	2.22	1.72	1.62	67.25	73.07	63.02	75.41	22.78	24.64	67.50	20.36	2.47	1.74	23.37	1.71	1.68	75.78	75.21	21.60
Austria	3.21	3.03	0.30	52.03	75.63	46.51	81.83	21.85	25.58	66.83	16.24	3.63	3.85	22.06	2.37	1.39	68.09	72.15	21.08
Belgium	3.08	3.00	0.29	53.27	74.59	53.48	93.48	16.47	20.23	83.67	20.16	3.70	3.34	17.22	1.85	2.32	69.87	70.36	14.93
Canada	2.84	1.69	1.33	66.59	86.86	73.44	87.49	18.72	22.27	75.17	35.21	3.07	1.78	18.62	2.39	1.50	82.01	86.91	19.05
Switzerland	1.89	1.76	0.80	97.20	95.85	71.87	87.45	21.57	25.78	51.83	17.15	2.16	2.24	22.59	1.35	0.81	98.43	94.34	19.67
Germany	2.65	2.81	0.44	67.73	83.61	53.82	88.94	18.75	22.49	68.16	18.16	2.81	3.22	19.57	2.32	1.99	76.39	80.52	16.84
Denmark	2.56	2.00	0.39	63.17	75.73	53.53	69.75	18.79	21.37	92.83	21.60	2.59	2.17	20.02	2.49	1.66	71.52	76.62	16.43
Spain	3.75	4.29	0.81	31.76	53.66	30.69	77.58	17.50	23.44	63.50	15.33	5.25	4.81	18.34	0.75	3.25	52.37	47.36	16.18
Finland	3.45	3.31	0.40	48.57	75.53	37.98	72.41	27.18	26.18	89.00	19.39	3.90	3.95	28.29	2.56	2.02	65.32	70.48	24.85
France	2.94	3.27	0.73	58.81	79.13	50.84	96.37	18.55	22.65	72.17	21.19	3.48	3.74	19.15	1.86	2.33	75.53	76.17	17.60
United Kingdom	2.16	2.11	0.31	67.85	72.56	55.02	74.14	12.02	18.21	75.67	15.86	2.30	2.09	12.48	1.87	2.16	67.74	68.35	11.26
Greece	3.96	4.38	0.66	18.97	33.83	17.47	44.63	15.49	21.50	66.83	14.28	4.99	5.72	16.19	1.90	1.70	34.11	34.51	14.14
Ireland	3.49	3.99	0.71	31.22	49.14	31.39	73.12	16.93	21.94	73.50	16.17	4.01	4.22	16.19	2.46	3.54	39.09	41.74	19.02
Iceland	3.44	2.57	1.24	50.05	76.22	48.42	73.78	23.40	25.07	78.33	12.94	3.40	2.80	23.91	3.52	2.11	63.73	75.24	22.22
Italy	3.44	3.78	0.46	47.23	73.20	42.62	93.14	18.39	23.28	59.83	18.81	3.77	4.41	19.29	2.78	2.53	62.60	68.99	16.31
Japan	5.39	5.17	0.94	29.91	80.63	23.54	76.24	25.21	31.31	87.00	20.54	6.42	6.14	25.55	3.34	3.25	61.46	71.64	25.33
Luxembourg	2.62	2.03	0.64	75.18	91.16	66.95	87.22	21.10	25.16	84.32	20.62	2.83	1.98	22.53	2.18	2.14	78.54	81.67	18.20
Netherlands	2.40	2.31	0.88	63.50	72.77	57.49	81.88	18.35	22.82	80.17	22.86	2.99	2.96	19.53	1.23	1.00	74.99	71.00	15.92
Norway	3.23	2.85	0.56	50.10	73.27	43.69	73.22	29.66	28.31	80.50	18.59	2.98	3.01	29.59	3.73	2.54	62.07	75.06	30.02
New Zealand	1.31	1.17	1.18	75.13	61.86	67.15	67.92	14.24	22.63	79.50	22.65	1.44	1.46	14.58	1.03	0.61	73.49	68.17	13.68
Portugal	4.08	4.13	0.57	20.77	38.24	16.47	39.55	18.23	25.18	44.67	8.57	5.15	4.76	18.86	1.93	2.85	33.32	33.78	16.90
Sweden	2.40	2.07	0.45	67.26	77.16	52.66	70.08	17.46	21.04	73.67	22.26	2.90	2.60	18.32	1.39	1.01	80.42	77.45	15.68
Turkey	2.96	3.69	2.40	17.43	23.36	15.13	32.02	18.22	18.73	29.00	5.98	3.69	4.67	18.02	1.48	1.71	21.86	21.17	18.83
United States	1.94	1.09	1.09	100.00	100.00	100.00	100.00	17.25	18.71	93.48	48.84	2.01	1.34	17.51	1.79	0.60	100.00	100.00	16.73
OECD	2.97	2.84	0.80	55.04	70.71	48.88	75.73	19.50	23.27	72.38	19.74	3.41	3.29	20.07	2.10	1.95	66.20	68.29	18.43
EU	3.09	3.18	0.57	49.95	66.47	44.15	76.65	17.55	22.36	72.11	17.80	3.66	3.62	18.28	1.97	2.29	61.34	62.59	16.14
G7	3.05	2.85	0.76	62.59	82.28	57.04	88.04	18.42	22.70	75.92	25.52	3.41	3.25	18.88	2.34	2.05	75.10	78.94	17.59
OECD(6)	3.26	3.61	1.05	32.55	43.35	29.72	55.80	16.77	22.24	59.50	13.83	4.09	4.27	17.03	1.59	2.28	42.37	41.12	16.46

Sources: OCDE (various publications), Human Capital from UNESCO (various yearbooks and own estimates) and own calculations

OECD(6) includes only the six poorest countries in 1990

Table 2.2: Persistence in Growth Rates

	Per Capita Income	Productivity
OECD		
1965-70	0.696	0.737
1970-75	0.217	0.635
1975-80	0.308	0.487
1980-85	-0.092	-0.069
1985-90	-0.121	0.295
EU		
1965-70	0.802	0.831
1970-75	0.776	0.752
1975-80	-0.019	0.573
1980-85	-0.228	-0.068
1985-90	-0.061	0.415
OECD(18)		
1965-70	0.692	0.753
1970-75	0.046	0.536
1975-80	0.683	0.611
1980-85	0.069	-0.085
1985-90	0.113	0.017
G-7		
1965-70	0.981	0.951
1970-75	0.362	0.884
1975-80	0.216	0.881
1980-85	0.011	0.247
1985-90	0.587	0.302

Table 3.1: β Estimates
(Absolute β convergence equation)

	Per Capita Income	Productivity
OECD		
1960-90	0.0203	0.0312
1960-65	0.0183	0.0244
1965-70	0.0252	0.0387
1970-75	0.0235	0.0321
1975-80	0.0018*	0.0127*
1980-85	-0.0017*	0.0099*
1985-90	0.0148	0.0145
EU		
1960-90	0.0243	0.0313
1960-65	0.0283	0.0317
1965-70	0.0282	0.0294
1970-75	0.0243	0.0287
1975-80	0.0087*	0.0175
1980-85	-0.0094*	0.0004*
1985-90	0.0111*	0.0058*
OECD(18)		
1960-90	0.0364	0.0461
1960-65	0.0396	0.0380
1965-70	0.0619	0.0723
1970-75	0.0562	0.0398
1975-80	0.0591	0.0413
1980-85	0.0280*	0.0327
1985-90	0.0295*	0.0270*
G-7		
1960-90	0.0419	0.0506
1960-65	0.0481	0.0409
1965-70	0.1070	0.0911
1970-75	0.0216*	0.0338
1975-80	0.0323*	0.0518
1980-85	0.0200*	0.0431
1985-90	0.0517	0.0439*

Note: * Not significant at 5% level

Table 3.2: Average Residuals (Conditional convergence equation)

Per capita GDP

	Residual Mean	Correlation with Initial Income
EU	-0.000647 (-0.12)	0.063
OECD(18)	0.004881 (0.92)	-0.139
OECD(6)	-0.014642 (-1.31)	-0.175
G-7	-0.023074 (2.60)	-0.369

Productivity

	Residual Mean	Correlation with Initial Income
EU	0.007320 (1.37)	0.161
OECD(18)	0.002928 (0.60)	-0.112
OECD(6)	-0.008783 (-0.86)	-0.043
G-7	0.022116 (2.80)	-0.427

Note: t-statistic in parenthesis.

Table 4.1

1960-1990 AVERAGES

COUNTRY	Rates of growth (%)					G/Y	Public Budget Deficit	Unemploymen Rate	Participation Rate	1960-1975 and 1985-1990 AVERAGES: Rates of growth (%)		Public Budget Deficit	Unemploymen Rate	1975-1985 AVERAGES: Rates of growth (%		Public Budget Deficit	Unemploymen Rate
	GDP/N	GDP/L	Exports	Money	Inflation					Exports	Inflation			Exports	Inflation		
Australia	2.22	1.72	5.95	8.94	7.26	19.77	-1.46	4.50	44.41	6.95	6.80	-1.09	3.49	4.66	8.86	-2.39	6.83
Austria	3.21	3.03	7.13	7.29	4.68	24.15	-2.89	2.28	41.65	7.98	4.75	-2.21	2.07	6.22	5.03	-4.20	2.70
Belgium	3.08	3.00	6.34	5.94	4.99	21.04	-5.72	5.96	40.12	7.95	4.92	-4.06	4.28	3.90	5.64	-9.05	9.60
Canada	2.84	1.69	6.74	8.74	5.51	22.58	-2.61	6.91	43.85	6.72	4.91	-1.73	5.89	7.45	7.18	-4.46	8.99
Switzerland	1.89	1.76	4.83	5.70	4.58	13.48	-0.13	0.29	50.67	5.20	5.44	0.02	0.18	4.62	3.41	-0.53	0.53
Germany	2.65	2.81	5.96	7.97	3.98	22.28	-0.99	3.42	45.77	6.76	4.35	-0.46	2.62	5.02	3.67	-2.13	5.24
Denmark	2.56	2.00	5.05	11.39	7.29	30.91	0.03	4.64	50.02	5.64	7.17	1.45	2.95	4.44	8.25	-2.93	8.28
Spain	3.75	4.29	8.21	15.41	10.36	18.80	-2.67	8.32	37.98	9.27	8.54	-1.97	6.63	6.99	14.85	-4.24	12.29
Finland	3.45	3.31	5.25	12.28	8.22	23.86	-0.68	3.43	50.01	5.01	8.15	-0.26	2.59	6.23	9.18	-1.67	5.30
France	2.94	3.27	6.76	9.56	6.91	22.36	-1.35	4.93	42.78	8.24	5.76	-1.01	4.06	4.64	9.79	-1.86	7.05
United Kingdom	2.16	2.11	4.25	10.32	8.20	30.82	-2.23	4.90	47.11	4.76	7.22	-1.18	3.60	3.70	10.89	-4.62	7.85
Greece	3.96	4.38	9.65	17.27	11.75	22.17	-5.35	4.82	38.41	11.90	9.10	-4.90	4.98	6.34	17.95	-5.95	4.37
Ireland	3.49	3.99	8.65	10.06	8.78	23.74	-8.29	8.88	37.56	8.96	7.12	-6.51	8.05	8.91	12.81	-12.78	10.87
Iceland	3.44	2.57	4.84	32.64	27.13	21.29	-2.44	0.59	44.41	4.57	19.45	-2.46	0.69	5.84	44.43	-2.63	0.44
Italy	3.44	3.78	7.27	15.73	10.02	21.59	-8.03	7.19	40.40	8.90	7.50	-6.40	6.81	4.90	15.81	-11.70	8.13
Japan	5.39	5.17	10.65	12.04	4.98	15.92	-3.11	1.77	49.09	12.21	5.91	-1.72	1.51	8.75	3.71	-6.12	2.29
Luxembourg	2.62	2.03	4.94	13.44	5.19	17.79	1.52	0.58	43.07	5.59	4.78	1.92	0.35	4.21	6.50	0.87	1.10
Netherlands	2.40	2.31	6.04	8.17	5.03	20.42	-2.81	4.83	42.14	7.56	5.43	-1.82	3.35	3.76	4.77	-4.90	8.20
Norway	3.23	2.85	5.34	12.81	6.52	25.15	-1.33	1.92	45.95	5.99	5.82	-1.08	1.80	4.65	8.51	-1.80	2.23
New Zealand	1.31	1.17	4.42	9.98	8.94	21.70	-3.91	1.95	45.39	4.67	7.08	-2.44	1.57	4.40	13.38	-7.13	2.90
Portugal	4.08	4.13	7.79	14.55	12.43	22.40	-6.29	4.77	48.58	7.87	8.32	-4.66	3.46	8.42	21.47	-10.36	7.69
Sweden	2.40	2.07	5.15	9.04	7.22	30.41	-1.86	1.96	49.90	5.93	6.47	-0.22	1.75	4.20	9.37	-5.83	2.47
Turkey	2.96	3.69	10.33	32.18	28.89	22.15	-3.66	10.64	40.69	8.79	21.87	-3.18	10.53	14.28	45.11	-4.70	10.93
United States	1.94	1.09	6.31	6.12	5.05	19.21	-2.29	5.98	44.44	8.42	4.42	-1.72	5.27	2.94	6.75	-3.54	7.43
OECD	2.97	2.84	6.58	12.40	8.91	22.25	-2.86	4.39	44.35	7.33	7.55	-1.99	3.69	5.81	12.39	-4.78	5.99
EU	3.09	3.18	6.74	11.65	7.91	22.86	-3.51	5.27	42.83	7.78	6.68	-2.47	4.26	5.44	11.03	-5.80	7.56
G7	3.05	2.85	6.85	10.07	6.38	22.11	-2.94	5.01	44.78	8.00	5.72	-2.03	4.25	5.34	8.26	-4.92	6.71
OECD(6)	3.26	3.61	8.17	16.58	13.52	21.83	-5.03	6.56	41.44	8.58	10.34	-3.95	5.87	8.22	20.93	-7.53	8.17

Sources: OCDE (various publications) and IMF (International Financial Statistics)

OECD(6) includes only the six poorest countries in 1990

Table 4.2

COUNTRY		1965-75 TO 1975-85							1975-85 TO 1985-90						
		Growth Rates Differences	Catching-up	Differences in			Other Factors	Residual	Growth Rates Differences	Catching-up	Differences in			Other Factors	Residual
				Saving Rates	Inflation	Exports					Saving Rates	Inflation	Exports		
Australia	1	-1.28	-0.04	-0.13	-0.24	-0.36	0.17	-0.66	-0.61	-0.02	0.00	0.36	0.47	-0.36	-1.06
Austria	2	-1.76	-0.18	-0.10	0.03	-0.57	-0.80	-0.15	0.26	-0.05	-0.04	0.30	0.06	-0.34	0.33
Belgium	3	-1.90	-0.14	-0.22	-0.00	-0.69	-0.60	-0.25	0.99	-0.01	-0.06	0.32	0.42	0.06	0.27
Canada	4	-1.02	-0.13	0.09	-0.22	-0.11	0.59	-1.23	-0.70	-0.07	0.14	0.51	-0.15	-0.54	-0.58
Switzerland	5	-0.39	0.06	-0.12	0.27	-0.23	-0.66	0.28	0.64	0.01	0.25	0.01	0.07	-0.69	1.00
Germany	6	-0.27	-0.06	-0.23	0.16	-0.42	-0.29	0.56	0.12	-0.05	-0.05	0.19	0.21	-0.25	0.08
Denmark	7	0.27	-0.00	-0.37	0.01	-0.18	0.17	0.65	-1.03	-0.09	-0.02	0.60	0.18	-0.40	-1.31
Spain	8	-3.79	-0.15	-0.24	-0.75	-0.62	-0.26	-1.76	3.40	0.04	0.03	0.95	-0.34	0.81	1.89
Finland	9	-1.49	-0.16	-0.19	-0.08	-0.08	-1.22	0.24	0.52	-0.09	-0.01	0.51	-0.26	-0.34	0.71
France	10	-1.64	-0.11	-0.17	-0.47	-0.92	-0.13	0.16	0.57	-0.02	-0.04	0.80	0.11	-0.99	0.71
United Kingdom	11	-0.05	0.02	-0.16	-0.56	-0.40	0.49	0.56	1.00	-0.04	0.13	0.94	0.25	0.11	-0.38
Greece	12	-3.51	-0.27	-0.32	-1.34	-0.88	0.39	-1.10	-0.62	-0.01	-0.21	0.14	0.13	-0.90	0.22
Ireland	13	-1.28	-0.15	0.07	-0.56	-0.05	0.55	-1.12	2.50	-0.06	-0.34	1.32	0.03	-0.59	2.15
Iceland	14	0.45	-0.21	-0.18	-3.27	-0.02	2.40	1.73	-1.51	-0.10	-0.20	2.92	-0.26	-1.58	-2.29
Italy	15	-1.03	-0.15	-0.23	-1.11	-0.73	0.04	1.16	0.11	-0.07	-0.07	1.17	0.23	-1.14	-0.00
Japan	16	-3.05	-0.30	-0.06	0.44	-0.88	-1.99	-0.26	0.73	-0.14	0.06	0.36	-0.62	-0.12	1.19
Luxembourg	17	-0.17	-0.01	-0.23	0.10	-0.46	-1.37	1.82	1.70	-0.07	0.02	0.37	0.59	0.89	-0.10
Netherlands	18	-1.90	-0.06	-0.34	0.23	-0.78	-0.70	-0.25	0.93	0.03	0.02	0.54	0.36	-0.03	0.01
Norway	19	0.27	-0.18	-0.06	-0.24	-0.18	-0.15	1.09	-2.49	-0.16	-0.25	0.63	0.02	-0.78	-1.95
New Zealand	20	-0.45	0.08	-0.06	-0.80	0.09	0.27	-0.03	-1.30	-0.01	0.18	0.40	-0.33	0.04	-1.58
Portugal	21	-3.05	-0.24	-0.21	-1.81	0.52	0.12	-1.43	2.23	0.00	-0.10	0.72	0.42	0.60	0.59
Sweden	22	-1.34	-0.02	-0.22	-0.44	-0.48	-0.01	-0.18	0.20	-0.01	0.08	0.39	0.04	-0.54	0.24
Turkey	23	-2.86	-0.16	-0.03	-4.51	0.56	2.19	-0.91	2.18	-0.03	-0.19	-0.31	-0.29	1.91	1.09
United States	24	0.16	0.04	-0.07	-0.24	-0.47	-0.17	1.08	-0.10	-0.02	0.05	0.45	1.13	-0.49	-1.22
OECD		-1.29	-0.11	-0.16	-0.64	-0.35	-0.04	0.00	0.41	-0.04	-0.03	0.61	0.10	-0.24	0.00
CEE		-1.53	-0.11	-0.22	-0.51	-0.47	-0.13	-0.08	0.99	-0.03	-0.06	0.67	0.22	-0.15	0.34
G7		-0.98	-0.10	-0.12	-0.29	-0.56	-0.21	0.29	0.25	-0.06	0.03	0.63	0.16	-0.49	-0.03
OECD(6)		-2.49	-0.15	-0.13	-1.63	-0.06	0.54	-1.06	1.40	-0.01	-0.10	0.54	-0.06	0.31	0.73