EMU VERSUS THE REGIONS?
REGIONAL CONVERGENCE AND DIVERGENCE IN EUROLAND

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Abstract

Opinion is sharply divided over whether EMU is leading to regional economic convergence or regional economic divergence. This paper examines the theoretical arguments and empirical evidence for these opposing views, and presents some additional analysis of patterns of regional productivity trends and employment growth over the period 1975-1998. The picture that emerges is a complex one: whilst worker productivity shows only very weak convergence across the EU regions (a process which halted altogether after the mid-1980s), regional employment growth has been sharply divergent.

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Introduction

Over the past two decades, the European Union has made major moves towards the goal of economic and monetary integration. The Single European Act of 1986 set the framework for the abolition of the last remaining obstacles and barriers to an integrated single market for goods and services, and the Maastricht Treaty of 1993 established the programme for European monetary union and an integrated capital market. As part of this programme, the beginning of 1999 saw the introduction of a single European currency (Euro) and a European Central Bank (ECB). At the time of writing, 11 of the 15 member states of the EU have signed up to monetary union and the Euro. Much of the discussion surrounding the formation of this 'Euroland' has focused on the so-called 'national convergence criteria' (the monetary conditions required for states to qualify for membership of the Eurozone, relating essentially to price stability, low interest rates, stable exchange rates, and limits on the size of budget deficits and national debt).[1] By comparison, far less attention has been directed at the role and significance of real economic conditions, such as output growth, productivity, employment or unemployment.

Although national monetary convergence criteria are obviously important, equally so are subnational - that is regional and local - aspects of the European monetary integration process. There are two main questions here. First, might not regional economic convergence be just as relevant as national monetary convergence to the formation of Euroland? And, second, what are likely to be the effects of economic and monetary union (EMU) on the regions of member states? While the regional dimensions of EMU have certainly not been ignored in EU policy statements (as is evident in European

Commission, 1994a, 1994b, 1996 and 1999), some commentators have argued that the regional issue has received insufficient attention. Thus Thirlwall has forcefully argued that:

In the debate on the euro, very little attention is paid to differences in the levels of income and unemployment across the regions of Europe, and whether a single currency is likely to narrow or exacerbate these differences. This is an important issue because existing regional inequalities already pose a threat to the cohesion of the European Union. There is a very real possibility that the single currency, without an effective regional policy, will worsen these disparities (Thirlwall, 2000a, p. 23).

For Thirlwall, the outcome appears quite clear. Monetary union in Europe will cause economic divergence amongst the regions, and this in turn could well threaten to undermine the whole single currency programme (see Thirlwall, 2000b). The idea that the adoption of a single currency, and convergence of nominal interest rates and monetary policies across the EU may end up fuelling regional divergence seems in fact to be shared by some of the EU's technocrats and was a factor behind the creation of the Cohesion Fund under the Maastricht Treaty.

In fact, assessing the likely impact of EMU on the European regions is far from straightforward. There are three main approaches, all of which are problematic. Since the stage-wise process of European integration towards a single unified market and monetary space has been underway for some time, we might expect the impact on the regions to be already empirically apparent. However, it remains unclear just how long it takes for regions to adjust to such a fundamental process. And certainly in the case of the new Euro system, insufficient time has obviously elapsed for there yet to be any discernible effects on the regions. At the same time, identifying the precise impact of EMU would require a valid counterfactual of what would be happening to regional development paths in Europe in the

absence of the integration programme of the past decade and a half, and producing such counterfactuals is itself a difficult task. An alternative procedure in this context might be to use the regional development experiences of an existing comparably-sized continental economic and monetary union as a guide to what to expect in the EU. The United States has been taken as the obvious example. But this strategy raises its own set of questions and problems. A third approach is to turn to theory for insight. But which theory? Traditionally, two major opposing theoretical positions on regional development have dominated the economics and economic geography literatures. The first, which has precedents in Borts and Stein's (1964) early study of regional growth in US, argues that market processes lead to the convergence of regional per capita incomes over the long run. The second, drawing closely on the classic works of Myrdal (1957) and Kaldor (1970) argues to the contrary, that market processes tend to generate persistent and cumulative differences in per capita incomes between regions. Neither theoretical tradition explicitly addresses the impact of economic and monetary integration on regional development, and each has had its share of criticism.

Thus for their part, economic geographers in recent years have progressively shifted their attention away from the long-term dynamics of *inter-regional systems* to the casual factors underpinning the development of *specific types of region*, especially 'successful' regions such as local high tech clusters and industrial districts of flexible specialisation. Whilst this focus has undoubtedly produced considerable insight into the geographical foundations of particular forms of economic growth and development, it has had much less to say on the longer-run evolution of regional systems, or on the regional impact of major regulatory shifts such as those associated with European economic and monetary integration. Equally, the question of long-run regional development has hardly occupied a central place within the economics profession. However, in the past few years a number of eminent macro-economists have suddenly 'gone geographical' and have begun to discover the importance of space in

the economic process, as the basis for what they themselves have labelled as the 'new regional economics' and the 'new economic geography'.[2] One of the interesting features of this new 'spatial turn' in economics is that it has been stimulated, in part at least, by an interest in the regional implications of economic and monetary union in the EU. As Fujita, Krugman and Venables (1999, p. 2) put it: "The field [the 'new economic geography'] has been given a big boost in particular by plans to unify the European market and the attempt to understand how this deeper integration will work by comparing international economics within Europe with interregional economics within the United States. The key argument is that the US shows how a continent-sized single market and currency union works in practice, and thus, as Europe moves progressively towards the sort of integrated economic and financial space which has long been in existence in the US, how the processes and paths of regional development in the EU are likely to become increasingly similar to those in the US. While much of this work has been theoretical, some of the models employed by these 'geographical' economists have stimulated a wave of empirical work - also mainly by economists - aimed at determining whether and to what extent regional convergence is occurring in Euroland.[3]

These themes form the focus of this paper. The aim is, first, to review the current state of theoretical and empirical work on the regional dimensions of EMU, and then, second, to cast some additional empirical light on the issue. A useful starting point is the theory of optimum currency areas, since the assumptions of this theory actually carry implications for the regional convergence/divergence problem. The paper then moves on to examine the current theoretical debate over regional convergence and divergence under EMU. In the subsequent section we look at the evidence relevant to this debate, and provide our own examination of the data. The picture that emerges is a complex one, but overall indicates that in terms of output growth there is little evidence of any strong convergence at the present time, whilst in terms of employment growth the pattern is one

of marked divergence. Given these findings, the final section of the paper returns to the claims and concerns voiced by Thirlwall over the regional implications of European monetary union.

Optimum Currency Areas, Euroland and the Regions

Some forty years ago, in one of the pioneering papers on the subject, Mundell (1961) emphasised that the theorisation of optimal currency areas (OCAs) was far from a purely abstract exercise: Certain parts of the world are undergoing processes of economic integration and disintegration, new experiments are being made, and a conception of what constitutes an optimum currency area can clarify the meaning of these experiments (p. 657). While not all agreed with this view [see for example Ingram (1969, p. 97-98), for whom the geographic extent of a currency area - including in that term national currencies rigidly linked by fixed rates and full convertibility - can be what ever we want it to be, large or small], history has proved Mundell right. The contemporary process of monetary integration and union within Europe is precisely the sort of experiment to which he was referring (Dent, 1997).

Yet, as Magnifico (1973), in a highly prescient but curiously neglected discussion of the regional dimensions of EMU, argued, the theory of optimal currency areas is not simply concerned with the *external macro-geographical limits* of currency unions (which countries qualify for membership), but also with the *internal economic geography* of such areas. The underlying premise of optimal currency area (OCA) theory is that in order to reduce the costs and maximise the benefits of monetary unification there should be a high degree of economic homogeneity amongst the countries making up a currency area. Since monetary union entails the surrender of individual national autonomy over exchange rate and other monetary policies, the homogeneity condition ensures that member countries are equally effected by external shocks and that

none are unduly destabilised by the imposition of centralised currency area policies regarding the interest rate, exchange rate and so on. Hence the emphasis on national convergence criteria in the European programme of monetary union set up by the Maastricht Treaty. But, as Magnifico (*op cit*) argues, since national economies are merely the aggregates and averages of their constitutent regional and subregional components, the homogeneity condition of OCA theory raises equally important issues at the regional level.

Four 'homogeneity conditions' can be identified from different versions of OCA theory. The first is that economies should be roughly similar and synchronised, so that shocks are symmetrical in the sense that if, for example, a negative demand shock occurs (such as a hike in oil prices), all the member countries are effected in roughly the same way, and all are equally affected by any central currency area policies. There have been various definitions of what is meant by 'economic similarity' in this context. For McKinnon (1963), another contributor to the original currency area debate, the required homogeneity condition is that the constituent member countries or regions making up an optimum currency area should have comparable degrees of 'economic openness' (ratio of non-tradable goods production to tradable goods production). The argument here is that if the countries and regions making up a common currency area do not have similar degrees of relative openness, the more uneven will be the need for and the impact of economic-monetary discipline, given the removal of the devaluation option. Thus where regions differ in relative openness, restrictive monetary policies aimed at reducing internal demand in order to maintain external balance will produce geographically uneven unemployment. According to Kenen (1969), on the other hand, the key homogeneity condition is that of similar degrees of structural diversification within the member states making up the currency area, where national industrial diversity is defined by the number of single-product regions (Kenen, 1969, p.49). In his view, the greater the 'structural diversification' - that is, the more regions are industrially specialised - across a currency area, the

more likely that asymmetric demand shocks will tend to average out across regions and industrial sectors. A well-diversified currency area economy, so defined, will not have to undergo changes in its terms of trade as often as a less diversified economy.

The idea that the stability of a currency area depends on the economic specialisation of its constituent regions is an intriguing one. It is also problematic. If regions differ in the form of their sectoral specialisation then they will also differ in the nature of their economic openness, and hence their susceptibility to competitive shocks change. A region specialising in a traditional manufacturing sector (say steel or textiles) is likely to be vulnerable to different sorts of shocks and developments than a region specialising in, say, biotechnology industries or computer software. A necessary condition underpinning Kenen's model of an optimal currency area, therefore, would seem to be that there are high rates of industrial and geographical mobility of labour and capital, so that resources expelled from sectors and regions hit by negative demand, technology and competitive shocks, can be reabsorbed by those sectors and regions in which demand and growth are more buoyant. If such mobility is weak or absent, then, contrary to what Kenen supposes, shocks are unlikely to be transient or to cancel out across regions, and instead could have long-term hysteretic and cumulative effects on particular geographical areas, leading to large and persistent regional inequalities in growth and inflationary pressure. Thus, where factor mobility is weak, regional specialisation could mean regional instability, and hence problems for monetary policy at the currency area level.

The need for full mobility of factors of production between the various regions of a currency area is precisely the point stressed by Mundell (*op cit*). With a single fixed exchange rate across a currency area, near-perfect geographical movements of capital and labour are necessary if asymmetric spatial demand and technology shocks are not to result in major regional imbalances in economic development

and growth. Where factor mobility between the regions, say North and South, of a monetary union is low, and other mechanisms of inter-regional stabilisation are absent or weak, a shift in demand from the products of the North to those of the South will cause unemployment in the North and inflation in the South. Unemployment in the North could be prevented by expanding money supply, but this would generate inflation in the fully employed South. Conversely, attempts to control inflation in the South would be at the expense of more unemployment in the North. In the Mundell model, then, as in Kenen's, factor mobility is necessary as an inter-regional equilibrating mechanism: if geographical mobility of labour and capital is low, or uneven, across regions, then such equilibration will not occur, so that the regions do not constitute an optimum currency area, and should not join a single currency and common exchange rate.

A third homogeneity criterion for an optimal currency area is that proposed by Magnifico (*op cit*), namely that the regions of which it is comprised should have similar propensities to inflation. If regions (or countries) showing the same rates of utilisation of productive factors systematically show different rates of cost and price increases they can be said to possess a different propensity to inflation. Such differences might arise because of embedded social-institutional-structural differences in cost-push pressures (for example arising from particular social expectations, strong labour organisation, and so on). They may also result from persistent uneven development between regions. In regions of persistent high-activity, the rate of inflation at which growth is maximised is likely to have a high positive value, in contrast to a much lower optimum rate in low activity regions. The existence of large differences in regional propensities to inflation (whether in a country, or across a wider currency union), imparts potential instability to the system. Thus, for example, the central imposition of system-wide credit controls aimed at stemming price increases emanating from regions with high propensity to inflation is likely to be injurious to industry and jobs in regions of low inflation

propensity.[4] In Magnifico's model, regional homogeneity in the propensity to inflation across regions thus implies balanced regional economic growth across the currency union. As he argued, the existence of labour and capital mobility, as in Mundell's theory, is not a sufficient criterion for an optimal currency area: factor flows into high growth regions may simply allow such areas to combine high growth with high relative price inflation.

Finally, a fourth requirement for a single currency area is that automatic fiscal mechanisms come into play through a centrally-organised tax-benefit system to compensate for differential national and regional shocks and growth. In an individual country, inter-regional transfers occur automatically as regions experience differential economic fortunes (via the operation of unemployment benefits, social security payments and taxation). Such transfers compensate for the absence of region-specific currencies and exchange rates. When countries form a currency union, their regions in effect become 'twice removed' from monetary policy and control since member nations cede such policy upwards to the central bodies of the currency union. Thus countries and regions joining a currency union need to be integrated into a corresponding centralised system of automatic fiscal stabilisation transfers.

How does Euroland measure up to these various criteria and conditions? Marked differences in economic performance and welfare exist across the EU (see, for example, Pompili, 1994; Dunford, 1993, 1996; Dunford and Perrons, 1994; European Commission, 1996; Hadjimichalis and Sadler, 1996; Molle, 1997; Boldrin and Canova, 2000; Thirlwall, 2000b). Regional economic inequalities in the EU are about twice those in the USA, measured either by the standard deviation of per capita income or the ratio of the top to the bottom decile of regions (Boldrin and Canova, 2000). At the level of NUTS2 regions, for example, regional unemployment rates in the EU vary by a factor of 10, and regional per capita GDP by a factor of 7. The regions of the EU also differ considerably in their sensitivity to

economic cycles (OECD, 1989; Decressin and Fatas, 1995; Eichengreen, 1993, 1995), and in local wage inflation and wage flexibility (Baddeley, Martin and Tyler, 2000). The theory of optimal currency areas requires that regional shocks are transient and cancel each other out, but this is not the case across the EU: many regions that have suffered a fall in the demand for their products have failed to recover and instead have tended to remain structurally depressed. One indication of this is that in stark contrast to the US, regional unemployment disparities in the EU are large and extremely persistent over time (Bertola and Ichino, 1996; Baddeley, Martin and Tyler, 1998; Overman and Puga, 1999). Similarly, factor mobility would not seem to provide the sort of inter-regional equilibrating role stressed by Mundell. Whilst capital mobility may have increased considerably across the European regions over recent years, inter-regional labour mobility between member states remains relatively low: overall, labour migration rates in the EU are only about one quarter as responsive to inter-regional differences in employment growth as are inter-state migration rates in the US, for example (see Baddeley, Martin and Tyler, 2000). It would seem, then, that the EU regions exhibit little of the balance or homogeneity stressed by OCA theory. On the basis of this sort of evidence Thirlwall concludes that no one... believes that the current eleven countries of Euroland constitute an optimum currency area (Thirlwall, 2000b, p. 25).

However, the EU is hardly exceptional in having regional disparities. If a strict inter-regional homogeneity condition (whether of regional openness, equal degrees of regional specialisation, uniform factor mobility, similar proneness to inflation, and so on) was a necessary requirement for a single currency, few national economies would themselves qualify as currency areas. It is not the simple existence of regional economic inhomogeneities (imbalances and disparities) that is at issue in the debate over the regional impact of European monetary integration, but rather the extent, nature, geographies and trajectories of those disparities. How small do regional disparities have to be for the regions in question to constitute a viable single

currency area? Which form of regional economic structure - regional specialisation or regional diversification - is most consistent with the internal stability of such an area? At what spatial scale are regional imbalances significant for currency unification? And, crucially, are regional economic disparities (in growth, incomes and employment) narrowing or widening? Monetary union assumes there is underlying convergence. Indeed some proponents of Euroland assume that EMU will produce the very regional convergence that currency unification needs in order to work successfully. If, on the other hand, the regions of Euroland are far from constituting an optimal currency area, will monetary unification merely exacerbate existing disparities and lead to regional divergence? The regional convergence-divergence issue thus lies at the heart of the Euroland debate.

Theoretical Debate on Regional Convergence and Divergence in the EU

Conventional neoclassical growth theory predicts that a reduction of barriers to trade associated with economic integration will lead to a step increase in allocative efficiency, and hence in income per capita. Growth will accelerate to a new equilibrium. The theory does not offer any explanation of sustained long-run growth, however, which is regarded as being determined by exogenous technical progress, and so does not identify any contribution from economic integration to a higher long-run growth rate. At the same time, given its assumptions of diminishing returns to capital and constant returns to scale, standard neoclassical growth theory predicts a tendency for poorer economies to show faster growth than richer economies, so that economies will converge over time towards a common level of per capita income (so-called 'absolute', 'unconditional' or 'strong' convergence).

The failure of conventional neoclassical theory to explain sustained growth has been addressed in recent years by the advent of new

variants of the neoclassical model which seek to endogenise the accumulation of factors. These endogenous growth theories incorporate various processes - such as localised collective learning, accumulation of skills, and technological innovation - which prevent social returns to investment (broadly defined) from diminishing. This opens up the possibility that economic integration can contribute to a higher long-run growth rate, by stimulating the accumulation of those forms of capital to which returns are not diminishing. It also allows the possibility for national and regional economies in a currency area to converge to different long-run steady state relative incomes. If economies differ in their basic growth parameters (such as savings ratios, technological innovativeness, human capital development, etc), or spillovers of knowledge between economies are weak, they may not converge to a common per capita income but instead to different economy-specific equilibrium levels of relative per capita income (so-called 'conditional' or 'weak' convergence). Under these sorts of circumstances, there might be convergence amongst similar types of economy ('club convergence'), but little or no convergence between such groups ('clubs').

While much of the revival and application of growth theory has centred on cross-country patterns and trends, it has also been extensively used to discuss convergence within regional economic systems, especially in the EU. According to Barro and Sala-i-Martin (1995), regions within a country - an integrated economic and monetary union - are much more likely to exhibit unconditional convergence than are growth rates across separate countries, precisely because regions within a national monetary union will tend to have broadly similar regulatory, institutional and related conditions:

Although differences in technology, preferences and institutions do exist across regions, these differences are likely to be smaller than those across countries. Firms and households of different regions within a single country tend to have access to similar technologies and have roughly similar tastes and cultures. Furthermore, the regions

share a common central government and therefore have similar institutional set-ups and legal systems. This relative homogeneity means that absolute convergence is more likely to apply across regions than across countries (Barro and Sala-i-Martin, 1995, p. 382).

The implication of this approach, therefore, is that with the removal of obstacles to trade, the harmonisation of regulations that otherwise segment markets, the liberalisation of capital and labour movements, and the ease and reduction of costs of settling payments afforded by a single currency, progressive European economic and monetary integration should lead not only to convergence of factor prices across regions but also to convergence in economic structures and in per capita incomes. Moreover, as integration deepens, and cultural, institutional and technological differences across the EU diminish, so convergence should be increasingly of the absolute or strong variety.

In contrast to this regional convergence theory, the contributions to the so-called 'new economic geography' tend to argue just the opposite, that economic and monetary integration in Europe will lead to regional divergence. The argument, set out for example in Krugman (1993), takes the following form. Greater economic integration increases trade and factor mobility, and this in turn creates new opportunities for economies of scale and specialisation. Depending on the mobility of factors (especially labour) the reductions in transport and transaction costs associated with EMU will tend to encourage greater spatial agglomeration and specialisation of economic activity. According to this theory, the key aspect of regional specialisation is the dependence of regional economies on export clusters held together by local Marshallian-type external economies. These external economies (of access to specialised labour, of technological spillovers, of linked and supporting industries, and supporting institutional and other 'soft' infrastructures) derive from localisation, and constitute an important source of increasing returns and competitive advantage (Krugman, 1991a, 1991b; 1993, 1998; a similar if less formal model of industrial

localisation is developed by Porter, 1990, 1998). Krugman argues that the reduction in transport and transaction costs associated with increased integration fuels the process of Marshallian industrial localisation, leading to a divergence between regions in terms of their industrial structures and to the increased specialisation of any particular region.

But, in addition, the process also generates regional differences in growth and accumulation. Whereas in the Kenen's optimal currency area theory regional specialisation is viewed as making for stability within a monetary union, in 'new economic geography' models increased regional agglomeration and specialisation renders regional economies increasingly prone to destabilising asymmetric regional demand and technology shocks. And again, contrary to the role of factor mobility as an equilibrating mechanism in both Kenen's and Mundell's OCA models, Krugman argues that the effect of greater capital and labour mobility is instead to magnify regional economic fluctuations and to produce long-run divergent economic growth over time. Consider a case where there is factor immobility. In a region which experiences an increase in demand for its products, the price of capital and labour would rise, and as a result weaken that region's competitiveness, thereby stemming the increase in demand. If capital and labour are mobile, however, the rise in factor returns due to a boom in a region's exports would attract the inflow of capital and labour from other areas, and thereby prevent excessively rising costs or supply constraints from choking off the increased demand for the region's products.[5] Again, consider a region which experiences a decline for its exports. This will put downward pressure on factor prices there, and will stimulate the outflow of capital and labour to other regions until factor prices are brought back into line. But this means that there is no reason to expect a region whose traditional industries are faring adversly to attract new industries (inward investment and capital flows). Such a region may simply shed jobs instead, and need not recover its former level of employment. In the presence of factor mobility then, regions in an increasingly integrated

Europe may be more likely to adjust to shocks by adding and shedding resources (especially labour) rather than by adding or shedding industries. The result, Krugman argues, is that there is no necessary reason why regions should converge in their growth rates or why regional employment and output relativities should return to some historical or equilibrium pattern.

While in their pure form these two theoretical positions lead to quite opposed predictions of the regional impact of economic and monetary integration in the EU, the recent emergence of endogenous growth variants of the neoclassical model make this distinction less clear than might at first appear (see Martin and Sunley, 1998). For example, Krugman is at pains to stress that his model of regional divergence in the EU is different from models of uneven regional development based on cumulative causation, core-periphery processes or self-reinforcing endogenous growth. The main driving mechanism making for regional divergence is the increased regional export specialisation that follows increased market integration rather than systematic forces of uneven regional development. Export specialisation then renders regions more prone to *random* demand shifts and shocks, and it is the tendency for factor movements to accentuate rather than compensate for the effects of these random shocks that generates regional economic divergence. Thus Krugman's model suggests that some regions will grow faster than and diverge from others, but it does not predict *which* regions will leading or lagging.

However, some versions of localised endogenous growth theory can also generate divergent regional development, and predict that regional divergence is likely to take place under EMU because market integration and monetary unification will tend to favour those regions that already lead the development process. In Bertola's (1993) model of localised endogenous growth, for example, capital and labour tend to migrate to existing prosperous and competitive regions, reinforcing increasing returns and cumulative growth in these areas while

emptying lagging regions of key resources. The influx of capital and labour into the more productive regional agglomerations prevents the onset of decreasing returns in those regions, attracting further investment and enabling high relative growth rates to be maintained. Further, to the extent that technological innovation is localised, and spatial transfers and spillovers are geographically limited or take time to diffuse, less productive regions need not necessarily catch up with the leading, more productive regions. Similarly, human capital development is likely to be concentrated in the more prosperous and productive areas, generating yet further localised externalities and increasing returns (see Martin and Sunley, 1998). Thus whereas in the standard neoclassical regional growth convergence models, technology and knowledge spillovers and externalities are assumed to diffuse across a unified economic and monetary space, and hence to contribute to the process of regional convergence, in some versions of localised endogenous growth theory, such spillovers and the increased competitiveness and growth effects they generate, are predicted to concentrate in more prosperous regions, and hence to contribute to regional divergence. In the EU context, the expectation of such models is that the more competitive regions will gain most from EMU.[6]

In effect, then, two interrelated issues are embedded in the debate on the regional implications of EMU. First, will EMU lead to greater regional economic specialisation? And second, will such increased regional specialisation lead to regional convergence or divergence of incomes, employment rates and welfare? In the Krugman view of Euroland, regional specialisation leads to divergence. But according to Braunerhjelm *et al* (2000) Europe's regions must specialise in order to survive. The smaller regional inequalities in per capita incomes in the USA are attributed to the fact that industries there are much more spatially concentrated: every US region specialises in some economic activity or other. In the US, strong geographical concentration of economic activity is also accompanied by labour mobility, with the result that employment rates and incomes per head

tend to be more equalised across regions. But in contrast, they argue, industry in Europe is significantly more dispersed, and far less concentrated in a few centres of production.. According to these authors, as economic and monetary integration proceeds in the EU, there is good reason to believe that Europe's economic landscape will become increasingly more like that of US, with increasing regional specialisation and a consequential narrowing of regional income and employment inequalities.

The Empirics of Regional Growth in the EU

What is the evidence for these differing views of regional evolution in an increasingly economically integrated EU? Are EU regions converging or diverging? In their own analyses of regional growth in the EU, Barro and Sala-i-Martin (1995, 1996) use two procedures to test for the regional convergence predicted by neoclassical theory. First, regional convergence implies that the dispersion of regional output per head, as measured for example by the standard deviation, should decline over time (so-called 'σ-convergence'). Second, convergence implies that initially poorer regions should growth faster than and thereby catch up with initially richer ones, so that the slope coefficient in a regression of regional per capita output growth rates on initial regional per capita output levels should be negative (so-called 'β-convergence').[7] Numerous empirical studies on regional per capita output convergence in the EU have subsequently used this 'growth regression' approach.

Most of the studies relate to the period 1950-1990, with only one or two having an extended coverage, and then only up to 1993. The results tend to vary with the precise specification of the model used, and some authors include additional 'conditioning' variables (such as national dummies, regional industrial structure, and various terms intended to capture possible endogenous growth effects, such as local skill mix, local educational levels, proxies for local R&D, and so on).

Nevertheless, most estimates have yielded absolute convergence rates for European regions of the order of 1-2 per cent per annum (see Table 1 for a summary; see also Martin and Sunley, 1998), which is similar to the rates estimated by Barro and Sala-i-Martin for the US states over the same period. This is hardly rapid convergence, since such rates imply that it takes between 35 and 70 years respectively for an initial regional disparity in regional per capita output to be halved. In addition, as is also evident from Table 1, the rate of convergence has been variable through time. In particular, most studies find that the speed of regional convergence in the EU slowed down over the course of the 1980s, to rates of between 0.2 and 0.5 percent per annum, just as the pace of economic integration in Europe began to quicken.

These estimates do not, therefore, provide overwhelming evidence of strong or sustained narrowing of regional per capita output inequalities in the EU over the 1975-93 period. And it would be difficult to argue from these results that the process of economic integration from the early-1980s onwards stimulated any discernible improvement in the relative position of lower income regions. But neither do these studies suggest that the deepening of integration over this period has thus far led to a widening of regional disparities. From a technical point of view, Quah (1993a) has argued that the growth regression approach has an inbuilt bias towards identifying convergence (the problem of 'regression to the mean'), so that the results in Table 1 may even over-estimate what little convergence has occurred. In addition, as Chatterji (1992), Quah (1993b), Pesaran and Smith (1995) and others have pointed out, the growth regression model only relates a region's growth to its own history, and does not allow explicitly for possible inter-regional interactions or co-dependence in growth over time, even though the existence of spatially autocorrelated error terms in some growth regressions for the EU regions suggests that such interdependencies may be present (see Armstrong, 1995; European Commission, 1997).[8] Furthermore, by pooling data for all EU regions, these growth regressions assume that

the underlying convergence process - if such exists - is identical across all regions, whereas in reality it is may well vary from region to region, or between different types or groups of regions (see Quah, 1993, 1996). And to compound matters, results tend to vary according to the level of regional disaggregation used. As Cheshire and Carbonaro (1995) argue, EU regions should really be defined so that they are functionally meaningful in terms of the economic processes believed to generate regional convergence or divergence: the NUTS regional classification is an administrative rather than functional one.[9] And of course, simple growth regressions do not tell us about the relative role of capital flows, labour migration or technological spillovers in the regional growth process across the EU (for some initial attempts to unravel these effects see Cheshire and Carbonaro, 1995; European Commission, 1997).[10]

Notwithstanding these shortcomings, it would nevertheless seem useful to provide a more up-to-date growth regression analysis which covers the remainder of the 1990s, thus giving an indication of regional evolutions which is perhaps more relevant to the current EMU debate. Here we use gross value added per worker, rather than GDP per capita.[11] Gross value added (GVA) per worker has the advantage is a useful proxy for productivity, and can be considered a direct outcome of the various factors that determine regional 'competitiveness',[12] although the openness of local areas to bought-in services and to worker commuter flows means that it may also over-state regional differences in output per worker. The data cover the period 1975 to 1998, the latest year for which out-turn figures are available, and have been converted to constant 1985 prices (ECU) using PPP exchange rates. Data availability constrains the analysis to the NUTS2 level, and in certain instances to the NUTS1 level. In the case of Ireland and Luxembourg, only national level (NUTS0) data are available, so that the region is defined at that level in this instance. Time series data for the whole period are not available for the regions of what used to be East Germany, so that these areas have been excluded from the analysis. On the other hand, comparable data

are available for regions in Norway, so that these have been included: hence the term E-16 is used hereafter to refers to the EU-15 plus Norway. Altogether, consistent data on real GVA per worker exist for some 195 regions over the study period.

The dispersion (variance) of regional disparities in GVA per worker is shown in Figure 1. The total dispersion of regional GVA per worker has fallen overall since 1975, but the decline was entirely in the period up to 1987, and since then regional disparities in GVA per worker have remained more or less constant. Furthermore, if the total variance is disaggregated into its between- and within-country components, it emerges that the decline in overall dispersion has been wholly due to a reduction in the between-country variance, whilst the within-country variance in regional GVA per worker has, if anything, risen very slightly over the period. Indeed, since the end of the 1980s, the dispersion due to within-country variations in regional GVA per worker has consistently exceeded that attributable to between-country variation.

These trends in dispersion do not tell us much about the disparities between different types of region across the E-16, for example about the relative movements of prosperous (high productivity) and poor (low productivity) regions. The convergence model predicts that initially low productivity regions should exhibit a steady improvement in productivity relative to the mean. Figure 2 reveals that (with the primary exception of certain parts of southern Germany) the most rapid growth in GVA per worker has indeed tended to be in regions outside what is generally regarded as the prosperous core of the EU. These regions have seen some improvement in their productivity relative to the E-16 as a whole. This is evident if we examine the evolution of different percentiles of the regional productivity distribution. Thus Figure 3, which plots the ratios of different percentiles of the regional GVA per worker distribution relative to the E-16 median value, shows that the least productive regions (bottom 10 per cent) have improved their relative

position, but only very slightly. Moreover, and confirming the trends in overall dispersion (σ-convergence) noted above, what little improvement has occurred took place almost entirely in the 1975-1985 period, and since then the relative productivity of the bottom 10 percent of regions has remained more or less constant.

The results of applying a growth regression to these data are shown in Table 2. The basic nonlinear regression was estimated for the whole 1975-1998 period, and separately for the two subperiods 1975-1986 and 1986-1998 to test for the slowdown or cessation of convergence from the mid-1980s onwards suggested by the dispersion and percentile measures. The estimates of absolute β-convergence confirm the patterns described above. For the whole period, the growth regression implies that regional GVA per worker has converged by about only 0.4 per cent per annum. The two sub-period regressions, however, indicate that all of this convergence occurred during 1975-86 (though at a rate still under 1 percent per annum): for the 1986-1998 period the convergence parameter is insignificantly different from zero.

Following the argument of Barro and Sala-i-Martin (1991, 1995), a region's growth may depend on its industrial structure and specialisation. To allow for this conditioning effect, an additional variable was added, defined as

$$S_{it} = \Sigma_{j=1,5}\, w_{rj,\, t-T}\, [\log(y_{jt}/y_{j,\, t-T})/T]$$

where $w_{rj,\, t-T}$ is the share of sector j in region r's total GVA in the base year, t-T (1975), and y_{jt} is the E-16 average GVA per worker in sector j at time t. The five sectors for which consistent regional GVA data are available are agriculture, energy and manufacturing, construction, market services, and non-market services. This structural variable indicates how much a region's GVA per worker would have grown if each of its sectors had grown at the E-16 average rate. Thus regions specialising in high growth sectors would

be expected to grow faster than regions with economies based more on slow growing sectors. Note that since S_{it} depends on the contemporaneous growth rates of E-16 averages, and on lagged values of region r's sectoral shares, the variable can reasonably be regarded as exogenous to the current growth experience of region r. This variable has only a small positive impact on regional convergence in each sub-period. There is still no statistically significant convergence since the mid-1980s.

The analysis here, therefore, does not provide any compelling indication that the post-1986 pattern of EU regional development, as captured by GVA per worker, has been one of strong convergence. However, neither is there much evidence of the disturbing divergent growth predicted by Thirlwall. But what of other aspects of regional development, for example employment? Krugman's (1993) discussion of the EU regional divergence issue is couched mainly in terms of employment evolutions. He points to the findings of Blanchard and Katz (1992) for the US. Interestingly, although Barro and Sala-i-Martin found regional per capita income convergence across US states, Blanchard and Katz show that regional employment evolutions in the US over the period 1950-1990 have been strongly divergent, with highly positive cumulative relative growth in the western and southern sun-belt and oil states, and strongly negative cumulative relative growth in much of New England, the Middle Atlantic coal states, and the rust belt states of the industrial Mid West. They show that employment shocks are quite asymmetric across US states, and that most of the adjustment of states is through the movements (migration) of labour. These movements prevent the opening up of persistent regional unemployment disparities but have permanent effects on regional employment growth paths. Thus if a region experiences an adverse relative shift in demand for its products, the fall in employment and rise in unemployment triggers labour out-migration rather than wage cuts, capital inflows or job creation. Given that labour mobility is lower in the EU than in the US, Blanchard and Katz argue that demand and technology shocks in

EU regions will have larger and longer lasting effects on regional employment and unemployment disparities. Krugman concurs with this prognosis.

Neither Blanchard and Katz, nor Krugman have explored these arguments by undertaking empirical analyses of regional employment evolutions in the EU. Krugman's own limited empirical work is confined to comparing national employment growth rates in selected EU countries (Belgium, France, Italy and the UK) with those in certain US states (Ohio, California and New York). As he remarks, he would like to see a study along the lines of the recent paper by Blanchard and Katz (1992) carried out for comparably sized geographical units in the US and in Europe (Krugman, 1993, p. 252). Here I go some way towards this by providing an analysis of regional employment growth for the same set of European regions over the same time period, 1975-1998, as used above.[13] Following Blanchard and Katz, trends in regional employment are measured by the cumulative change in the logarithm of regional employment relative to that in E-16 total employment. Figure 4 shows these trends on a country by country basis.[14] In each case the regional curves relate to deviations around the EU average, not the respective individual national averages.

The graphs are quite striking. Clearly, there is no evidence of regional convergence in employment growth; to the contrary, regional employment evolutions across the E-16 since the mid-1970s have been strongly divergent. This divergence has been particularly marked in Greece, Italy, Sweden Spain, and the UK, but is also present to a greater or lesser extent in every state. The general picture is one of sustained regional differences in employment growth across Europe over the period. In this respect, regional employment evolutions in the EU appear to be not dissimilar to those found for US states by Blanchard and Katz (*op cit*). Whilst the rate of cumulative divergence in regional employment trends shows signs of easing after 1990, there is little indication of any convergence. And while most of

the states contain both regions which have grown faster and slower than the E-16 average, there is neverthless a broad geographical pattern to employment growth (see Figure 5). In particular, the majority of the fast employment growth regions form a band stretching across the centre of the EU, from Ireland through southern England, the Netherlands, parts of Germany, Austria and northern Italy. Much of this arc contains what are widely viewed as the 'core regions' of the EU. Two outlying groups of fast growth regions exist in southern France and throughout Norway. Much of the rest of the E-16 includes regions with below average rates of growth.

The differences in employment growth between the regions has been considerable. Some regions in Belgium, the Netherlands, Germany, and northern Italy have experienced net job growth of more than 25 percent and in some cases even as high as 50 percent between 1975-98. By contrast, other regions, in northern United Kingdom, Sweden, Finland, southern Italy and much of Spain have actually seen their employment base fall in absolute terms. Martin and Tyler (2000) show that regional differences in industrial structure account for only a small proportion of these variations in job growth across the EU, which suggests that other differential endogenous and localisation effects are the main factors at work. What is also significant in this context is that the geography of employment growth in the E-16 is in marked contrast to that of the growth of GVA (compare Figure 5 with Figure 2). Indeed, as Figure 6 demonstrates, there is a strong inverse correlation across regions between the two. The causal mechanisms behind this inverse relationship require investigation, since it suggests rather different employment-output dynamics across regions. Furthermore, understanding the causes underpinning the regional differences in employment growth evident in Figure 5 is clearly critical to explaining and reducing the large and persistent disparities in regional unemployment that exist across the EU (Baddeley, Martin and Tyler, 1998; Overman and Puga, 1999).

Some Conclusions: EMU Versus the Regions?

Where does this leave the question of the impact of EMU on regional growth inequalities across the EU? This paper began by posing two, inter-related questions. Is regional economic convergence important for European monetary integration and the formation of Euroland? And, what are likely to be the implications of EMU for the European regions? As argued in the introduction, there is yet no clear or definitive answer to these questions. Optimum currency area theory stresses the need for economic homogeneity across regions as a condition for establishing a unified monetary space, although there are different views as to what 'economic homogeneity' means in this context, and to the spatial (regional) scale at which such homogeneity is supposed to apply. Neoclassical growth models predict that the creation of a European currency area should lead to regional economic convergence of the sort implied by optimum currency area theory. Models of regional growth based on localised increasing returns and endogenous growth, on the other hand, predict that EMU will lead to regional divergence, which is counter to the requirements of an optimum currency area. The actual empirics of regional development are therefore important since they may provide some indication of whether the EU regions have been moving towards or away from the conditions deemed necessary for monetary union.

On the face of it, in recent years regional economies across the EU do not appear to have moved appreciably nearer those conditions. The existing evidence on regional economic trends in the EU, together with the additional empirical material presented here, indicates that while regional convergence (in ouput per capita and per worker) took place between the 1950s and the mid-1970s, since then, as the process of European economic integration itself has deepened, convergence has slowed and ground to a halt. This finding thus contrasts with claims that convergence has been accelerated by the implementation of the Single Market programme in 1986 (European Commission, 1997; see also European Commission, 1999). When we

turn to employment growth since the mid-1970s, the picture is far from one of convergence, but instead of sustained regional divergence, with most of the net new jobs created in Europe over this period being concentrated in the EU core regions. Although mindful of the limited nature of these findings, they do not suggest that EU regions have become more 'similar' as required by optimal currency theory. There may well be grounds, therefore, for agreeing with Thirlwall (2000a,b) that given the lack of regional balance across the EU, the area does not yet represent an optimum single currency space.

But the reasons for this lack of regional convergence remain unclear. Krugman (1993) and others (such as Blanchard and Katz, 1992; see also Bayoumi and Eichengreen, 1993; Eichengreen, 1990) would argue this it is what we should expect as European economic and monetary integration proceeds and regional growth dynamics in the EU become increasingly like those in the US. However, the fact that recent regional developments in the EU have been similar to those observed in the US does not of itself prove that this is due to the increasing similarity of the EU to the US. Indeed, current trends in uneven regional development in the EU may have little to do with the impact of EMU. Rather, the similarity of contemporary regional evolutions in the US and the EU suggests the playing out of common systemic forces, such as post-industrialisation, technological change and globalisation. For this reason, the regional experience of the US does not of itself provide a reliable guide of what the specific impact of EMU on the regions of the EU will be.

In any case, to use the economic geography of the United States as a predictor of the emerging economic geography of the European Union is fraught with various other problems. Even when fully integrated economically, the European Union will still differ in significant ways from the United States. For one thing, the institutional foundations of economic accumulation and distribution are likely to differ as between the two areas: EU capitalism will

continue to be differently embedded, both socially and institutionally, as compared to US capitalism (for discussions of this issue, see, for example, Berger and Dore, 1996; Hollingsworth and Boyer, 1997). For another, because of enduring cultural and linguistic differences, labour mobility across the EU is never likely to be as high as that in the US. And yet further, comparisons of the EU with the US are rendered problematic because US states are much larger than EU regions, and this complicates comparisons of regional specialisation, regional sensitivity to shocks and so on.[15]

Yet, in other respects the US experience is instructive, in that it does point to two important issues. The first - and most obvious - is that a highly integrated continental market does not solve regional problems: the marked divergence of regional employment paths in the US (Blanchard and Katz, 1992) is illustrative of this. Thus although it remains uncertain whether regional disparities in the EU will be exacerbated by economic and monetary integration, they will certainly not disappear. The second concerns the nature and impact of the stabilization mechanisms and policies available to compensate for such disparities. Although the US does not cope with regional shocks and differential employment growth perfectly, a highly federalised fiscal system certainly provides a partial solution to the regional stabilisation problem there. It has been estimated, for instance, that in the US as much as one third of a negative demand shock in a state is cushioned by interstate transfers operating through the Federal tax and transfer system (see Sala-i-Martin and Sachs, 1991). At present there is no comparable system of automatic inter-regional fiscal stabilisation transfers in Euroland, and while fiscal unification could be argued to be the logical counterpart to monetary union, the prospects for establishing a EU-wide fiscal transfer system in the near future seem remote. Of course each member state has its own internal systems of fiscal transfers and regional policies, and these provide some measure of inter-regional stabilisation. But whether these national systems are sufficient to cope adequately with large regional shocks arising from the process of EMU, and involving shifts of

economic activity between member states, is an unresolved question. Likewise, it could be argued that the EU Structural and Cohesion Funds act as an inter-regional stabilisation mechanism. Certainly these funds have been increased in recent years, and the resources involved are by no means insignificant: some ECU 230 billion have been committed to these Funds over the period 2000-2006 (of which ECU 195 billion are for the Structural Funds). EU regional policies provide the framework and justification for the regional policies of member states, and together they transfer sizeable proportions of GDP between regions. However, while some argue that these regional policies have prevented regional economic divergence from taking place, other evidence suggests that their impact on the poorer regions of the EU has in fact been marginal (Boldrin and Canova, 2000).

Three conclusions can be drawn from all this. The first is that we simply do not yet know enough about the specific regional effects of EMU to be able to accept or reject claims such as that by Thirlwall that monetary union will seriously widen regional inequalities in the EU. The picture varies according to the measure of regional performance examined, as the different evolutions of regional productivity growth and regional employment growth examined here demonstrate. This leads to a second point, namely that whole process of regional convergence and divergence in the EU is complex, and can not be adequately captured by the growth regression convergence models that have thus far tended to dominate research and debate in this field. A much more disaggregative approach is required, which focuses on identifying the detailed impacts of EMU on particular sorts of regions. This is precisely where economic geographers could make an important contribution, given their current emphasis on case-study research. As yet, however, that research has not directed much attention to the EMU issue. The third point is that we should be cautious about using the experience of regional development in the USA as a basis for predictions about Euroland. The evidence on regional specialisation and adjustment to shocks in the USA is itself far from comprehensive or conclusive, so to use the USA case to

make inferences about Euroland seems premature.[16] In short, considerably more research is required before the regional impact of increasing economic and monetary integration in the EU can be discussed with confidence.

Notes

[1] More specifically, as laid down by the Maastricht Treaty, these criteria were (see Dent, 1997):

(a) Price stability: an average rate of inflation not more than 1.5 percent above that of the three best performing member states;

(b) Interest rates: an average nominal long-term interest rate not more than 2 percent above that of the three best performing member states;

(c) Exchange rates: participation in the Exhange Rate Mechanism's normal bands without devaluations for at least two years;

(d) Budget deficits: a government budget deficit of less than 3 percent of GDP under sustainable conditions;

(e) National debt: a government national debt of less than 60 percent of GDP

[2] Thus Blanchard (1991, p.159) has claimed that 'macroeconomists have rediscovered regional economics'. Similarly, Eichengreen (1992, p.66) has argued that "it might be said that all macroeconomics is regional. It is important to think harder than we traditionally have about the market area or region to which a particular macroeconomic analysis applies. Perhaps the most influential exponent of the new regional or geographical focus in economics, however, is Paul Krugman who has urged 'the acceptance of economic geography as a major field within economics' (1991, p.33), and indeed has gone on to pioneer the so-called 'new economic geography' (Krugman, 1998; Schmutzler, 1999).

[3] By comparison, economic geographers have in general been slow to contribute to the empirical research on regional convergence-divergence across the EU: some notable exceptions are Armstrong (1995a,1995b), Cheshire and Carbonaro (1995), Dunford (1993), Dunford (1996), and Dunford and Smith (2000).

4 This is precisely what has happened in the UK in recent years, as high-wage, high-cost economic growth has concentrated in the South East region, causing inflationary pressure there. The Bank of England has responded by raising the national rate of interest even though economic activity has been much less buoyant, and unemployment rates much higher, in the northern regions of the country. According to Governor of the Bank of England, unemployment in the North of the UK is 'a price worth paying' for keeping national inflation low. Not surprisingly, northern businesses have questioned why they should be penalised (by high interest rates) for the economic excesses of the South-East region of the country.

5 In effect, such inflows of labour and capital raise the full employment growth ceiling in the region. This raises the region's 'natural' growth rate, and permits it to continue on an upward development path.

6 Krugman (1997) has been critical of the concept of 'competitiveness', arguing that in a national context it tends to present international trade as a zero-sum game, whereas in the long term a country's standard of living depends on its absolute level of productivity (output per worker). A similar argument could be made regarding the idea of regional competitiveness, in that it presents a picture of regions pitted one against another in an attempt to capture bigger shares of particular export markets. Yet, elsewhere, Krugman (1993b) has argued that, by generating increasing returns and positive externalities, the localisation of an industry in a region (that is, regional specialisation) increases that industry's (and thus the region's) international competitiveness. The same idea forms the basis of Porter's theory of industrial clusters (Porter, 1990, 1998), which argues that the geographical localisation of an industry confers important competitive advantages to that industry in

international markets, and thereby to the local or regional economy in which the industry is clustered.

7 Barro and Sala-i-Martin use a nonlinear version of this 'growth regression', namely

$$(1/T)\log(y_{rt+T}/y_{rt}) = \alpha - [(1-e^{-\beta T})/T]\log(y_{rt}) + \varepsilon_{rt,t+T}$$

where y_r is per capita output in region r, T is the number of time periods (years) over which growth is measured, β is the convergence rate, and ε is the effect of random shocks. This form is preferred to a straightforward linear regression because it allows convergence to be asymptotic and for the speed of convergence (β) to be compared directly across historical periods of different length without having to use transformations.
If σ^2_t is the cross-region variance of $\log(y_{rt})$ at time t, the growth regression implies that σ^2_t evolves over time as

$$\sigma^2_t = e^{-2\beta}\,\sigma^2_{t-1} + \sigma^2_{\varepsilon t}$$

Because of the contribution of the error variance term, $\sigma^2_{\varepsilon t}$, β-convergence is a necessary but not sufficient condition for σ-convergence.

8 For example, Armstrong (1995) found evidence of geographic clustering of regional growth rates across the EU. Fast growing regions tend to be spatially clustered with other fast-growth regions, and similarly slow-growth regions tend to be geographically grouped in close proximity. This at least lends support to the idea that the spillovers of knowledge, capital and technology emphasised in endogenous growth theory are geographically localised.

[9] Most official EU discussions of regional issues tend to use NUTS2 and NUTS3 level regions. Whether these are suitable for analysing regional convergence and divergence is questionable. Neither NUTS2 nor NUTS3 regions are homogeneous entities economically; nor are they 'self-contained' in a labour market sense, so that, for example, highly urbanised regions (major cities) can have large commuter hinterlands which distort regional differences in output and value-added relative to resident populations.

[10] Analysis of the effects of different causal factors is hampered in the EU context by the paucity of detailed time series data on the relevant variables at the regional level.

[11] These data were supplied by Cambridge Econometrics, UK, and formed the basis of its study for the European Commission (1997). For a description of the data and the sources used in their construction, see European Commission (1997).

[12] The issue of defining 'regional competitiveness' is a difficult one, and various indicators have been used. In the EU context, the problem is compounded by the lack of data on many indicators or measures of competitiveness at the regional level (see Pompili, 1994; Fagerberg, Verspagen and Caniels, 1997; Pinelli, Giacometti, Lewney and Fingleton, 1998).

[13] These data were also supplied by Cambridge Econometrics.

[14] Excluding Ireland and Luxembourg.

[15] On the other hand, US counties, of which there are several hundred, are too fine a spatial disaggregation. A more appropriate level, perhaps would be the 132 regional units defined by the Bureau of Economic Analysis. As far as I am

aware, no convergence analysis has been carried out for these regional units.

[16] For example, the claim that US regions are more economically specialised than EU regions has yet to be convincingly demonstrated. Comparisons have been restricted to those between US states and EU countries, not EU regions. And even Krugman (1991, Ch.3) himself has admitted that the degree of specialisation of US states has in fact been declining over the post-war period. At the same time, relatively little is known about trends in regional economic specialisation in the EU (data limitations being one reason).

TABLES AND FIGURES

Table 1: The Empirics of Regional Convergence in the EU: Estimates of Regional Convergence rate, β, from Some Major Studies

Period	Barro and Sala-i-Martin (1991) (GDP per capita NUTS1 regions)	Barro and Sala-i-Martin (1995) (GDP per capita NUTS1 regions)	Armstrong (1995a) (GDP per capita NUTS2 regions)
1950-60	0.011		
1960-70	0.028		
1970-80	0.018		
1980-85	0.012		
1950-60		0.018	
1960-70		0.023	
1970-80		0.020	
1980-90		0.010	
1950-90		0.019	
1950-60			0.016
1960-70			0.027
1975-81			0.008
1981-93			0.002
1975-93			0.003

Period	Armstrong (1995b) (GVA per capita, NUTS1 regions)	European Commission (1997) (GVA per capita, NUTS2 regions)	Button and Pentecost (1999) (GDP per capita, NUTS1 regions)
1950-70	0.017		
1975-92	0.009		
1975-87		0.003	
1987-93		0.005	
1975-85			0.010
1980-90			0.006

Notes:. **1.** In the table, a positive value of β (but less than unity) implies regional convergence. A negative value would imply divergence.

2. In Barro and Sala-i-Martin (1991) and Button and Pentecost (1999) the estimates include the effects of country dummies.

3. The number of countries - and hence number of regions - included varies from study to study.

Table 2: Convergence Regression Results for the E-16 Regions, 1975-98 (Growth of Constant Price GVA per Worker)

	Absolute Convergence Model			Conditional Convergence Model with Regional Industrial Structure Term		
Period	**Intercept**	**β**	**R-sq**	**Intercept**	**β**	**R-sq**
1975-1986	0.2029	0.0072 (2.032)**	0.2902	02021	0.0098 (2.104)**	0.3301
1986-1998	0.0788	0.0018 (1.041)	0.0673	0.02993	0.0020 (1.266) -	0.0898
1975-1998	0.2067	0.0041 (1.686)*	0.1736	0.18791	0.0054 (1.752)*	0.1961

Notes: 1. ** significantly different from zero at 5 percent
* significantly different from zero at 10 percent
2. Coefficients on regional industrial structure term not shown for results from conditional model

Figure 1

Regional Disparities in GVA Per Worker in the E-16 1975-1998

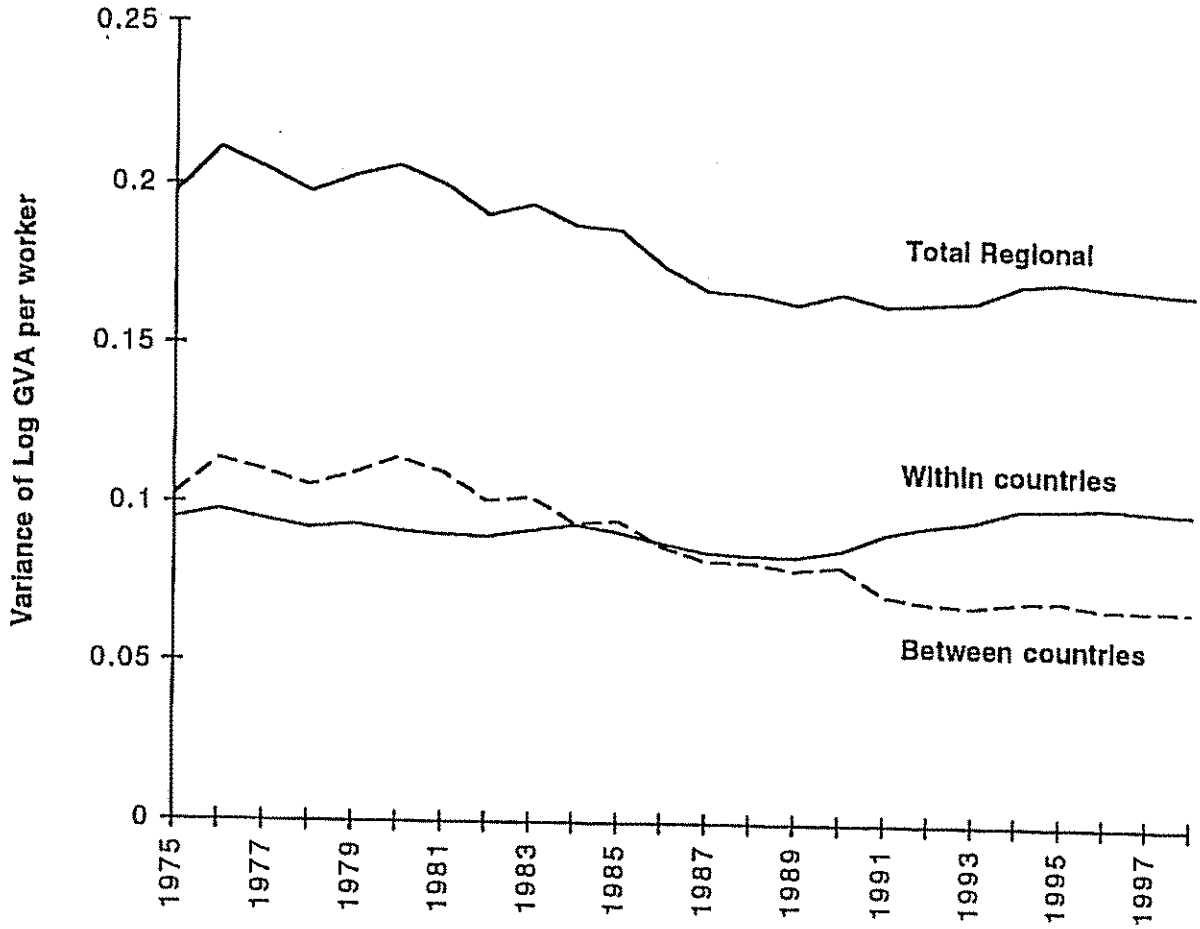


Figure 2

Average Annual Growth of GVA per Worker in the E-16, 1975-98

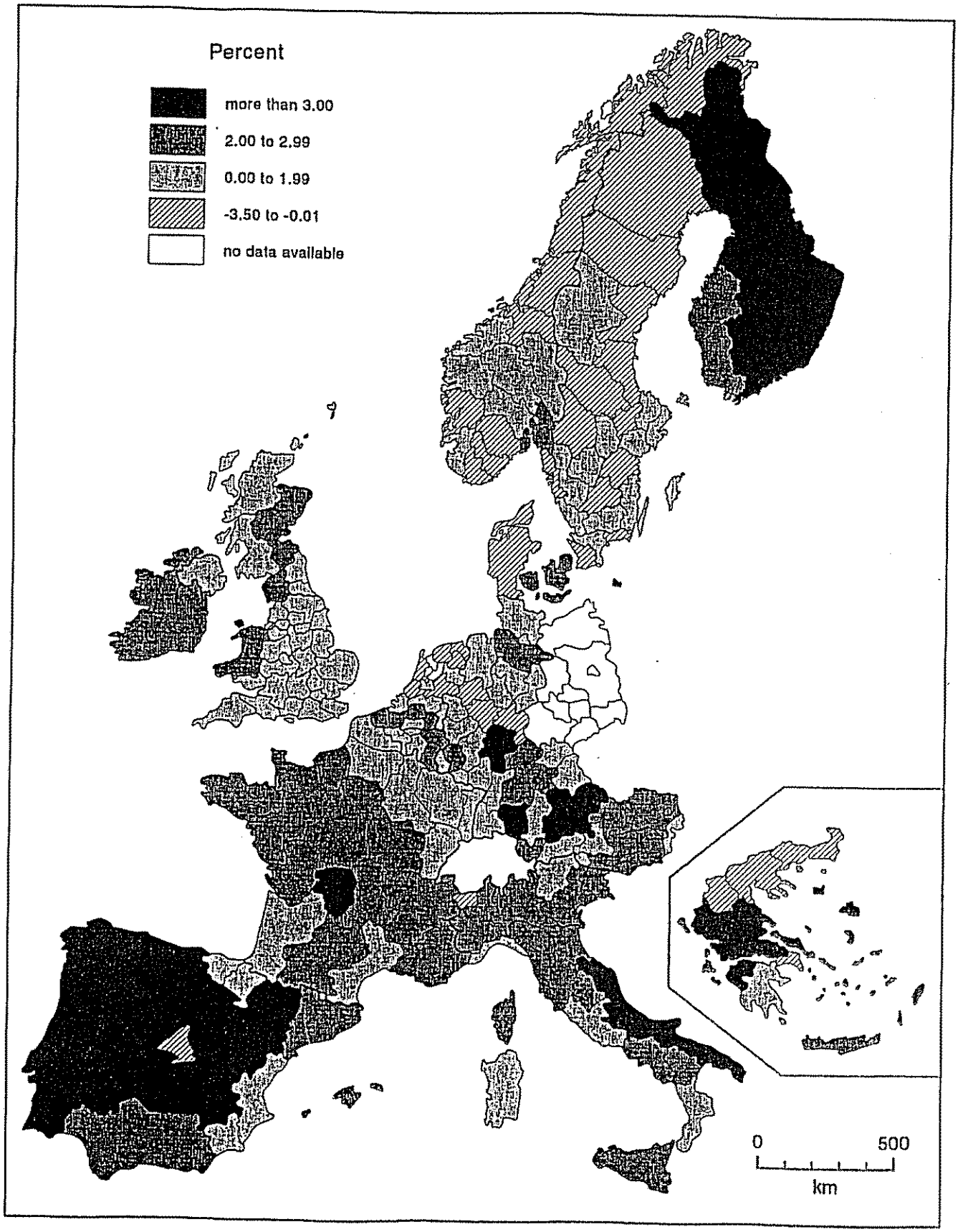


Figure 3

Regional Inequalities in GVA per Worker in the E-16, 1975-1998 (Ratios of Percentiles to the Median)

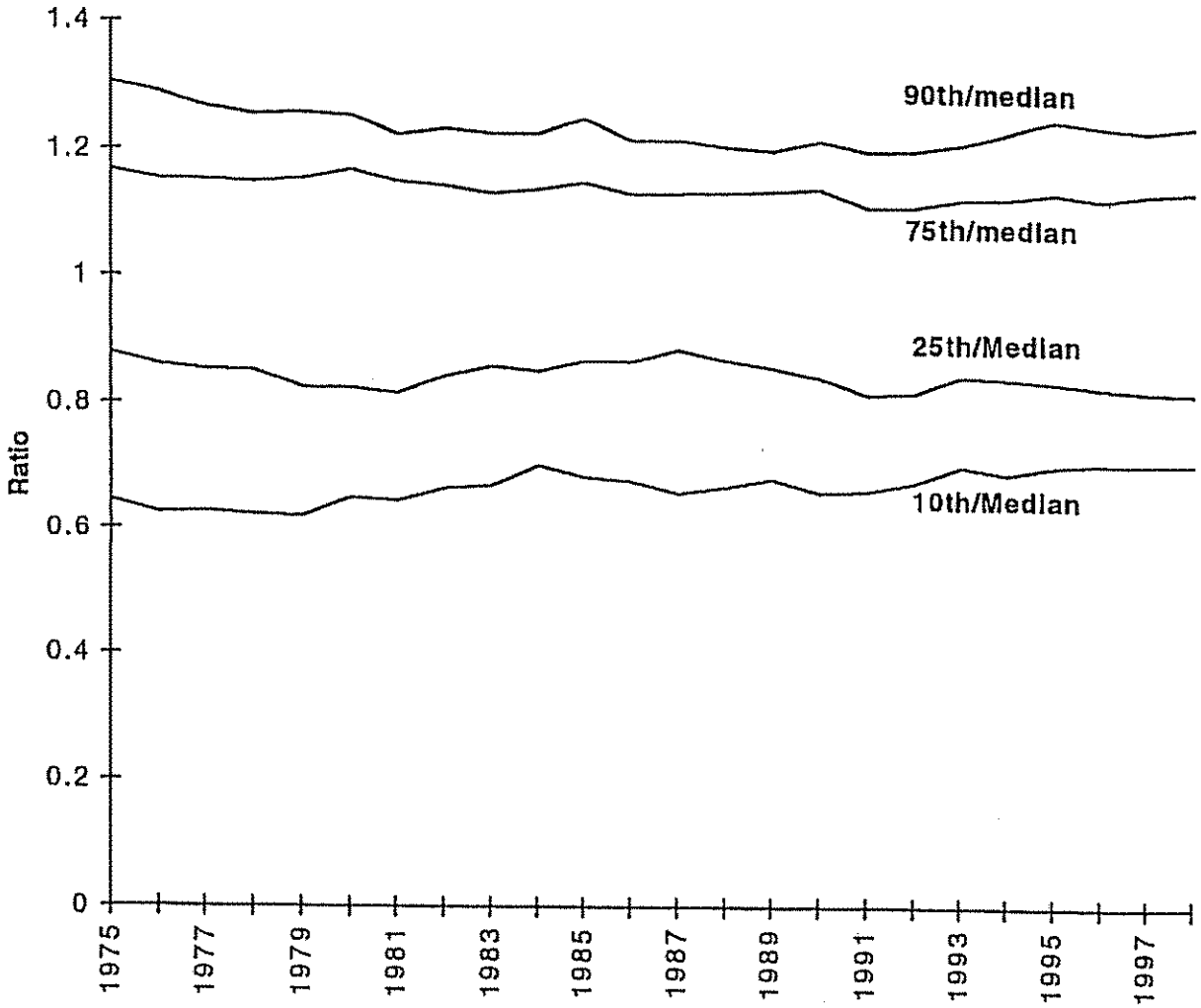
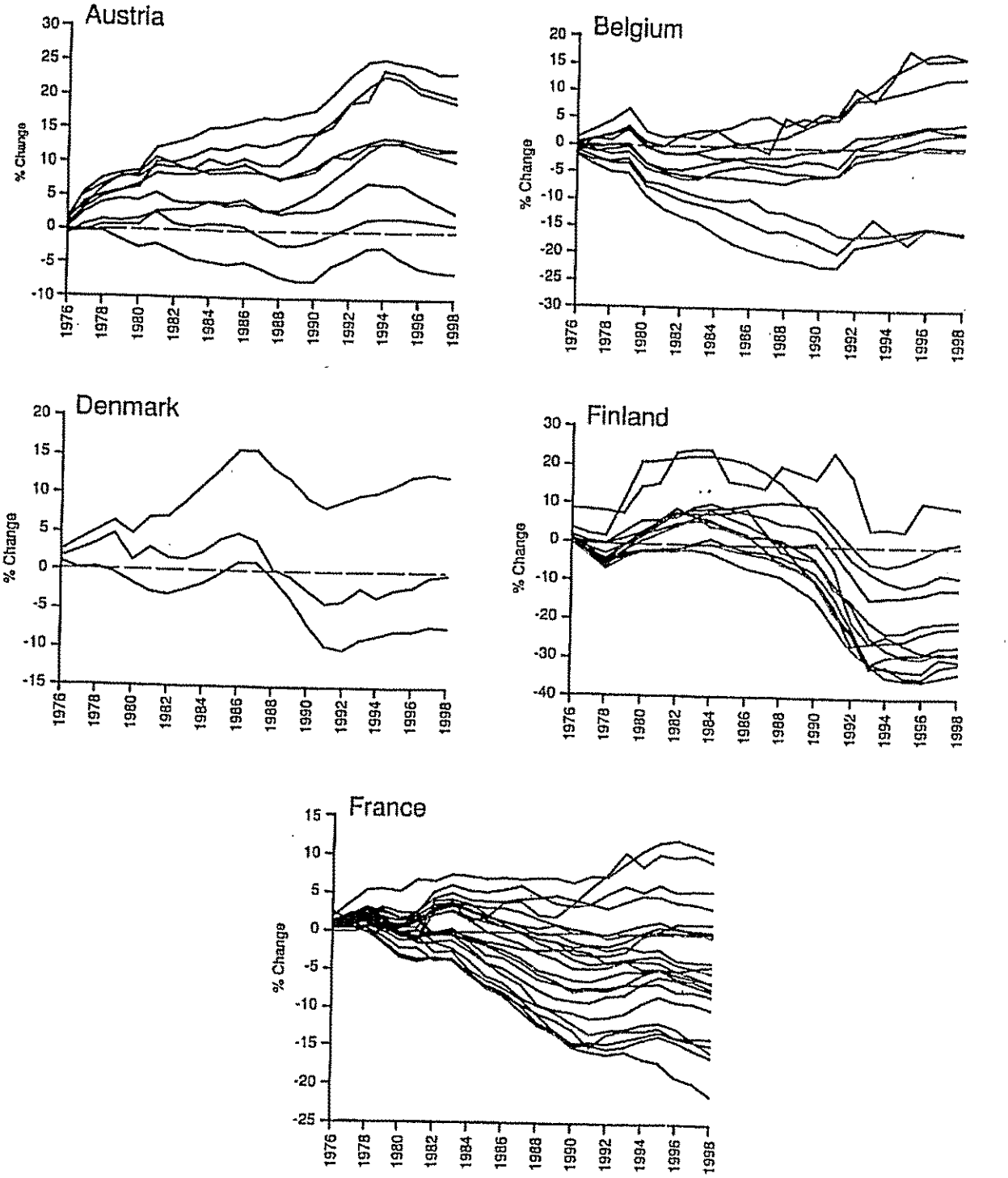
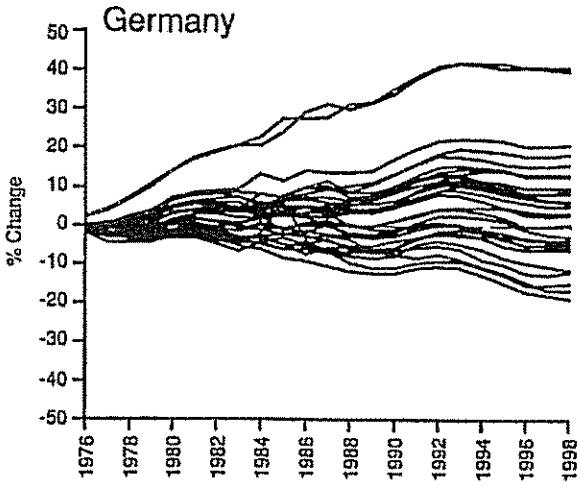


Figure 4

Regional Employment Evolutions in the E-16 (Cumulative Growth Relative to E-16 Average) 1975-98




Germany
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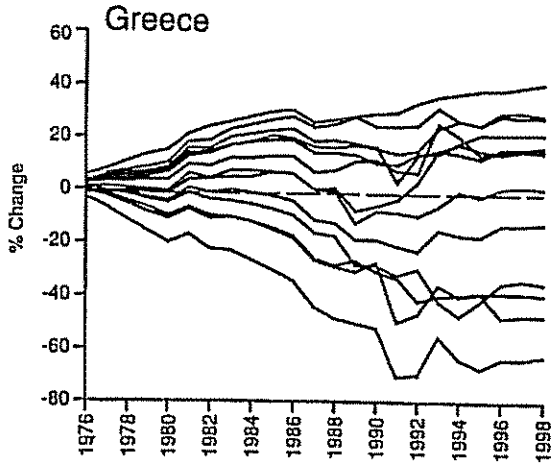
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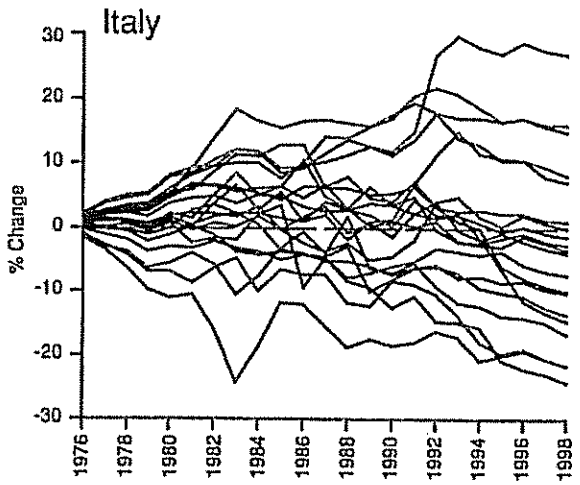
Italy
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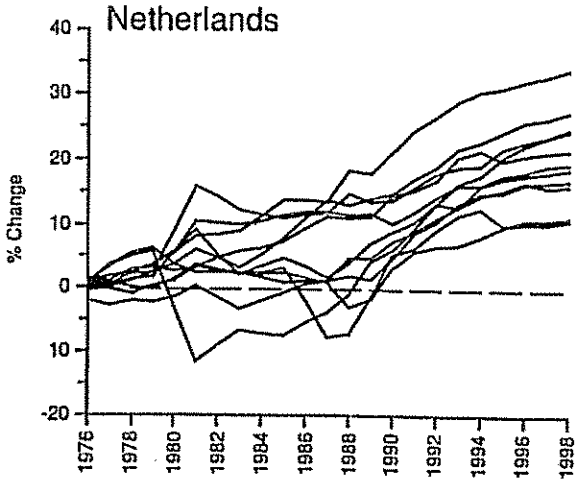
Netherlands
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1988
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1992
1994
1996
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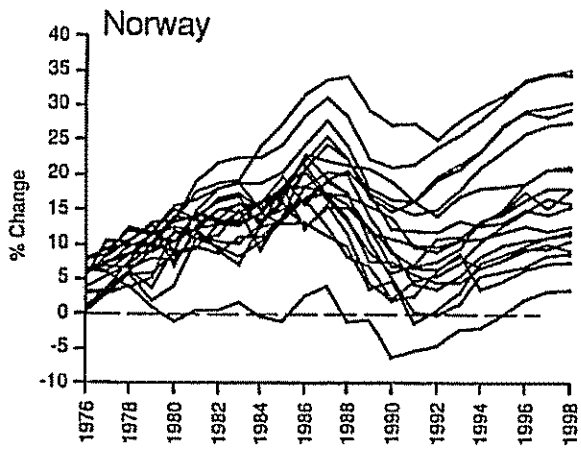
Norway
% Change
40
35
30
25
20
15
10
5
0
-5
-10
1976
1978
1980
1982
1984
1986
1988
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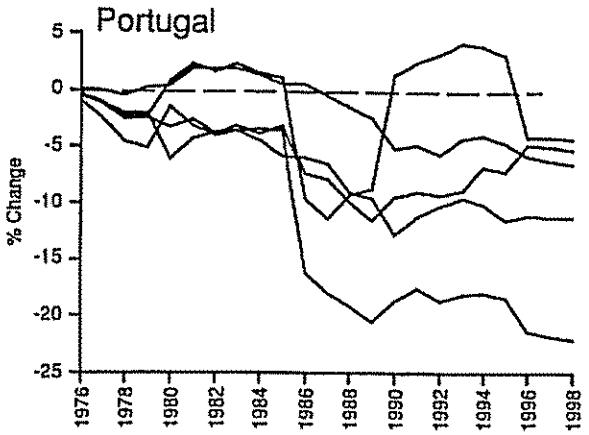
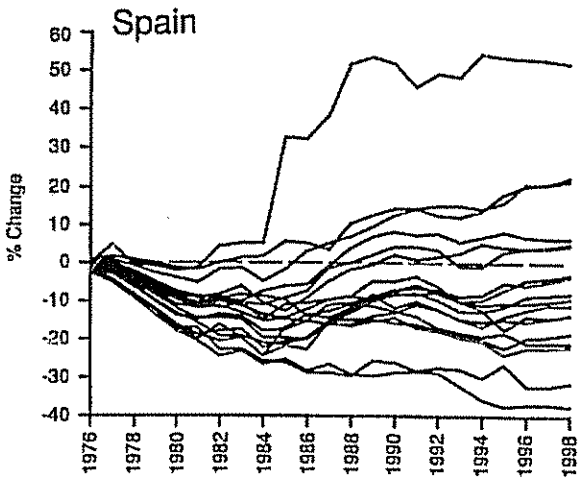
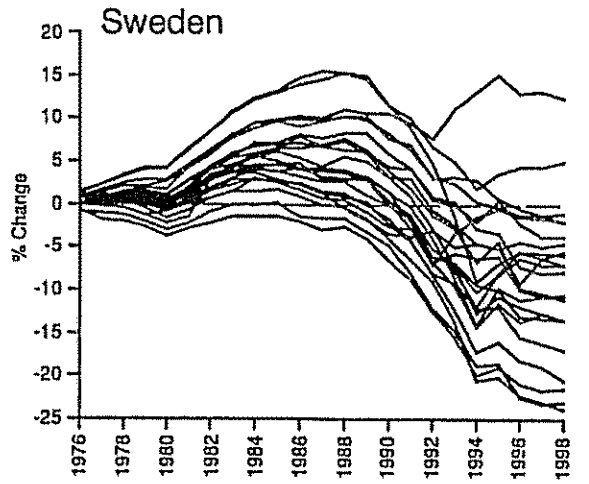
1992
1994
1996
1998


Portugal
% Change
5
0
-5
-10
-15
-20
-25
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998


Spain
% Change
60
50
40
30
20
10
0
-10
-20
-30
-40
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998


Sweden
% Change
20
15
10
5
0
-5
-10
-15
-20
-25
1976
1978
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1984
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1992
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1996
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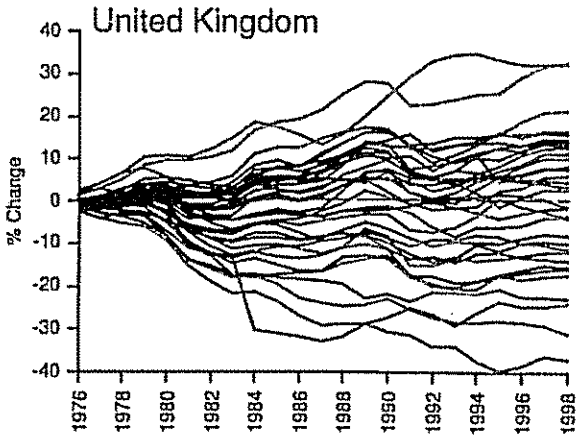
United Kingdom
% Change
40
30
20
10
0
-10
-20
-30
-40
1976
1978
1980
1982
1984
1986
1988
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1992
1994
1996
1998

Figure 5

Cumulative Employment Growth in the E-16
(Relative to E-16 Average)
1975-98

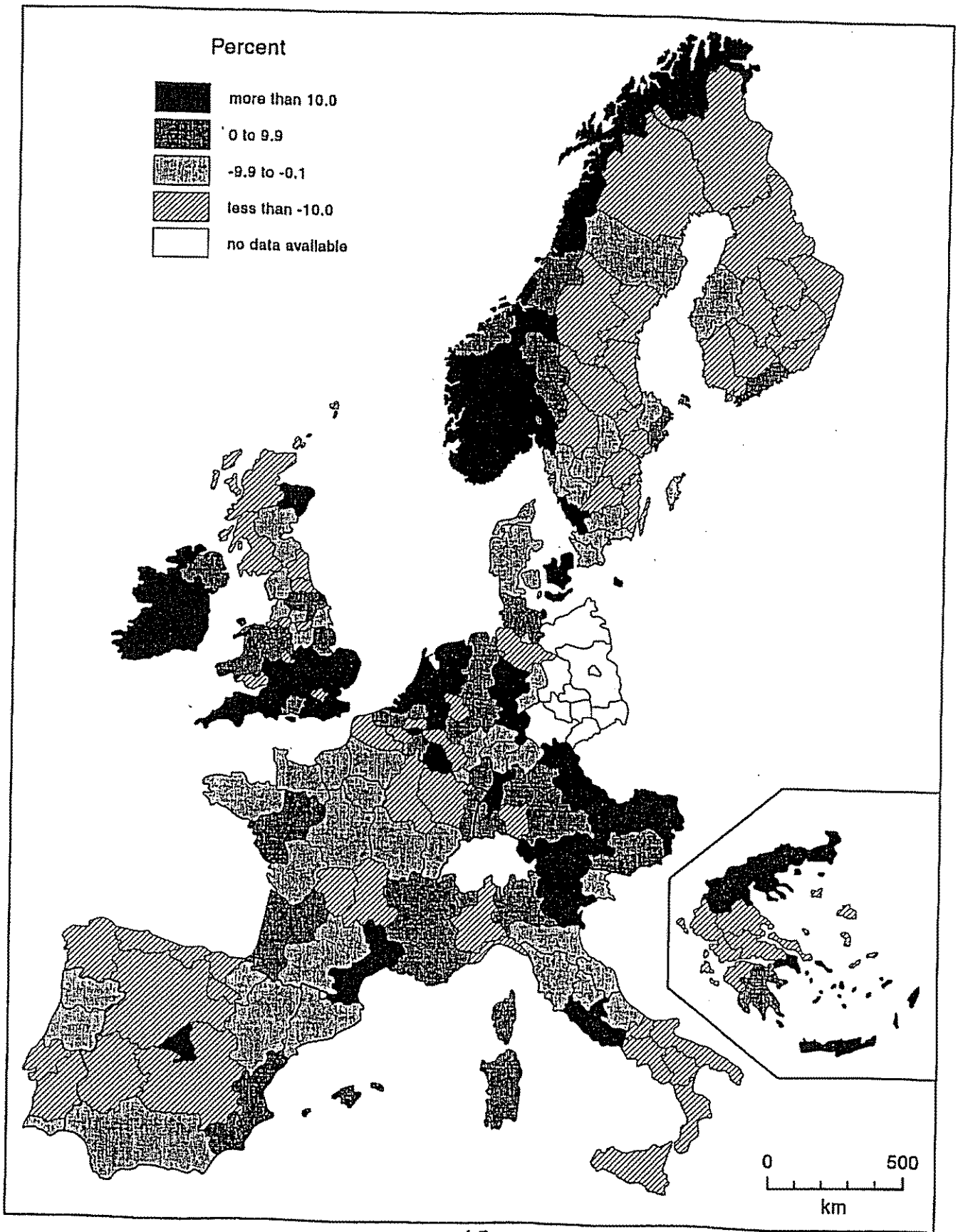
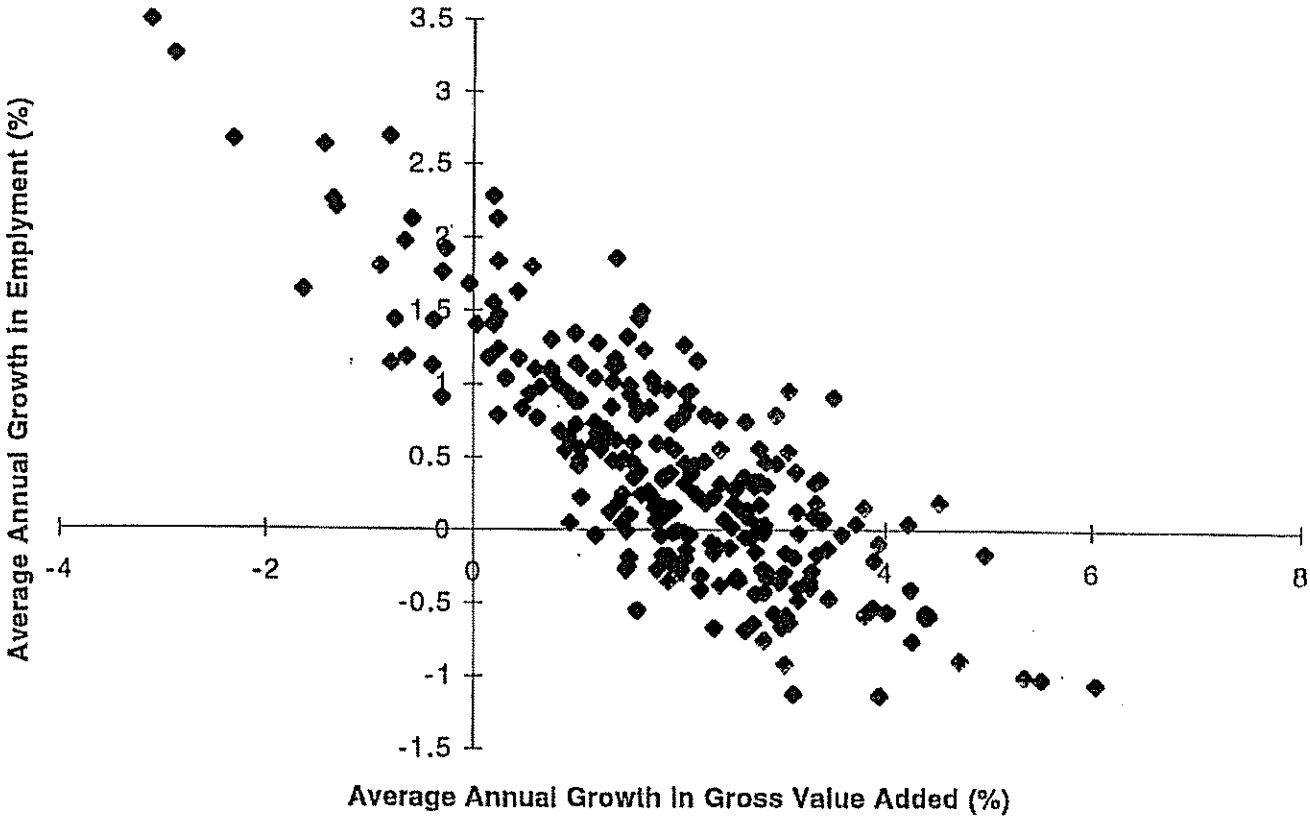


Figure 6

Growth in Regional Output and Employment in the E-16, 1975-98



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