

Melachroinos, Konstantinos A.; Spence, Nigel

Conference Paper

Capital and labour productivity convergence of manufacturing industry in the regions of Greece

38th Congress of the European Regional Science Association: "Europe Quo Vadis? - Regional Questions at the Turn of the Century", 28 August - 1 September 1998, Vienna, Austria

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Melachroinos, Konstantinos A.; Spence, Nigel (1998) : Capital and labour productivity convergence of manufacturing industry in the regions of Greece, 38th Congress of the European Regional Science Association: "Europe Quo Vadis? - Regional Questions at the Turn of the Century", 28 August - 1 September 1998, Vienna, Austria, European Regional Science Association (ERSA), Louvain-la-Neuve

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<https://hdl.handle.net/10419/113405>

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Capital and labour productivity convergence of manufacturing industry in the regions of Greece

Konstantinos A. Melachroinos and Nigel Spence
Queen Mary and Westfield College, Mile End Road, London E1 4NS
(K.Melachroinos@qmw.ac.uk; N.Spence@qmw.ac.uk)

Paper prepared for the Regional Science Association European Congress, Vienna, Austria, 28 August - 1 September 1998: DRAFT

Abstract

This paper explores the process of manufacturing capital and labour productivity convergence across the regions of Greece. The starting point of the analysis is the evolution of current thinking about productivity in spatial analysis. It is suggested that the greater mobility of the factors of production within national borders is to a large extent responsible for the long-standing tendency of geographers to overlook regional productivity dynamics. Some definitional issues in the measurement of productivity precede the estimation of regional capital and labour productivity levels in Greece during the period 1984-1994. Some surprising results are generated. There are clear signs of convergence, but it is the main metropolitan area of the country that attempts to match the labour productivity levels of the other regions, while the latter strive to achieve the capital productivity levels of the capital. The examination of spatial variation in capital intensity makes clear that convergence trends are mainly the outcome of an adjustment process in response to economic crisis. A closer look at the regional incentive legislation reveals an unexpected culprit behind the trends.

Key words: capital productivity convergence labour productivity
 Greek regions regional disparities uneven growth

1. Introduction

Given that spatially uneven industrial growth is a prime topic in economic geography, it is surprising that changing regional productivity is a relatively understudied area. Geographers seem to be more interested in the dynamics of the unequal distribution of the factors of production (labour and capital) rather than in the regional inequalities of their productive use. However, there are clear signs that this has started to change. In the field of regional science, at least, there is a proliferation of studies focused on productivity growth and the factors that affect it in a variety of regional contexts. Apart from the numerous US studies (a detailed review is offered by Gerking, 1994), mention can be made of the studies of Chen (1996) in Chinese regions, and Vagionis and Spence (1994) and Vagionis and Sfakianakis (1997) for Greece. At the same time productivity concerns are being raised more frequently in mainstream geographical thinking.

There are at least two reasons that make necessary a closer examination of the evolution of regional disparities in productivity levels and growth rates. The first is because in the long run the improvement of living standards in an economy of any scale is heavily dependent upon labour productivity increases. From this viewpoint,

the dynamism of the regional industrial expansion process is reflected, to a large extent, in productivity growth rates. The second is because recent findings in the field of international economics suggest that a productivity convergence process between advanced and lagging economies is under way (Baumol, 1986; Dollar and Wolff, 1988; Doyle and O' Leary, 1997; Wolff, 1991; Wolff, 1996). To the extent that similar trends and sources of convergence (structural change, technological diffusion etc.) are reported to hold at the regional level in many countries (see for example De la Fuente, 1997 for Spain), then it is necessary for more attention be paid to this issue. A more detailed examination of the nature and mechanisms of this phenomenon will enhance understanding of spatially uneven growth and the factors that oppose it, while also facilitate the development of policies and strategies for the reduction of such inequalities.

This paper explores the process of manufacturing productivity convergence in the regions of Greece. The first issue to be addressed is methodological and concerns the evolution of the conceptions of productivity growth in geographical thinking. Without trying to justify the neglect of this important parameter of uneven growth, it is argued here that the greater mobility of the factors of production within the boundaries of the national state is largely responsible. The analysis proceeds with a brief discussion of some of the issues that are involved in measuring productivity.

The main objective of the paper is reached in the fourth section. Here an attempt is made to estimate and understand the evolution of regional manufacturing productivity in Greece between 1984-1994. The short period for which there are available data and their aggregated character make the use of elaborate econometric models problematic. However, the comparative analysis of two single factor productivity indices - for capital and labour - clearly shows that a significant and somewhat peculiar convergence process is taking place in Greek regions over the whole period. The core region of the capital city attempts to match the labour productivity levels of the peripheral regions, while the latter, in turn, attempt to close the gap between their capital productivity levels and those of the principal metropolitan region.

An effort to explain the trends is attempted in the penultimate section. The evolution of the capital-labour ratio during the period reveals that there is also a homogenisation process ongoing amongst Greek regions. This trend is mainly the outcome of considerable regional variation in the rates of employment and capital stock growth/decline. A closer look at the regional incentive laws offers a rather unexpected explanation about, perhaps, the major motive force behind regional productivity convergence in Greece. The paper concludes with a summary of the basic findings and their relevance to policy formulation.

2. Spatial uneven industrial growth and productivity

The importance of productivity growth for a given economy of any scale (national or regional) is epitomised neatly in the words of Krugman (1994a: 14). "*Productivity isn't everything, but in the long run it is almost everything.*" If it is properly understood that improvements in levels of well being are highly dependent upon increases in labour productivity, then this seems to be far from an overstatement.

In general, there are two ways through which economic growth can be achieved. The first is through the expansion of the factors of production and other production inputs. Increases in the size of the labour force and that of capital stock usually translate into output growth. In the same vein, improvements in the levels of educational attainment of the workforce and their skills or in the quality of capital deployed have similar positive effects. The second way via which economic growth takes place is through rises in productivity, or in other words increases in the amount of output that is produced by given amounts of inputs. Such productivity increases can take place as a result of improvements in the efficiency that the factors of production and other inputs are used. Technical progress is a major cause of such improvements, but not the only one. Other factors, such as economies of scale, external economies or agglomeration economies have been reported to have similar effects on productivity.

Although expansion of production inputs plays a critical role in the generation of economic growth, nevertheless, empirically it has been observed that the latter cannot happen without an increase in productivity levels. This, at least, is confirmed by empirical regularities such as Fabricant's law, which points to a positive relationship between output and labour productivity. Similar positive relationships have been found to hold for output and total factor productivity (TFP) growth (Oulton and O'Mahony, 1994).

There are several reasons why increases in the volume of the factors of production are, alone, not enough to sustain high rates of output expansion (Krugman, 1997). The first is that the expansion of the factors of production is subject to certain limitations. These can be highlighted once it is assumed that the factors of production are to a large extent immobile (an assumption that is not so unlikely at the international level). Employment, for example, cannot be expanded endlessly, because in the long run its growth rates follow those of total population. Similarly, new capital formation is heavily dependent on the share of output that is re-invested. The second reason is related to the increase of the magnitude of economic activity. In the early stages of economic development, a modest expansion of production inputs will tend to generate high growth rates. However, enlargement of an economy entails that higher increases in the amount of inputs (fixed capital, human capital etc.) are necessary for growth rates to be sustainable. The final issue is that of diminishing returns. It is not certain that the expansion of the factors of production will lead to equal increases in the amount of output produced. It is quite possible for the output growth rate, after a certain point (under a given technological regime), to be less than the pace of the expansion of inputs.

If the above considerations are transferred into a spatial context then it is apparent that uneven industrial growth can also be thought of as the outcome of two processes - the result of unequal expansion of the factors of production and the result of differential productivity growth. Given what has already been suggested about the nature of input-driven growth, the spatial divergence in productivity levels acquires clear importance for the understanding of the evolution of regional inequalities. It must be the case that regional disparities in output growth are not viable in the long run if they are the mere outcome of an unequal expansion of the factors of production. Unless, they are followed by productivity increases, then it is certain that sooner or later they will be eliminated. Similarly, a process of regional convergence in productivity levels will

lead to the reduction of regional inequalities in the long run. Thus, it is obviously beneficial both from an analytical and policy perspective to explore this process. Such an examination will enhance understanding about uneven growth and the factors that determine it, and may well lead to the formulation of alternative strategies for the reduction of regional disparities. Undoubtedly, strategies which focus on enhancing productivity in the lagging regions, rather than on simple transfers of resources to them as usually the case until recently, offer the greatest potential.

However, apart from the regional policy aspect, it is perhaps instructive to examine why some researchers have been, until recently, reluctant to address the productivity issue. A cursory glance at the late seventies' industrial restructuring literature reveals that productivity growth is usually approached as an inevitable process (Massey and Meegan, 1979). The focus is not on the sources behind differential regional productivity performance but on its implications for employment growth. This tendency becomes clearer in the mid-eighties' de-industrialisation literature where productivity is viewed as a constraint that under certain circumstances (slow output growth) will lead to employment decline and higher unemployment (Rhodes, 1986). During early nineties conceptions of productivity growth began to change. Markusen et al (1991), for example, employing a more advanced shift-share analysis model than that of Massey and Meegan (1979) this time for US regions, are also concerned about the negative impact of productivity growth on employment. Again it is stated that the positive effects of output expansion are eliminated due to productivity rises. However, they do also acknowledge that, if regional productivity gains outpace those in other areas, then they might be beneficial for employment through increases in regional market share. In more recent papers, the role of differential regional productivity performance is further explored, not only in the context of uneven growth, but also as a parameter of regional variation. Spatial differences in productivity levels alongside differences in the employed share of the population have been argued to be important explanatory variables of regional disparities in the levels of GDP per head in the EU (Dunford, 1993; 1996). In addition, regional differences in capital and labour productivity are now considered to reflect spatial variation in production techniques (Rigby and Essletzbichler, 1997).

The above brief review is indicative of two issues. First, it points to the tendency of researchers to approach industrial growth as the pure outcome of the expansion of the factors of production. The focus, mainly on employment, can be partly accounted for by data availability. Second, is the view that productivity growth is an inevitable event rather than the outcome of the dynamism of the industrial development process and, thus, a target to be achieved. It is tempting to try to account for the neglect of the productivity dimension using the above axes.

It can be argued that, although growth is dependent upon productivity gains at the same time, it is also dependent upon the expansion of the factors of production. According to this explanation researchers have been simply more interested in the unequal expansion of the production inputs rather than in regional disparities in their productive use. This argument can be supported empirically. Hulten and Schwab (1984), for example, report that the faster growth of Sun Belt in comparison to that of the Snow Belt between 1951-1978 was not due to differences in levels of economic efficiency, but largely due to differences in the growth of labour and capital inputs.

It is not difficult to see that the above argument is rather weak since the expansion of the production inputs is subject to certain limitations. The freedom of the factors of production to move without any control across regions offers a second, perhaps more persuasive, explanation. International labour migration is subject to rigorous control policies, while the same applies, though to a lesser degree, to capital movements in many countries. In contrast, at the regional level mobility barriers are much lower, and it can be argued that in many instances researchers have been witnesses to significant expansionary or declining trends in the availability of factors of production (urbanisation, centralisation etc.). In such a context, productivity growth becomes somewhat less important for the sustainability of high rates of growth. The expansion of production inputs is not dependent any longer on the actual limitations of the regional economy but on its ability to attract resources. It is pertinent that regional development policies, since the early days, have focused on the facilitation of the transfer of production resources from the core to peripheral regions.

Spatial concentration of production resources is also associated with productivity increases. Agglomeration, external or scale economies are the simple manifestation of this fact. Until the emergence of diseconomies, the gathering of large amounts of factors of production leads inter-alia to productivity rise. Given that spatial concentrations are usually self-reinforced over time (history and accident matter) it can be argued that regional analysts were more interested in the spatial concentration process itself rather than its productivity-based, underlying causes. Indeed, for quite some time they lacked formal methodological tools to model such phenomena. As Krugman (1991) argues, increasing returns, external economies and imperfect competition were exactly those aspects that economists found hard to model, at least until recently. It is worth noting that much of the early regional science literature on productivity focuses on issues such as agglomeration economies or urban productivity (see Beeson, 1987 and Gerking, 1994 for a review). The difficulties encountered in attempts to incorporate into a spatial context conventional production functions that assumed constant returns to scale are indicative of this point.

The above discussion should not be read as a justification for the neglect of this important parameter of uneven growth, but rather as an attempt to account for the lack of interest in it. The difficulty in formulating plausible explanations for this neglect and the recent revival of the interest indicate that productivity is an important element of spatially uneven growth. The reasons that have been mentioned so far about the wider significance of productivity also hold at the regional level. From another point of view, it can be argued that in the current context of slow industrial growth in many western economies, its regional importance increases even further. Regional development policies cannot be based upon the mobilisation of huge volumes of production inputs as in the past (Mezzogiorno, for example), since in an era of decline such amounts are simply not available and a large number of regions inevitably bid for them.

In the succeeding sections an attempt will be made to estimate and understand the evolution of regional manufacturing in Greece between 1984-1994. But first a brief discussion about some of the issues involved in measuring productivity, and the availability of data, is necessary.

3. Measuring productivity growth

Productivity is conventionally defined as the quantity of output per unit of input. Consequently, productivity growth takes place as a result of increases in the amount of output produced by a given amount of inputs. However, as in many other major economic notions, things are not quite so simple as they seem, either theoretically or empirically. The fact that many types of output are produced and numerous inputs are utilised makes the situation complex. Even for the simplest case of one firm using one input to produce only one homogeneous output, there are at least six different ways in which productivity growth may be viewed (Diewert, 1992). Space does not permit a proper exploration of productivity measurement issues, so instead the analysis will focus on some general empirical points related to the indicators used here. Additionally, some focus will be placed on the data available to this research.

Although many types of inputs are used in the production process, it is the case that productivity is usually measured in terms of labour. In general, there are two ways in which labour productivity is measured: either in terms of output per employee or in terms of output per hour worked. Such accounting is surely legitimate since welfare depends in the long run on increases in the amount of output that human beings produce. However, given that many other inputs are utilised, it is possible that labour productivity increases may not reflect improvements in technical efficiency, but merely the pure expansion of other production inputs (Krugman, 1994c, O' Mahony, 1994). Given the obvious limitations in the expansion of the factors of production, it is essential to know where the real efficiency gains are.

A neat method to account for those productivity increases that can be attributed to technical change is total factor productivity (TFP). This growth-accounting method measures both that part of output increase that is due to the expansion of production inputs and that part due to technical change. Although TFP has been used extensively empirically, its foundation in production theory is particularly rigorous, which really means that almost every single assumption matters in the interpretation of the results. Thus, strictly, to generate reliable results, estimations have to be undertaken at the industry-level (three or four digit SIC category), gross measures of output have to be used instead of value-added, while disaggregated information is necessary on production inputs in order to account for the variation in their quality (Oulton and O' Mahony, 1994). Unfortunately, such detailed estimations are rarely possible at the regional level due to data limitations. The impact of such data deficiencies can be dramatic. The use, for example, of value-added instead of gross output data, results in an overestimation of technical progress by a factor of 2 or 2.5. This happens because value-added usually accounts for approximately 40-50% of gross output (Oulton and O' Mahony, 1994). The use of gross output data at the regional level is especially problematic. Purchased services are not treated as intermediate inputs, while, more important, statistics do not net-out the manufactured goods produced in one region and used in another region as intermediate inputs (Hulten and Schwab, 1984). In the Greek regional context, estimation difficulties are made worse because of the short period for which data are available.

The above observations should not be read as a criticism to the considerable econometric work on the field. However, they do highlight the fact that results should be treated with caution and always in relation to the hypotheses from which they derive. For this research at this time, it was decided to use simpler single factor productivity indices to provide an alternative, and relatively problem free, way of approaching regional productivity performance. It will be demonstrated that these simple indicators reveal rather an interesting story that might well provide a helpful context for more complex analysis.

Capital and labour productivity are the two single factor indices used here. It has been already mentioned that labour productivity is usually measured as output per employee or output per person hour. Given that data on hours worked are unavailable for Greek manufacturing, only the first estimation is feasible. However, this measure too is not unproblematic. Apart from not accounting for the actual hours worked (especially important where part-time working is significant), it also does not provide any information about the quality of human capital. Better-educated or more skilful employees are also more productive, and thus it is really necessary to account for regional differences in the quality of human capital. The last problem can be addressed by the development of an alternative labour productivity indicator, that of output per unit of labour cost (includes here both labour remuneration and employers' national insurance contributions). Since better-educated employees are usually higher paid, interregional differences in labour productivity levels, defined as output per unit of labour cost, will be unaffected by the spatial variation in the quality of human capital. Nevertheless, it is useful to compare the evolution of trends of the different indicators of labour productivity, since some telling aspects can be revealed about the uneven growth of human capital in the regions of Greece. In both measures of labour productivity, value-added is used as a measure of output. Given what has been said about the gross output and intermediate inputs data, this choice offers the safest alternative. Following a similar logic, capital productivity is also measured as the amount of value-added per unit of capital cost. Manufacturing capital stock data are used as a measure of capital cost. The parallel examination of capital and labour productivity defined, as value-added per unit of capital or labour cost respectively, will minimise the risk of attributing production input (intermediate inputs, capital stock, number of employees, human capital) expansion to productivity gain.

The value-added and labour cost data, necessary for the productivity estimations, derive from industrial surveys carried out annually since 1974 by the National Statistical Service of Greece (ESYE). Changes in the regional boundaries and the unavailability of the 1978-1979 data (the results were never published) mean that only data since 1980 are operational. This fact reduces considerably the time period of the analysis since the last year for which data (unpublished) are available is 1994. At the regional scale, the surveys contain information only for manufacturing firms that employing more than twenty. The published data are aggregated and refer only to total manufacturing activity. To estimate labour cost, unpublished data on employers' national insurance contributions were also used. The transformation of figures from current prices into constant 1980 prices was undertaken using manufacturing GDP deflators. The necessary regional manufacturing capital stock data come from earlier work (Melachroinos and Spence, 1997a). The figures have been estimated under the assumptions of a double-declining balance depreciation pattern and an 18-year full

depreciation period. The fact that capital stock data cover only the years 1984-1994 entails that analysis has to be limited even further within this time boundary.

4. Manufacturing productivity convergence in the Greek regions

It will be demonstrated that the exploration of capital and labour productivity reveals some telling aspects about the evolution of regional disparities in Greece between 1984 to 1994. But first it is useful to examine briefly the changes in the traditional indicators of regional economic performance. This will provide a clear picture of the unequal distribution of manufacturing among Greek regions, which will be helpful in putting the productivity figures into perspective.

Regional inequalities in the general distribution of manufacturing activity are clearly depicted in table 1. They refer to absolute values at constant 1980 prices and provide an understanding of the actual magnitude of manufacturing activity in each region. In 1994 the region hosting the main metropolitan area of the country (Attiki) accounted for approximately 45% of all value-added, more than 35% of total capital stock and 44% of national employment. The regions of Central Makedonia and Central Greece followed with much smaller shares, while there were six regions (Western Makedonia, Ipiros, Ionian Islands, Northern Aegean Islands, Southern Aegean Islands and Kriti), where not only the relative shares, but also the actual size of manufacturing activity were small indeed. The last mentioned group of regions are exclusively peripheral, located at the borders of the country. Thus, a clear distinction between core and periphery emerges. Additionally, simple comparison of the 1984 and 1994 figures reveals that few changes took place in this unequal distribution of manufacturing.

TABLE 1 HERE

Regional manufacturing dynamics are better depicted in table 2, which contains the annual rates of growth and decline in key performance indicators. Nationally, value-added remains almost stagnant in a ten-year period (growing by less than 0.4% per year), while capital stock and employment decline at an alarming pace (2% and 3% respectively). Another interesting aspect is that labour costs also decrease, but at a much slower rate (0.75%) than employment. The term 'de-industrialisation' encapsulates the principal economic theme of the period.

TABLE 2 HERE

In such circumstances, individual regions adjust to the negative economic environment with a varying degree of success. Employment losses are recorded everywhere save for Kriti, Ipiros and Eastern Makedonia-Thraki, where figures remain more or less the same (slightly positive or negative). Similarly, regional capital stock levels decline in the majority of regions (Attiki, Ionian Islands and Kriti are the exceptions). But the picture is more complicated for value-added. Several regions exhibit significant output growth rates (Ipiros, Kriti, Eastern Makedonia-Thraki, Attiki and Central Makedonia) given the general negative climate, while in the remaining regions the economic crisis also takes the form of output decline. The severest losses are recorded in peripheral regions of the country, such as the Ionian (12.3%) and Southern Aegean Islands (8.9%) and Western Makedonia (7.7%). However, it can be

argued that these sharp negative trends are partly the outcome of the small size of their manufacturing bases. In any event, Kriti appears the real winner in terms of both (modest) employment and capital expansion coupled with substantial output growth. Other regions, which also experience output growth, perhaps should be included in the same category, despite their employment and capital stock losses. In contrast, output decline in the other eight regions, it is fair to say, reflects the general collapse of their manufacturing base.

From this information it is not difficult to speculate about the trends in labour and capital productivity. Nationally, the modest increase in the value-added and the parallel decline of capital stock, employment and labour cost have led to substantial productivity gains, as made explicit in table 3. Capital productivity accelerates by 2.5% annually, while labour productivity (value-added per employee) increases remarkably fast at 3.4% per year. The labour productivity gains are less dramatic, but still substantial (1.15%), when the focus is on the growth of output per unit of labour cost. This variation in labour productivity rates is the outcome of the divergence in the trend lines of decline of employment and labour costs (the latter decreasing less dramatically than the former). It can be argued that this divergence is indicative of an improvement in the quality of human capital. Since labour costs decline much more slowly than employment, it is logical to assume that those workers taking up positions in new firms, or retaining their jobs, were actually more highly paid than those that lost them. Given that higher wages usually reflect better educated or skilled and, thus, more productive labour force, it is sound to conclude that skilled employees retained their jobs while the less well trained exited the sector¹. Thus, variation in the growth rates that the two labour productivity indicators measure can be associated, partly at least, with improvement in the quality of human capital.

TABLE 3 HERE

As can be seen from table 3, only in Western Makedonia and the Southern Aegean Islands does the growth of output per employee exceed the growth of output per unit of labour cost. In all other regions, labour productivity gains are much lower, or even negative, once labour costs are taken into account. Thus, the relative inputs of skilled and specialised labour increase almost everywhere. It is also important to note that the pace of quality improvement in human capital does vary between regions. There is substantial spatial variation in the difference in the annual growth rates between the two measures of labour productivity. The actual difference between the annual growth of output per employee and output per unit of labour cost ranges from 2.57% (Attiki) to -2.73% (Southern Aegean Islands). According to this measure the pace of human capital quality improvement is faster in Attiki than elsewhere.

The leading role of the main metropolitan area is challenged when the focus turns to productivity growth. Capital productivity increases faster in the peripheral regions of the country (Northern Aegean Islands, Ipiros, Western Makedonia and Eastern Makedonia-Thraki). The more industrialised areas follow (Western Greece, Central Greece, Peloponnissos and Central Makedonia). But, in contrast, in Attiki capital productivity is almost stagnant (only a 0.48% annual increase). Finally, severe capital productivity decline is recorded in two somewhat marginal regions (Ionian Islands and Southern Aegean Islands).

However, for labour productivity the picture is quite different. Using the evolution of output per unit of labour cost as an indicator to account for differences in the levels of education and skills, it is apparent that the Southern Aegean Islands (3.2%) and Western Greece (3.1%) experience the higher growth rates. In contrast, negative trends are recorded in three peripheral areas (Ionian Islands, Eastern Macedonia-Thraki and Kriti) and one relatively industrialised region (Thessalia). Nevertheless, the most important finding is that the labour productivity growth in Attiki is much faster than that of the majority of other regions. Only the two above-mentioned areas show higher productivity dynamism. The situation is even more clearly depicted when labour productivity is viewed as output per employee. With the exception of Western Greece, the annual rate of labour productivity growth in Attiki far outpaces that of the rest of the country.

The above analysis points up a rather interesting process of differential productivity growth ongoing among Greek regions. At one extreme, the capital region (Attiki) is outperformed in terms of capital productivity growth by almost everywhere else. At the other, Attiki appears to be one of the most dynamic regions in terms of labour productivity expansion. It is worth recalling that this is the region that houses the lion's share of Greek manufacturing activity. Next it is important to ask whether this dual process of uneven spatial productivity growth is accompanied by parallel convergence trends.

Examination of the evolution of regional inequalities in the levels of capital productivity (table 4) reveals that the regions showing higher growth rates are indeed those that were lagging at the beginning of the period. Therefore, the dramatic expansion of the output per unit of capital cost in regions such as the Northern Aegean Islands, Western Macedonia, Central Greece or Ipiros has much to do with the fact that in 1984 their capital productivity levels were less than the 70% of the national average. Similarly, the trends are strongly negative, or near zero, in those regions which, in 1984, were characterised by extremely high capital productivity levels (the Southern Aegean and Ionian Islands had more than double the national average). By 1994 the disparities in capital productivity levels are much reduced. The main metropolitan area appears still to be one of the most capital productive Greek regions. However, the gap between Attiki and the other regions has narrowed. In contrast, capital productivity in the two extreme cases of the Ionian and Southern Aegean Islands has been severely reduced.

TABLE 4 HERE

Similarly, spatially differential labour productivity growth also appears to be associated with a convergence process. Reviewing the figures in table 5 reveals that in 1984 labour productivity (value-added per unit of labour input cost) in Attiki was less than 85% of the national average. The high labour productivity growth between 1984 and 1994 improved this figure to 92.8%. The regions, in contrast, which were initially characterised by high labour productivity levels (Ionian Islands, Thessalia, Kriti, amongst others) experienced negative or stagnant growth rates. The outcome of these opposite trends is reduced regional disparity in labour productivity levels by 1994.

TABLE 5 HERE

These findings suggest that there is a strong relationship between differential capital and labour productivity growth and convergence. Regions that were lagging initially in terms of capital productivity demonstrate higher growth rates, while similar trends prevail in regions that in 1984 were well behind in terms of labour productivity growth. In contrast, productivity declines or increases only at a slow pace in those regions that in 1984 enjoyed the highest levels. It has to be understood, however, that the convergence process does not automatically mean that all the lagging regions catch up or that all the advanced regions are subject to decline. The most lagging regions do not necessarily show the highest growth rates (Western Makedonia or Central Greece in terms of capital productivity), in the same way that advanced regions do not necessarily demonstrate negative trends (see Central Makedonia and Western Greece in terms of capital and labour productivity respectively).

But the capital and labour productivity convergence process is still an undeniable fact (table 6). Given the enormous variation in the size of the regional manufacturing bases, the figures should be treated with some care. Some sharp changes in marginal cases like those of the Ionian or Northern Aegean Islands, with limited manufacturing bases, can significantly affect the coefficient of variation (CV). Even so, it is clear that the convergence process is more intense in terms of capital than labour productivity. This finding is, perhaps, indicative of the existence of significant spatial differentiation in the methods of production and the employed technology. The quite substantial differences in regional capital productivity (mainly a result of the supremacy of Attiki) are substantially reduced over the decade (CV decreasing from 0.54 to 0.32). However, the regional disparities in capital productivity are still sharper in 1994 when compared to the spatial inequalities in labour productivity.

TABLE 6 HERE

Labour productivity convergence is much more complicated. The initially rather modest differences in labour productivity (value-added per unit of labour cost) decline further. However, divergent trends prevail when labour productivity is taken as value-added per employee. Here the CV increases from 0.20 to 0.24 between 1984 and 1994. This increase is not particularly high, but it does demonstrate that convergence is not a ubiquitous phenomenon covering every aspect of regional economic performance². The regional variation in the pace of improvement in the quality of manufacturing human capital has already been pointed out. It can be argued that this is, to a large extent, responsible for the divergent trends in the evolution of output per employee.

The speed at which regional convergence takes place over the period is quite different for capital and labour productivity (table 7). The annual rate of capital is 5.16%, while that for labour productivity (cost based) convergence is much slower (2.93%). For output per employee, divergence increases by 2.11% annually on average. Furthermore, it has to be pointed out that both labour and capital productivity convergence seem to be fairly constant over time. Although there is significant variation in the figures for the annual rates of convergence, it is also true that the trends are fairly constant (CV declines over time). In any respect, large yearly

variations in productivity statistics are certainly not unexpected under conditions of widespread de-industrialisation since firms do not tend to lay off all their redundant personnel or dispose of all surplus capital stock at once.

TABLE 7 HERE

However, despite the persistence of the trends, the limitations of the convergence process are also apparent. Projecting the current annual rates into the future, it will take approximately 14 and 24 years, respectively, for regional inequalities in capital and labour productivity levels to be cut by half. Anyway, as it will be demonstrated subsequently, the continuation of these trends is a rather unlikely event.

5. Towards an explanation of the convergence trends

In the regional productivity literature, structural change and the diffusion of technology have been outlined as the two most prominent sources of spatial convergence. Diminishing returns are also a favourite candidate, especially among those economists who find the neoclassical assumption of constant returns to scale highly plausible. In this context, low annual rates of convergence can be attributed to the fact that returns to scale in reproducible factors are almost constant (De la Fuente, 1997).

The productivity convergence trends reported in this paper are simply too high to be attributed solely to the effects of diminishing returns to scale. They are a plausible explanation for annual convergence rates of around 2%, but not higher. Furthermore, and unhelpfully, the available data do not permit the testing of the structural change hypothesis in the Greek context. Disaggregated data at manufacturing branch level are needed for this task. However, it can be said with some assurance that technological diffusion is not the main source of manufacturing productivity convergence among Greek regions. A rather intuitive justification of this statement is provided by the fact that the capital stock declined during the period almost everywhere. If technological diffusion did, in fact, take place then it should have been accompanied by capital stock expansion or, at least, increased investment levels (O' Mahony, 1994). However, this is certainly not the case and, thus, it is difficult to attribute regional convergence in capital and labour productivity to the diffusion of technology. A more elaborate explanation of the argument can be advanced once the evolution of regional differences in capital to labour ratios (capital stock divided by labour cost) is examined.

From the data of table 8 it is apparent that capital to labour ratios fell in almost all Greek regions (save for Attiki, the Ionian and Southern Aegean Islands). Such a decrease in capital intensity it is not a sign of technological diffusion which presupposes rather the opposite. Moreover, it is interesting that capital to labour ratios are much higher in the peripheral regions compared to Attiki. This is an even more surprising finding, since the metropolitan area might be expected to have the highest levels of capital intensity. Instead, it is the latter where capital intensity increases (at a modest rate of 1.6% annually) to match the levels of the other regions (capital intensity decreases nationally by 1.3% yearly) (table 3). The outcome of this trend is a modest convergence in regional capital to labour ratios (tables 6 and 7)³.

TABLE 8 HERE

Thus, given the ubiquitous manufacturing decline that has taken place (mainly in terms of employment and capital stock, but in eight regions also in terms of output) it makes more sense to assume that spatial convergence in productivity levels is the outcome of an adjustment process. The regions which have a manufacturing base characterised by higher capital intensity experienced a sharper capital stock decline, while in the more labour intensive regions de-industrialisation took the form of employment decrease. The joint outcome of these twin processes was the convergence in both capital and labour productivity levels.

A good question to be asked is under what circumstances the peripheral regions of Greece appeared to be more capital-intensive than the core region. The examination of the regional incentives legislation provides a plausible explanation.

In order to promote a more even spatial distribution of industrial activity the Greek State has developed, since early seventies, a system of direct subsidies and other incentives for investment undertaken in the periphery. Of course, regional incentives were in operation much earlier, but after 1972 their significance increased considerably. In addition, special efforts were made to spatially differentiate them, because up until 1971 manufacturing investment implemented anywhere outside the Attiki region enjoyed the same level of preferential treatment (Labrianidis and Papamichos, 1990). Thus, from 1972 onwards the country was divided into zones where substantially different subsidy rates and other incentives applied. In this system firms locating in the peripheral regions received more aid than their counterparts in the more industrialised regions of Greece (such as Central Greece or some counties of Thessaly). In all cases, firms located in Attiki were excluded from direct subsidies, while in some instances even self-funded investments were prohibited. The necessary investment implementation permits (extension, environmental etc.) were not granted on the grounds of the heavy congestion and pollution problems in the metropolitan area.

One of the most important characteristics of the regional incentives system is capital investment subsidy reaching, in some cases, as much as 50%. Thus, it makes sense to assume that firms not only in the peripheral regions but also in the more industrialised regions of the country certainly had a direct incentive to employ more capital-intensive methods compared to their counterparts in Attiki. It was obviously cheaper for firms to substitute labour with capital.

In the Greek literature the operation of the regional incentive legislation has been subject to many criticisms on the grounds of its inefficiency in promoting regional development. A detailed summary of these criticisms is given by Labrianidis and Papamichos (1990: 465) who also mention: *“Until 1981 the legislation promoted the substitution of labour with capital, because it subsidised the cost of capital, and this had very important repercussions on employment. In particular, the promotion of capital intensive methods resulted in the underuse of the comparative advantages offered by the existence of an abundant labour force, in pressures for wages increases, and in the unnecessary leakage of foreign exchange abroad to*

acquire expensive machinery, which in the end was underused. That is, there was a gross discord between the legislation and the demands and abilities of the society.”

From the above concise account it is not difficult to explain the higher capital-intensity of the manufacturing firms located outside Attiki. Although, this finding appears at a first glance as surprising, it really is no surprise at all. The heavy direct or indirect (through tax allowances etc.) subsidisation of capital investment, in both the peripheral and some of the more industrialised areas, is to a large extent responsible. Of course, there is always the possible counter-argument that the regional incentive laws might have not had a great impact on the manufacturing base of the Greek regions. (Not all the firms receive subsidies, while many of the firms that succeed in their bids for state support do not finally implement the investments). Although, this argument may have some validity in the context of the regional manufacturing generally, it does not hold in this particular case. The data utilised in this paper refer to firms employing more than twenty people, in other words, to large scale Greek manufacturing. There is no doubt that these are exactly the firms that do bid for, and actually receive, state subsidy, while it is also almost certainly the case that most of their capital investment has received some sort of state support. (The share of the investment that is undertaken by firms of this group independently of regional or other incentives is rather small.) In addition, given the limited number of large-scale manufacturing firms in Greek peripheral regions it is logical to expect that the impact of the incentives legislation will be even higher in such locations. It is often enough only for three or four firms to implement large state subsidised investments for the manufacturing base of a peripheral region to be transformed completely.

Consequently, it is not difficult to imagine the impact of the regional incentive legislation in the evolution of regional variation in capital intensity, capital and labour productivity in Greece. The peripheral and more industrialised regions have become more capital-intensive than the core, which has been excluded from the incentives. Moreover, higher rates of capital-intensity in the periphery entailed lower capital productivity than in the core, because machinery and equipment were under-utilised. By the same token, labour productivity appears higher in these regions, since the workers had more capital at their disposal.

It does not need a long discussion to point out that this situation could not be viable in the long run. The variation in regional productivity levels was due to non-economic factors and was not the outcome of disparities in the rate of technical progress. Similarly, it is not difficult to imagine the impact of the higher capital intensity on Greek peripheral regions under conditions of general industrial decline. The exodus of proportionally more capital has become the major characteristic of de-industrialisation in these regions, since this is the factor of production that was present in abundance. In contrast, in Attiki the crisis took mainly the form of employment decline, due to the fact that its manufacturing base was more labour-intensive⁴. As an outcome, the core region experienced a relatively higher labour productivity growth, while capital productivity grew faster in the remaining regions of the country.

Thus, the convergence in capital and labour productivity levels has to be understood as the outcome of an adjustment to the crisis, rather than an effect of greater technological diffusion. However, it has to be stated that it is equally interesting to ask

whether the crisis entailed, also, regional structural change. It has been mentioned already that the available data do not allow such an analysis to be undertaken. Nevertheless, one feature seems certain. Even if structural change plays an important role in the convergence process, the results of the analysis here continue to hold. The two sources of convergence (adjustment and structural change) are not mutually exclusive.

6. Conclusions

From the previous analysis it has become clear that a process of capital and labour manufacturing productivity convergence is under way in Greek regions between 1984 and 1994. The character of this process is rather peculiar since it is the core metropolitan region of the country that moves to match the labour productivity levels of the peripheral regions while the latter move towards the capital productivity levels of the core. A closer look at the capital to labour ratios revealed a rather unexpected situation with the peripheral regions exhibiting higher capital-intensity than the core metropolitan area. However, this certainly unexpected element of regional variation it is not surprising at all if closer attention is paid to the regional incentives legislation. The acquisition of capital by the firms choosing to locate outside the main metropolitan area has been heavily subsidised. It is easy enough to point out that this heavy underwriting of capital expenditure has not only led to fewer jobs, as suggested so far, but also to the acquisition of amounts of capital more than was really necessary.

Thus, the productivity convergence process during mid-eighties to mid-nineties is not really a mystery at all. Under conditions of heavy national de-industrialisation, the main characteristic was the exodus of relatively greater numbers of workers from Athens and the relatively higher decline in capital stock in other regions of the country. Given that regional incentive laws had already subsidised the purchase of capital in the periphery the firms that were closing down, or were downscaling, were more capital intensive than their counterparts in Attiki. The latter, having been excluded from the regional incentives, were more labour intensive and thus the industrial decline there took the form of employment decline. The final outcome of these two distinct processes was a twin convergence in both capital and labour productivity levels.

Another interesting aspect of the convergence process was that the increase in labour productivity was accompanied by an increase in the quality of the human capital. Output per employee, labour productivity growth rates have been high and, in fact, have contributed to divergence rather than convergence. (By 1994 Attiki had outpaced the national productivity level). However, the growth rate of labour productivity, defined as output per unit of labour cost, was much more moderate revealing that the employees that kept their jobs were more highly paid and thus, in all likelihood, more qualified or skilled.

The results of the present paper deserve to be studied further. An important question to pose is what percentage of the productivity convergence can be attributed to structural change? Unfortunately this question cannot be answered due to the lack of

detailed data at the individual industry level. Nevertheless, the current results are still helpful in terms of both analysis and policy.

From an analytical perspective what they point out is that the productivity convergence process cannot be considered as viable in the long run since it is based upon mere adjustment and not real technological diffusion. Moreover, it is doubtful if the convergence process will have any impact on the elimination of uneven regional industrial growth. Certainly in 1994 (the last year of available data) the regional distribution of the main manufacturing indicators (value-added, employment, and capital stock) was not more even than in 1984. In the same way that the relatively high labour productivity levels of the peripheral regions in the past did not lead to a reduction of the regional inequalities in the distribution of manufacturing output and employment, it is unlikely that the improved capital productivity levels will achieve that.

From a policy perspective it is interesting that the attempt, over a long period, to facilitate the flow of capital towards the peripheral regions has not been successful. In the absence of long-term data it is impossible to get a handle on the initial success of the policy. However, even if the policy had a huge initial success, one conclusion seems certain. Policies focusing solely on the increase in the availability of a single factor of production are not successful in the long run. In the absence of provisions for the facilitation of technical progress, the degree of success is subject to the law of diminishing returns. After a certain point increases in the capital stock do not have a large impact on either productivity or growth. Thus, regional policy should be turned towards to the direction of promoting technical progress. This aim is not served by simply subsidising the acquisition of newer and, thus, more advanced capital. The full potential of technological advances can be realised only when they are broadly applied (Krugman, 1994b). Thus, policy has to make sure that the fruits of new technology are diffused across the whole regional productive spectrum.

¹ It can be suggested that the slower decline of labour costs in relation to employment may be the outcome of increases in labour unit costs or an expansion in the hours worked per person. Under conditions of generalised de-industrialisation and growing unemployment it is difficult to account for rises in unit labour costs, while the lack of data on hours worked does not allow the empirical examination of the second hypothesis. However, as the overall level of employment has been reduced by more than one quarter, an increase in the hours worked per person would appear unlikely, at least as a major force. The inflexibility of the Greek large scale manufacturing labour market (part-time work is rare) and the fact that data refer to average annual employment eliminate further the possibility that differences in labour productivity growth rates are due to an expansion in hours worked.

² In earlier work similar results have been reported to hold at a county level for a much longer period (Melachroinos and Spence, 1997b). By using a different measure, that of manufacturing GDP per employee, it was demonstrated that spatial inequalities in labour productivity levels actually deepened during the period 1970-1988. Although these findings refer to a separate period, a different spatial division and derive from different datasets (total manufacturing instead of firms employing more than 20 persons), nonetheless they are reassuringly similar to the present results.

³ The convergence trend would have been much higher than the almost negligible 0.2% annually (table 7) if the marginal case of the Ionian Islands had been excluded from the calculations.

⁴ This is far from an unexpected outcome. Varaiya and Wiseman (1981) have shown for US regions that industrial crisis is more likely to take the form of intense employment decline in the traditional

industrial areas than elsewhere. This happens because capital stock is usually older there and thus production techniques are likely to be more labour intensive.

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Table 1 Regional economic performance in manufacturing: evolution of value-added, capital stock, employment and labour cost in Greece, 1984-1994. Figures are in million drachmae constant 1980 prices

Prefectures/Year	Value Added 1984	Value Added 1994	Capital Stock 1984	Capital Stock 1994	Employment 1984	Employment 1994
Attiki	91,474	104,254	129,203	140,303	137,521	99,513
Eastern Makedonia-Thraki	8,968	10,642	21,275	17,911	15,136	14,648
Central Makedonia	45,686	49,332	78,057	65,646	60,273	49,703
Western Makedonia	2,433	1,094	12,341	3,702	3,252	1,631
Thessalia	15,616	12,653	35,673	25,115	19,002	13,723
Ipiros	1,764	2,636	5,480	4,979	2,919	3,013
Ionian Islands	513	137	527	818	474	194
Western Greece	12,234	11,024	32,685	20,949	16,909	8,699
Central Greece	33,165	29,784	133,033	87,537	32,057	23,093
Peloponissos	9,322	9,316	26,345	19,604	10,142	6,971
Northern Aegean Islands	598	360	2,638	848	986	506
Southern Aegean Islands	1,754	693	1,656	1,311	2,535	956
Kriti	1,696	2,207	3,912	4,086	2,278	2,367
Total Greece	225,223	234,132	482,826	392,808	303,484	225,017

Sources: ESYE (National Statistical Service of Greece): Annual Industrial Surveys (1984-1991), and unpublished data (1992-1994). Melachroinos and Spence (1997a): Capital stock estimations.

Table 2 Regional performance of manufacturing: annual rate of growth (percent) of value-added, capital stock, employment and labour cost in Greece, 1984-1994

Prefectures/Year	Value Added (%)	Capital Stock (%)	Employment (%)	Labour Costs (%)
Attiki	1.32	0.83	-3.18	-0.75
Eastern Makedonia-Thraki	1.73	-1.71	-0.33	1.86
Central Makedonia	0.77	-1.72	-1.91	0.26
Western Makedonia	-7.68	-11.34	-6.67	-8.20
Thessalia	-2.08	-3.45	-3.20	-0.74
Ipiros	4.10	-0.95	0.32	2.59
Ionian Islands	-12.33	4.49	-8.55	-7.25
Western Greece	-1.04	-4.35	-6.43	-3.98
Central Greece	-1.07	-4.10	-3.23	-1.30
Peloponissos	-0.01	-2.91	-3.68	-0.61
Northern Aegean Islands	-4.96	-10.73	-6.45	-5.56
Southern Aegean Islands	-8.86	-2.31	-9.29	-11.69
Kriti	2.67	0.44	0.38	2.72
Total Greece	0.39	-2.04	-2.95	-0.75

Sources: Table 1. ESYE (National Statistical Service of Greece): Unpublished labour cost data (1984-1994).

Table 3 Regional productivity dynamics: annual rate of growth (percent) of labour productivity (a) (value-added per employee), labour productivity (b) (value-added per unit of labour cost), capital productivity (value-added per unit of capital cost) and capital intensity (capital stock divided by labour cost) in Greece, 1984-1994

Prefectures/Year	Labour productivity a (%)	Labour productivity b (%)	Capital productivity (%)	Capital intensity (%)
Attiki	4.65	2.08	0.48	1.59
Eastern Makedonia-Thraki	2.06	-0.13	3.49	-3.50
Central Makedonia	2.73	0.51	2.53	-1.97
Western Makedonia	-1.08	0.57	4.13	-3.43
Thessalia	1.16	-1.35	1.42	-2.73
Ipiros	3.77	1.48	5.10	-3.45
Ionian Islands	-4.14	-5.47	-16.10	12.66
Western Greece	5.76	3.07	3.47	-0.38
Central Greece	2.23	0.23	3.16	-2.84
Peloponissos	3.81	0.61	2.99	-2.31
Northern Aegean Islands	1.60	0.64	6.46	-5.47
Southern Aegean Islands	0.47	3.20	-6.71	10.62
Kriti	2.27	-0.05	2.22	-2.22
Total Greece	3.44	1.15	2.48	-1.30

Sources: As for tables 1 and 2.

Table 4 Regional inequalities in capital productivity of manufacturing: value-added divided by capital stock in Greece, 1984-1994.

Prefectures/Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Attiki	151.8	146.8	139.7	130.2	129.0	129.2	126.0	127.5	122.7	124.7	124.7
Eastern Makedonia-Thraki	90.4	91.9	94.5	103.4	99.6	97.2	105.9	99.6	111.4	113.8	99.7
Central Makedonia	125.5	128.0	129.9	139.2	128.9	123.7	126.7	126.5	135.9	130.5	126.1
Western Makedonia	42.3	41.5	41.8	36.6	39.9	43.8	43.8	33.3	30.8	36.9	49.6
Thessalia	93.8	90.8	96.7	94.2	99.5	105.7	102.4	103.2	92.5	92.3	84.5
Ipiros	69.0	84.4	91.1	108.5	88.3	90.4	99.3	101.2	91.7	84.7	88.1
Ionian Islands	208.5	236.0	210.9	218.5	121.4	109.3	90.4	114.5	78.5	68.5	28.2
Western Greece	80.2	72.0	81.8	85.4	77.7	76.8	78.8	80.0	81.2	84.0	88.3
Central Greece	53.4	51.8	50.5	49.5	59.4	57.8	57.6	54.8	54.2	51.0	57.1
Peloponissos	75.9	94.5	83.7	87.4	73.6	82.9	88.3	93.1	88.8	91.5	79.7
Northern Aegean Islands	48.6	54.0	72.8	61.5	55.4	41.0	59.0	47.0	76.5	60.9	71.1
Southern Aegean Islands	227.0	196.1	185.5	172.3	178.4	180.4	162.7	162.6	100.3	85.8	88.8
Kriti	93.0	117.3	102.8	111.0	119.8	120.5	103.8	94.3	101.0	100.8	90.6
Total Greece	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: As for table 1.

Table 5 Regional inequalities in labour productivity of manufacturing: value-added divided by labour cost in Greece, 1984-1994.

Prefectures/Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Attiki	84.7	86.0	88.3	87.4	88.9	90.3	88.8	90.0	89.1	91.5	92.8
Eastern Makedonia-Thraki	101.2	97.8	97.8	96.7	92.7	88.8	95.4	86.1	94.6	94.2	89.0
Central Makedonia	115.0	115.4	111.9	116.0	108.5	106.2	105.6	107.9	112.8	111.2	107.9
Western Makedonia	78.9	77.0	72.3	61.9	62.9	64.5	59.0	46.0	52.4	62.7	74.4
Thessalia	125.2	120.8	122.1	118.0	123.3	125.4	122.7	118.1	106.6	100.2	97.5
Ipiros	97.7	116.7	115.0	127.8	101.2	101.3	108.0	105.2	103.1	105.0	100.9
Ionian Islands	160.9	210.6	228.6	201.5	147.0	132.7	110.7	141.8	102.6	110.8	81.7
Western Greece	106.4	97.9	107.2	111.8	103.0	102.3	105.2	111.4	119.1	131.6	128.4
Central Greece	117.3	110.3	106.9	101.5	118.1	115.4	115.4	110.3	107.8	98.4	107.0
Peloponissos	135.9	159.0	139.5	157.0	127.4	134.1	157.9	161.5	149.0	139.9	128.8
Northern Aegean Islands	89.8	87.2	107.1	88.7	79.3	50.6	98.8	78.2	131.1	89.6	85.4
Southern Aegean Islands	79.6	66.9	62.2	57.4	65.2	64.5	58.5	59.4	35.0	96.4	97.3
Kriti	119.0	137.8	120.8	113.1	125.8	127.5	111.1	111.6	120.2	110.4	105.5
Total Greece	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: As for tables 1 and 2.

Table 6 Coefficient of variation (CV) of capital productivity, labour productivity (a) (value-added per employee) and (b) (value-added per labour cost) and capital to labour ratios of manufacturing based on regions in Greece, 1984-1994.

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Capital productivity	0.54	0.51	0.44	0.44	0.37	0.38	0.32	0.36	0.29	0.31	0.32
Labour productivity a (value-added per employee)	0.20	0.25	0.22	0.27	0.22	0.26	0.23	0.30	0.28	0.25	0.24
Labour productivity b (value-added per labour cost)	0.21	0.32	0.34	0.33	0.23	0.26	0.24	0.29	0.29	0.18	0.16
Capital to labour ratio (capital stock divided per labour cost)	0.41	0.39	0.37	0.39	0.35	0.34	0.36	0.36	0.36	0.28	0.40

Sources: As for tables 1,2, 4 and 5.

Table 7 Annual average rate of convergence (percent per annum) of capital productivity, labour productivity (a) (value-added per employee) and (b) (value-added per labour cost) and capital to labour ratios of manufacturing based on regions in Greece, 1984-1994.

Year	1984-1985	1985-1986	1986-1987	1987-1988	1988-1989	1989-1990	1990-1991	1991-1992	1992-1993	1993-1994	1984-1994
Capital productivity	-5.65	-12.76	0.20	-16.27	2.28	-15.01	10.64	-17.74	3.96	3.60	-5.16
Labour productivity a (value-added per employee)	28.62	-11.37	21.35	-19.59	18.33	-12.06	30.35	-4.84	-10.39	-4.21	2.11
Labour productivity b (value-added per labour cost)	52.93	5.23	-2.82	-28.90	12.56	-9.11	21.90	-2.10	-37.31	-12.76	-2.93
Capital to labour ratio (capital stock divided per labour cost)	-5.15	-4.67	4.93	-8.78	-2.36	5.89	-0.87	1.04	-23.71	43.54	-0.19

Source: Table 6.

Table 8 Regional inequalities in capital intensity of manufacturing: capital stock divided by the labour cost in Greece, 1984-1994.

Prefectures/Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Attiki	<i>55.8</i>	<i>58.6</i>	<i>63.2</i>	<i>67.2</i>	<i>68.9</i>	<i>69.9</i>	<i>70.4</i>	<i>70.6</i>	<i>72.6</i>	<i>73.4</i>	<i>74.4</i>
Eastern Makedonia-Thraki	<i>111.1</i>	<i>106.3</i>	<i>103.4</i>	<i>93.6</i>	<i>93.1</i>	<i>91.4</i>	<i>90.0</i>	<i>86.4</i>	<i>84.9</i>	<i>82.8</i>	<i>89.4</i>
Central Makedonia	<i>91.6</i>	<i>90.2</i>	<i>86.2</i>	<i>83.3</i>	<i>84.2</i>	<i>85.9</i>	<i>83.3</i>	<i>85.3</i>	<i>83.0</i>	<i>85.3</i>	<i>85.6</i>
Western Makedonia	<i>186.6</i>	<i>185.8</i>	<i>173.0</i>	<i>169.0</i>	<i>157.8</i>	<i>147.4</i>	<i>134.8</i>	<i>138.4</i>	<i>170.1</i>	<i>169.8</i>	<i>150.1</i>
Thessalia	<i>133.4</i>	<i>133.0</i>	<i>126.3</i>	<i>125.3</i>	<i>123.9</i>	<i>118.7</i>	<i>119.8</i>	<i>114.4</i>	<i>115.2</i>	<i>108.5</i>	<i>115.3</i>
Ipiros	<i>141.6</i>	<i>138.2</i>	<i>126.2</i>	<i>117.8</i>	<i>114.6</i>	<i>112.1</i>	<i>108.8</i>	<i>104.0</i>	<i>112.4</i>	<i>123.9</i>	<i>113.6</i>
Ionian Islands	<i>77.2</i>	<i>89.2</i>	<i>108.4</i>	<i>92.2</i>	<i>121.1</i>	<i>121.4</i>	<i>122.6</i>	<i>123.9</i>	<i>130.7</i>	<i>161.9</i>	<i>289.7</i>
Western Greece	<i>132.6</i>	<i>135.9</i>	<i>131.1</i>	<i>131.0</i>	<i>132.5</i>	<i>133.1</i>	<i>133.4</i>	<i>139.2</i>	<i>146.7</i>	<i>156.8</i>	<i>145.5</i>
Central Greece	<i>219.5</i>	<i>212.8</i>	<i>211.7</i>	<i>205.0</i>	<i>198.9</i>	<i>199.7</i>	<i>200.2</i>	<i>201.2</i>	<i>198.8</i>	<i>193.1</i>	<i>187.5</i>
Peloponissos	<i>179.2</i>	<i>168.3</i>	<i>166.6</i>	<i>179.6</i>	<i>173.2</i>	<i>161.7</i>	<i>178.9</i>	<i>173.4</i>	<i>167.8</i>	<i>152.9</i>	<i>161.5</i>
Northern Aegean Islands	<i>184.9</i>	<i>161.6</i>	<i>147.2</i>	<i>144.2</i>	<i>143.1</i>	<i>123.4</i>	<i>167.6</i>	<i>166.5</i>	<i>171.3</i>	<i>147.3</i>	<i>120.0</i>
Southern Aegean Islands	<i>35.1</i>	<i>34.1</i>	<i>33.5</i>	<i>33.3</i>	<i>36.5</i>	<i>35.7</i>	<i>36.0</i>	<i>36.6</i>	<i>34.9</i>	<i>112.3</i>	<i>109.6</i>
Kriti	<i>128.0</i>	<i>117.4</i>	<i>117.5</i>	<i>101.9</i>	<i>104.9</i>	<i>105.8</i>	<i>107.0</i>	<i>118.3</i>	<i>119.0</i>	<i>109.5</i>	<i>116.5</i>
Total Greece	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>

Sources: As for tables 1 and 2.