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# THE EFFECTS OF AGGREGATE FLUCTUATIONS ON REGIONAL ECONOMIC DISPARITIES IN FINLAND

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**Abstract**

This paper investigates the evolution of regional disparities in Finland between 1988 and 1997. The analysis focuses on per capita GDP and its subcomponents, particularly labour productivity and employment. The results show, first, that the evolution of both labour productivity and employment rate account for regional divergence of per capita GDP during 1990-1995. Second, as far as productivity is concerned, private services contribute the most to the divergence of per capita GDP, whereas primary production is the main convergent sector. Third, the divergence of regional productivity in a sector does not necessarily contribute to regional divergence of overall per capita GDP. Fourth, even though inter-regional migration tends to have convergent effects on regional per capita GDP levels, its effect was not strong enough during 1990-1995: GDP divergence dominates. Finally, while the aggregate measures point to economic recovery as early as in 1994, at the regional level the recession lasted two years longer.

Keywords: Regional disparities, recession, labour productivity
JEL: E32, O47, R11

## 1. Introduction

The long-run evolution of regional production structures and economic disparities have always been a central focus of study in regional economics. The question of the regional effects of short-run fluctuations in the aggregate economy has been addressed to much lesser extent, however. Yet economic fluctuations are likely to affect regions differently, because regional production structures differ from each other (e.g. Temple, 1994; and Isard, 1982). For this reason, the business cycle should also have an impact on regional disparities. Indeed, previous empirical studies indicate that there is a tendency for regional disparities to grow during recessions, and diminish when the economy is expanding (Dunford and Perron, 1994; Mackay, 1994; Evans and McCormic, 1994; Hess and Shin, 1997). Moreover, regional labour market disparities show exactly the same tendency as production in the goods market (Audas and Mackay, 1997; Demertzis and Hughes Hallet, 1996).

Finland experienced a rapid economic upswing in the late 1980s that abruptly turned into one of the worst recessions in the history of the nation. The 1990s recession marked the end of a long period of regional economic convergence in Finland. Previous studies show that regional per capita incomes and GDP had been converging since the 1930s, and that convergence was particularly rapid in the 1960s and 1970s (Kangasharju, 1999; Pekkala, 1999). The rate at which per capita disparities were narrowing had already begun to fall in the 1980s, and by the early 1990s, when the downturn began, no trace of a convergence process remained. In fact, Pekkala (2000) shows that regional convergence occurred before the slump, but that divergence dominated in the downturn and early recovery. The recession in Finland was the deepest in Europe, and it treated regions very differently: some regions were in recession only for 4 years whereas others felt its effects for up to 8 or 9 years (Kuntaliitto, 1999). Moreover, the slump radically changed the relative positions of the subregions in their GDP ranking, indicating that it had noticeable repercussions on regional structure.

The aim of the present paper is to analyse the observed pattern of convergence and divergence among the 85 Finnish subregions[1] that are close approximations to commuting areas. The period of investigation runs from 1988 through 1997. First, we describe the

general evolution of regional per capita GDP before, during and after the recession. Then we disaggregate the change in regional per capita GDP into the components of productivity and employment. The change in productivity (GDP per employee, that is) is then further subdivided into the components of GDP and job. Secondly, we analyse the changing regional production structure and evaluate the extent to which differences in industrial composition affect the evolution of regional disparities. Finally, a simple model quantifies the relative magnitudes of the impacts of employment and productivity upon regional divergence.

The results indicate that, firstly, the recession did exacerbate regional disparities in terms of regional GDP per capita, as found in earlier studies. The main reason for this divergence was the faster growth of productivity in the initially rich subregions. Slower decline in employment in the rich subregions also contributed to divergence. Inter-regional migration flows exerted a convergent effect on the GDP per capita, but not sufficiently to offset the disparity in productivity and employment. Secondly, the results indicate that particularly in the manufacturing sector, but also in agriculture and forestry, productivity disparities grew, whereas in the construction sector convergence of productivity occurred. The effects of sectoral evolutions on overall per capita GDP disparities were different, however: private services, manufacturing and construction contributed to overall divergence, but agriculture and forestry as well as the public sector contributed to convergence of per capita GDP.

The remains of the paper is organised as follows. The second section presents a theoretical framework in which the effects of cyclical fluctuations on regional economy are analysed. The third section describes the data and methods used. The fourth section presents the main findings on the effects of the recession on regional productivity disparities, production structure and population composition. The last section discusses the policy implications of regional recession dynamics and concludes the paper.

## 2. Theoretical background: the business cycle and the regional economy

The traditional macroeconomic theory predicts that in the long-run poorer regions tend to catch up with richer ones, due to the diminishing marginal product of capital and the diffusion of knowledge and innovations (see e.g. Barro and Sala-i-Martin, 1995). Theory,

however, ignores the effect of business cycles on economic growth or long-term development, (Romer, 1996). Business cycles are considered merely as fluctuations around a steady trend. Therefore, they are not expected to have any long-lasting effects on regional structure either. Recently, however, this view has been challenged by the emergence of the ”new growth theory” where endogenous growth is generated by ”learning-by-doing”, R&D and other internal processes. Here, economic fluctuations are seen as having a role in generating further growth during expansions when people are able to accumulate a stock of knowledge, enabling firms to invest more in further knowledge enhancing activities (Stadler, 1990; Saint-Paul, 1997).

Another approach emphasises the positive role of recessions in their tendency to improve productivity. According to Aghion and Saint-Paul (1998) there are several reasons for this (see also Aghion and Howitt, 1998). The first reason why recessions increase productivity is that recessions tend to cut the least productive activity and preserve only the most efficient firms (see Caballero and Hammour, 1994, for a formalisation). Secondly, the opportunity costs of productivity-improving activities, such as reorganisation and training, are lower during recessions. Reorganisation and training usually take place at the expense of directly productive activities, such as manufacturing. Since the demand for manufacturing goods is lower during recessions than booms, the opportunity costs in terms of foregone profits are also lower. Consequently recessions speed up productivity improvement. The third reason is the “disciplinary effect”, which says that during recessions the likelihood of bankruptcy is lower for firms that undertake reorganisation investments. The final reason is that recessions may decrease the probability of a mistaken occupational choice. If, during recessions, the difference between efficient and inefficient workers can be observed more easily, then a recession can help to improve the worker selection.

Since the recent theoretical advances suggest that recessions may have permanent effects on the level of productivity, it also follows that if productivity improvements differ across regions, then recessions may have permanent effects on regional economic disparities as well.

The theory of regional, or intranational, business cycles is rather similar to that of international business cycles, with, however, a few important exceptions. Even though the

comovements of the central variables (GNP, consumption, prices, employment) are the same, in the regional context there are no restrictions on trade or factor mobility (Hess and Shin, 1997). Moreover, it has been argued that business cycles tend to move from region to region via industries that comove in response to national factors, and that there tends to be a higher correlation between industries than individual regions (Kollman, 1995). In other words, the most important determinant of the comovement of economic activity across regions is the composition of industry, whereas other regional features tends to matter far less. It is only for the neighbouring regions that the level of activity will show a higher correlation at the regional than at the national level (Hess and Shin, 1997). Therefore, even though certain region-specific factors may be important in understanding the effects of intranational business cycles, the causes and consequences of economic fluctuations can best be understood through the industrial composition of regions.

Because regions differ in terms of their production and population composition, they experience business cycles differently, which, in turn, leads to growing or diminishing regional disparities. The important role of the industrial structure of regional economies is emphasised by Isard (1982) and Temple (1994), who argue that divergence from the average structure explains why the business cycle of a given region may differ greatly from the average cycle, and why regional disparities are affected by economic fluctuations. In this context, a general observation is the tendency of regional disparities, such as per capita GDP and productivity, to diminish during economic upturns and increase in recessions (Myrdal, 1957; Dunford and Perron, 1994; Mackay, 1994; Evans and McCormic, 1994; Audas and Mackay, 1997).

The discussion above suggests that a situation of diminishing regional disparities is the norm, one which may occasionally be disrupted by recessions. There are several reasons why disparities should grow during recessions. Traditionally, reasons why poorer regions are finding it increasingly difficult to cope during contractions have been sought in the timing and duration of regional cycles (Saint-Paul, 1997). Assuming that the downswing begins with industry X at the aggregate level, then those regions where that industry is “over-represented” will fall into the slump first. This is called the ”lead-and-lag” hypothesis of regional business cycle fluctuations (Fisher and Nijkamp, 1987). It states that the timing and severity of cyclical fluctuations tend to differ across regions owing to their differential

proportions of lead and lag industries. A lead industry is one that falls into the slump (or starts growing in an upturn) ahead of the aggregate cycle, whereas lag industries are those that experience the downswing (or begin the upswing) after the aggregate cycle. During recessions regional disparities may widen, as initially lagging areas may be more specialised in sectors that tend to suffer from longer and deeper downswings. Differences in the timing of recession are likely to cause rather temporary changes in regional disparities, whereas differences in the severity of recession between sectors tend to produce somewhat more long-lasting effects.

The second reason for widening regional disparities during recessions is that firms in the initially richer regions are often more advanced which, in turn, has made these regions richer than the others. One major reason why advanced firms are located in richer (often central) regions in the first place relates to agglomeration and localisation benefits in innovative activity (see e.g. Freeman 1990; and Kangasharju and Nijkamp, 2000). Because of their modern structure, firms in richer rather than poorer areas are better able to adjust their production to changes in aggregate demand. Thus, in recessions productivity increases more in the richer regions, which leads to growing regional disparities. These types of changes are rather permanent in nature, since there is no theoretical reason to expect that poorer regions will improve their labour productivity relative to that of richer ones during the ensuing boom period.

Diminished migration activity is the third reason for regional divergence during contractions. Migration is the key force in equalising per capita income and unemployment rates across regions. It is therefore important to analyse the mobility of labour during different phases of the business cycle. A well established fact is the lower tendency of labour to migrate during periods of recession (Pissarides and McMaster, 1984; Dewhurst, 1998; Attanasio and Padoa-Schioppa, 1991; Decressin, 1994).[2] In addition, as migrants are mostly young students and unemployed persons, their current productivity is lower than the average, and therefore their lower migration during contractions slows down the convergence process. Changes in migration activity are not likely to cause long lasting effects on economic disparities, since low migration activity during recessions is usually counteracted by accelerating activity during boom periods.

The final reason for the slow-down in convergence during recessions is the decreased role of regional policy instruments. During slumps there are fewer economic resources to be devoted to regional policy goals. This may depress the odds of poorer areas catching up with the richer ones. Decreased use of regional policy instruments during recessions has long lasting effects on regional disparities, if the use of instruments is not increased during economic upturns.

In sum, two of the reasons mentioned above suggest that fluctuations would have permanent effects on regional disparities. Aggregate economic fluctuations have a long-run effect on regional disparities, since firms in the rich and poor regions may react differently to fluctuations, even where they operate in the same sector, and the severity of the recessions may differ between sectors which are unevenly located across regions. In other words, the differences within and between sectors may have long term effects on regional structure.

## 3. Data and Method

The regional level of the analysis is the NUTS4 of the European Union. In Finland this classification comprises 85 subregional units, the borders of which closely follow those of commuting districts. The source of the data is Statistics Finland Regional Accounts and Employment Statistics. GDP is expressed in 1995 prices, meaning that we analyse the evolution of regional disparities in production volumes and disregard changes in prices.

As opposed to most previous studies, we do not merely analyse per capita GDP, but decompose it into GDP per employee and a version of the "employment rate"[3]. In other words, we decompose the per capita GDP measure as follows:

$$(1) \qquad GDP_i/N_i = GDP_i/E_i \times E_i/N_i,$$

where N is the population and E is the number of persons employed in region i, irrespective of the place of residence, i.e. the number of jobs in region i. The first sub-component is henceforth called the "productivity component"[4] and the second the "employment component". This can further be manipulated into the following "change"-decomposition:

$$(2) \qquad \left(\frac{\dot{GDP}_i}{N_i}\right) = \left(\frac{\dot{GDP}_i}{E_i}\right) + \left(\frac{\dot{E}_i}{N_i}\right) = \left(\frac{\dot{GDP}_i}{E_i}\right) + \dot{E}_i - \dot{N}_i = \dot{GDP}_i - \dot{N}_i$$

Using this expression, we can analyse the change in per capita GDP in terms of various decompositions. On the one hand, we analyse relative measures, such as changes in the productivity (GDP/E) and employment (E/N) components. On the other hand, we also analyse absolute figures, such as changes in the GDP, job (E) and population (N) components.

## 4. Finnish regional economy and the 1990s recession

### 4.1 The evolution of regional disparities

Aggregate, as well as per capita, GDP experienced radical changes during the recession period: both grew in 1988-90, then fell until 1993, after which they started steadily to climb up again (Figure 1). Between 1990 and 1993, national GDP fell altogether by 9.5 percent and unemployment rose from 3.2 to 16.6 percent. Since then the average annual growth in GDP has been over 4 percent and by 1999 unemployment had dropped to around 10 percent.[5]

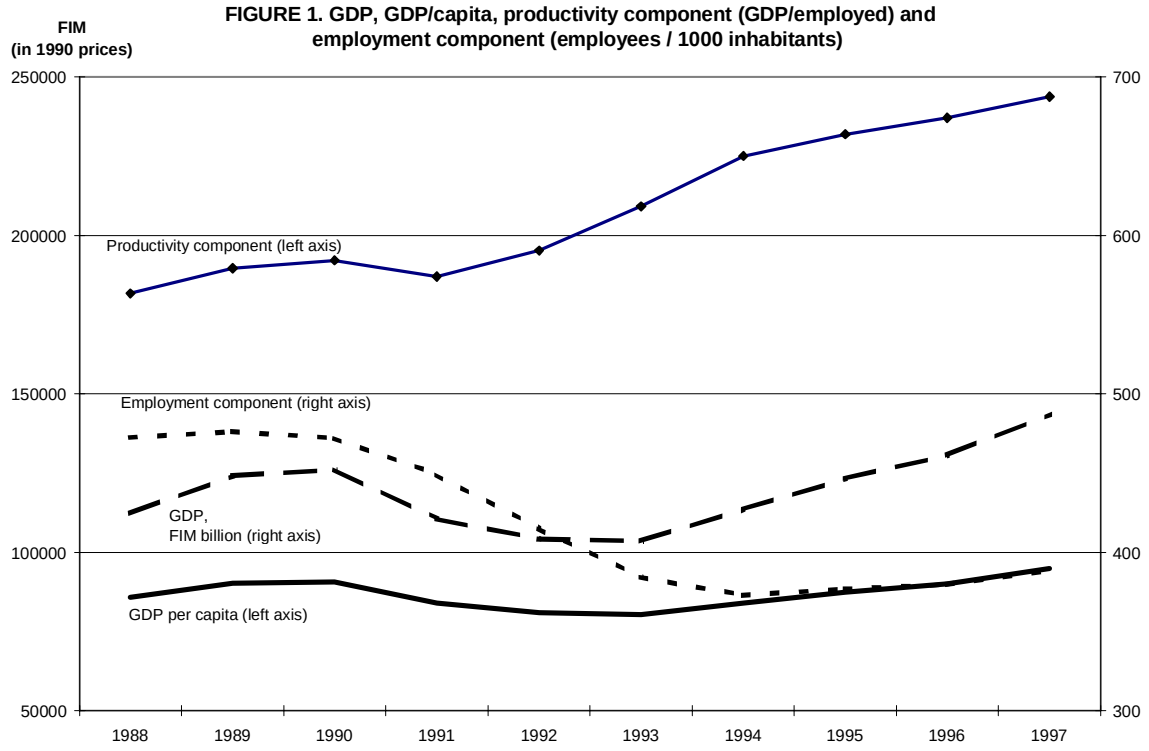


**Figure 1: GDP, GDP/capita, productivity component (GDP/employed) and employment component (employees / 1000 inhabitants), 1988-97**

The recession affected manufacturing and construction particularly badly: the fall in production was greatest in those sectors (Figure 2). Moreover, the slump seems to have hit these sectors first; production started to decline in mid 1990. These two represent the “lead industries”, whereas the most obvious “lag industry” is public services, where production started to fall at the end of 1991. Conversely, the recovery phase began first in agriculture and forestry and in manufacturing. As the severity and timing of the recession differed across sectors, it is very likely that the regional differences in sectoral composition influenced the degree of regional disparities.

Compared with the movements in per capita GDP, there are even more noticeable changes in its subcomponents, the productivity component (GDP per employee, that is) and the employment component (employees per population) (Figure 1). In fact, these components have moved in opposite directions, a fact that tends to be hidden when analysing simple per capita GDP. Productivity has risen almost continuously, and the recession seems to have further accelerated its improvement, whereas the employment component fell dramatically during the slump years. Hence, the well established ”efficiency hypothesis” cannot be

rejected here: an almost equal amount of per capita GDP can be produced with far fewer workers, when recession removes the most inefficient economic activity. A notable feature is that productivity started to increase already in 1991 when GDP was still decreasing. For example in the USA productivity starts normally improving after slumps. Moreover, it becomes clear why GDP should be divided into several subcomponents: the aggregate figure hides a lot of interesting information.

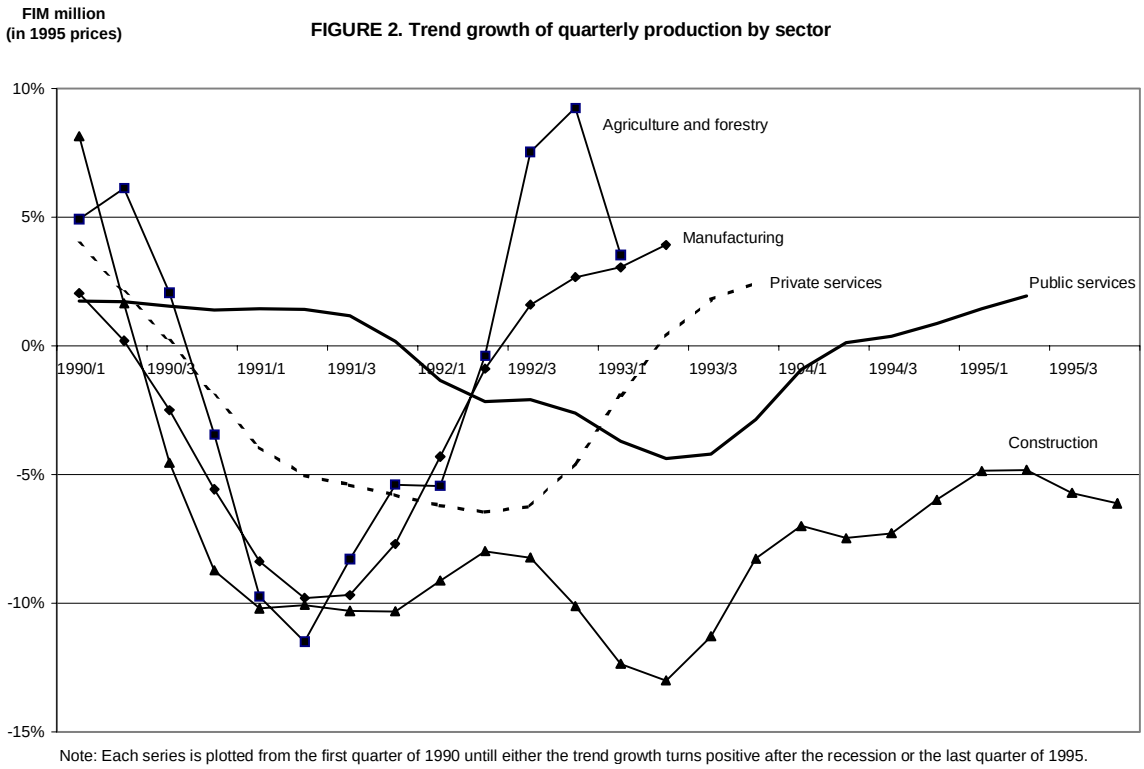


**Figure 2: Trend in growth rate of quarterly production by sector, 1988-95**

Moving on to a regional analysis of the above components, let us start with absolute figures. The coefficient of variation is drawn for GDP, the number of jobs and population (Figure 3). Regional population structure has experienced constant and continuous divergence, with, however, a change in the regime around 1993-1994. Until 1993, the annual increase in the variation coefficient was 1.2%. In 1993-1997, the change jumped to 2.3% a year, indicating that the growth of migration flows around the mid 1990s was accompanied by a growing net migration to the more populous subregions.[6] Similarly, the variation in the regional number of jobs has continuously increased in the 1990s, accelerating from 1995 onwards. And, finally, the evolution of GDP disparities indicates that disparities grew, in particular, between 1993 and 1996, but seem to have declined

somewhat in 1997. This pattern suggests that the larger subregions (in terms of GDP) recovered sooner from the recession than the others.

**FIGURE 3. Subregional GDP, jobs and population: Coefficient of variation**

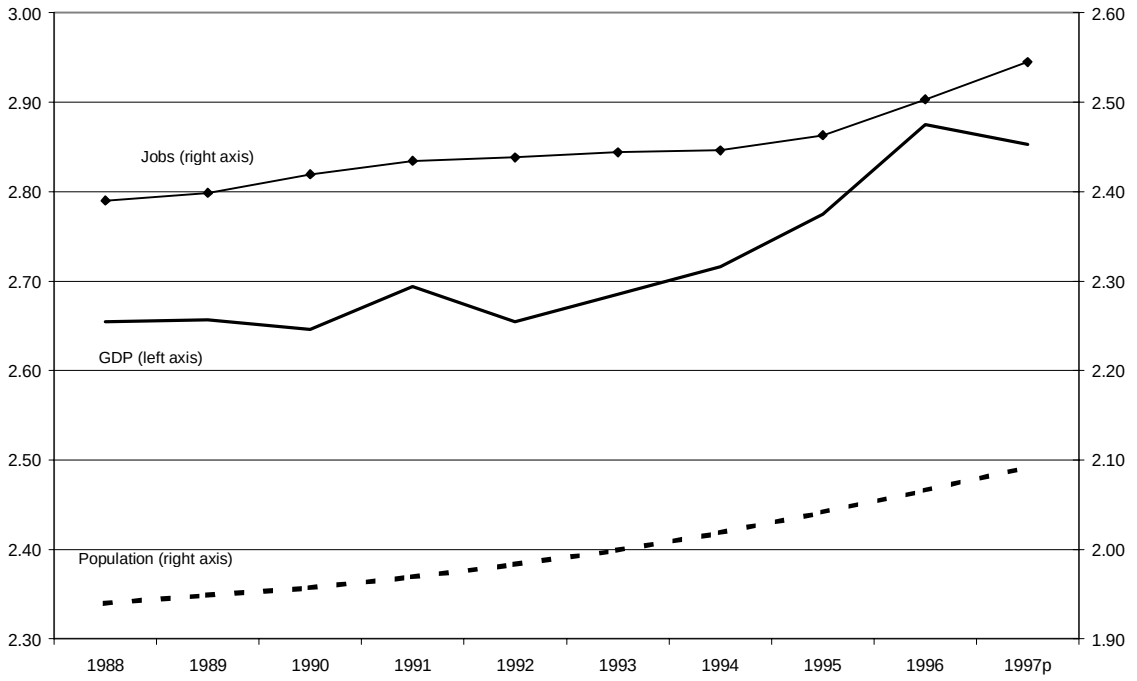


**Figure 3: Subregional GDP, jobs and population between 1988 and 1997: Coefficient of variation.**

One difficulty with the analysis of regional ”aggregate” measures (as opposed to per capita measures), however, is that they do not take into account concomitant population movements. Using relative measures the coefficient of variation confirms that per capita GDP did exhibit a degree of convergence in the pre-recession period, whereas divergence dominated during the slump years and early recovery (Figure 4). After 1995 the divergent trend levelled off, indicating the end of the recession in most parts of Finland. Rather than employment, the productivity component seems to dominate the changes in regional disparities of per capita GDP, since the productivity component shows a pattern similar to that of per capita GDP: productivity disparities fall before the slump and then grow until 1995. The employment component, however, appears to be somewhat different, displaying growing disparities all the way until 1996, and falling in 1997. The fall in the “employment rate” disparities implies that the “employment rate” started to improve in the lagging subregions relative to the leading subregions as late as 1997. The fall in the “employment

rate" disparities also partially explains why the disparities in per capita GDP grew somewhat in 1997.[7]

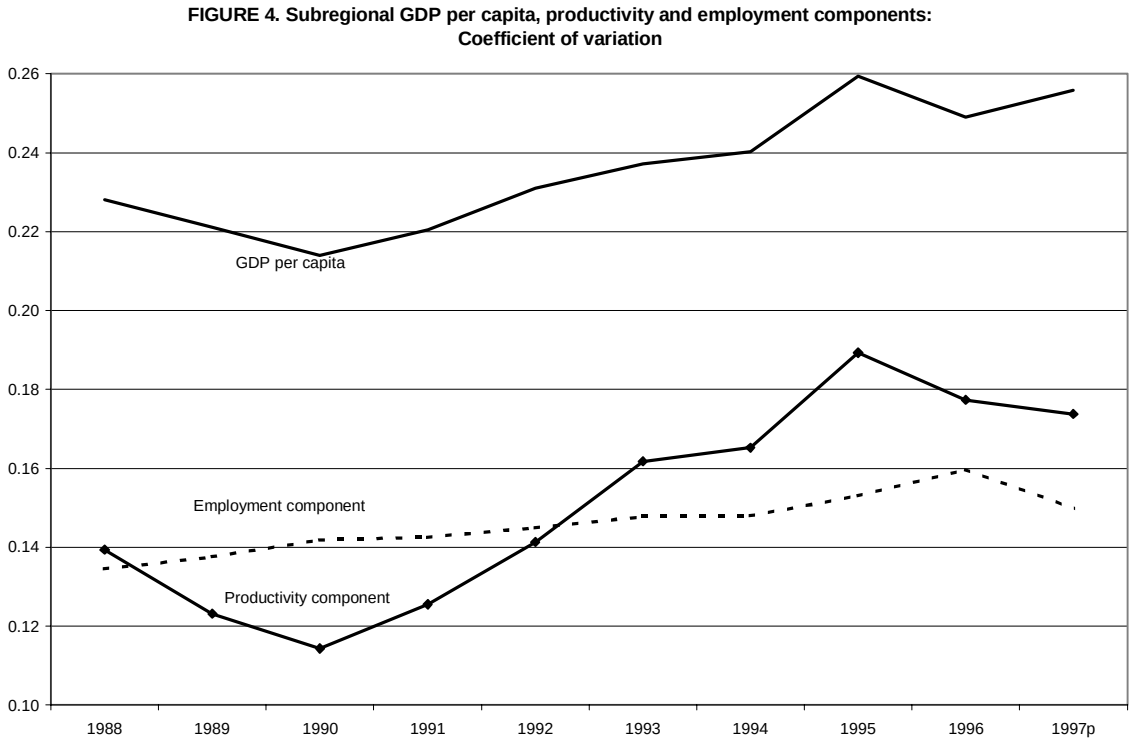


**Figure 4: Subregional GDP per capita, productivity and employment components between 1988 and 1997: Coefficient of variation**

In sum, aggregate and per capita GDP started to recover from the slump as early as in 1994, but in terms of production the recession was over in most subregions only after 1995. Hence, in the regional context, the period of recession was effectively 1990-1995: a period during which regional disparities in per capita GDP, and in the productivity and employment components grew.

The number of subregions that diverge from the per capita GDP mean supports this result (Table 1). The number of diverging subregions was 41 in 1989, thereafter increasing with the severity of the recession, and rising to 49 in 1991. Between 1992 and 1994 the number remained above 45, but increased again to 51 during the early recovery phase in 1995, implying regional differences in the timing and duration of the slump. Since then, the number of diverging subregions dropped, being 31 in 1997.

**Table 1. Number of diverging subregions relative to previous year**

| | Number of Subregions | Proportion |
|---|---|---|
| 1989 | 41 | 48 % |
| 1990 | 45 | 52 % |
| 1991 | 49 | 58 % |
| 1992 | 46 | 54 % |
| 1993 | 47 | 55 % |
| 1994 | 45 | 53 % |
| 1995 | 51 | 60 % |
| 1996 | 44 | 52 % |
| 1997p | 31 | 36 % |

Note: p stands for preliminary data.

### 4.2. Differences in Growth

In order to find out what accounts for the observed divergence between the rich and poor subregions, we divide the subregions into two classes according to their per capita GDP relative to the national average at the beginning of the recession, in 1990. Clearly, the divergence observed during the slump must be a result of either poor regions growing more slowly (or declining more quickly) than the average, or rich regions growing more quickly (or declining less) than the average, or both. Indeed, it appears that on average per capita GDP fell annually by 0.57 percentage points less during 1990-95 in the rich than in the poor regions (Table 2). Note that growth rates in Table 2 are the averages over the time period and regional units.

Looking at the first decomposition (top panel), it expectedly seems that particularly the productivity component but also the employment component exerts a divergent effect: the efficiency effect of slump has been greater in the rich subregions and their per capita employment has fallen somewhat less. Continuing the first decomposition, we see that on average the GDP of the rich regions has fallen annually by 1.11 percentage points less than that of poor regions, but that migration has been a convergent force since the population of the rich subregions has increased at the expense of the poorer subregions. However, the convergent effect of migration is not strong enough to offset the divergent effect of GDP, as the difference in population growth rates is only 0.54 percentage points annually. Secondly, the decomposition of productivity (middle panel) shows that its divergent effect comes from the GDP component, whereas the job component has had a convergent effect. Thirdly, decomposing the employment component (bottom panel) we notice that it is

divergent because the number of jobs falls less in the rich regions. Again, the convergent effect of migration is not enough to offset the change in employment.[8] And finally, note that the size of divergent effect caused by the job component (0.69) is actually larger than that caused by the productivity component (0.42). Divergence caused by the job component refers to more permanent effects than that caused by productivity component, since the latter can partially result from high evolution of production volumes over time. Production volumes may vary particularly in capital intensive production.

**Table 2: Average annual changes in per capita GDP and its subcomponents, 1990-1995**

| | **ΔGDP/N** | **=** | **ΔGDP/E** | **+** | **ΔE/N** | **=** | **ΔGDP** | **-** | **ΔN** |
|---|---|---|---|---|---|---|---|---|---|
| **Rich regions** | -0,76 % | = | 3,36 % | + | -4,12 % | = | -0,47 % | - | 0,29 % |
| **Poor regions** | -1,32 % | = | 2,94 % | + | -4,26 % | = | -1,57 % | - | -0,25 % |
| **Difference, %-points** | 0,57 | = | 0,42 | + | 0,14 | = | 1,11 | - | 0,54 |
| | **ΔGDP/E** | **=** | **ΔGDP** | **-** | **ΔE** | | | | |
| **Rich regions** | 3,36 % | = | -0,47 % | - | -3,83 % | | | | |
| **Poor regions** | 2,94 % | = | -1,57 % | - | -4,51 % | | | | |
| **Difference, %-points** | 0,42 | = | 1,11 | - | 0,69 | | | | |
| | **ΔE/N** | **=** | **ΔE** | **-** | **ΔN** | | | | |
| **Rich regions** | -4,12 % | = | -3,83 % | - | 0,29 % | | | | |
| **Poor regions** | -4,26 % | = | -4,51 % | - | -0,25 % | | | | |
| **Difference, %-points** | 0,14 | = | 0,69 | - | 0,54 | | | | |

Note: Growth rates are the averages over the time period and regional units.

The lesson here is that even though inter-regional migration tends to have convergent effects on regional incomes, these effects have not been strong enough during the recession. The reason for this may be that the migration flows have not been large enough (a common observation is that migration activity decreases in a recession) or that the migrants from the poor to rich regions have mainly been employed persons, who bring gains in GDP to their destination region.[9] In sum, the negative effects from the productivity and employment components have been the cause of regional divergence during the recession.

As a final object of curiosity, we will look at the population component more closely. So far we have argued that the differential population growth between the rich and poor regions stems from the net migration. However, as the majority of migrants tend to be

rather young, a large in-migration may also, by increasing its fertility, lead to population growth. It can be seen that on average population growth has been much faster in the rich regions that in their poorer counterparts during the recession (Table 3). The reason for this difference is both the greater average in-flow of migrants to the rich regions (even though, owing to the extremely concentrated flows, it is negative on average) and, to an equal extent, greater average fertility, compared to mortality, in the rich regions. In other words, the in-flows of young migrants to the rich regions contribute to population growth in many ways, further emphasising the convergent (in per capita terms) effect of migration.

**Table 3: Average composition of regional population growth, 1990-95**

| | **Net fertility*)** | **Net in-migration**)** | **Net immigration***)** | **Population Growth rate** |
|---|---|---|---|---|
| **Rich regions** | 1.3% | -0.8% | 0.5% | 0.3% |
| **Poor regions** | -0.3% | -1.9% | 0.4% | -0.4% |
| **All regions** | 0.4% | -1.4% | 0.5% | -0.5% |
| **Difference** | 1.6% | 1.1% | 0.1% | 0.6% |

Notes: Net growth rates of fertility, in-migration and immigration do not sum to population growth rate, since growth rates are the averages over the time period and regional units.
*) (births-deaths)/population;
**) (in-migration- out-migration)/population; and
***) (immigration-emigration)/population

### 4.3 The effect of regional industry composition

As the analysis above showed, rather than the employment component the productivity component causes more regional divergence of per capita GDP. It is obvious, however, that analysing productivity at the aggregate level hides important information. Not all sectors grow or diminish at the average rate, but experience recessions very differently. This has strong implications in terms of regional disparities, as the sectoral structure of a region will strongly determine how badly it suffers from a recession. In this section regional productivity growth is decomposed into five sectors: agriculture and forestry, manufacturing[10], construction, private services and public services.

The evolution of regional productivity disparities has differed widely across sectors (Figure 5). Regional productivity disparities have evolved most visibly in manufacturing. During both economic upturns (1988-1990 and 1995-1997) the level of productivity in the manufacturing sector converged across subregions, whereas 1990-1995 was characterised by divergence. Since 1995 convergence has proceeded exceptionally fast. This means that during 1990-1995 productivity improved more in subregions where it was already higher,

and vice versa during 1998-1990 and 1995-1997. As far as the other sectors are concerned, in agriculture and forestry divergence occurred, whereas convergence was the trend in construction. In the two service sectors productivity development has not exerted any clear influence on regional disparities.

**FIGURE 5. Subregional labour productivity by sector: Coefficient of variation**

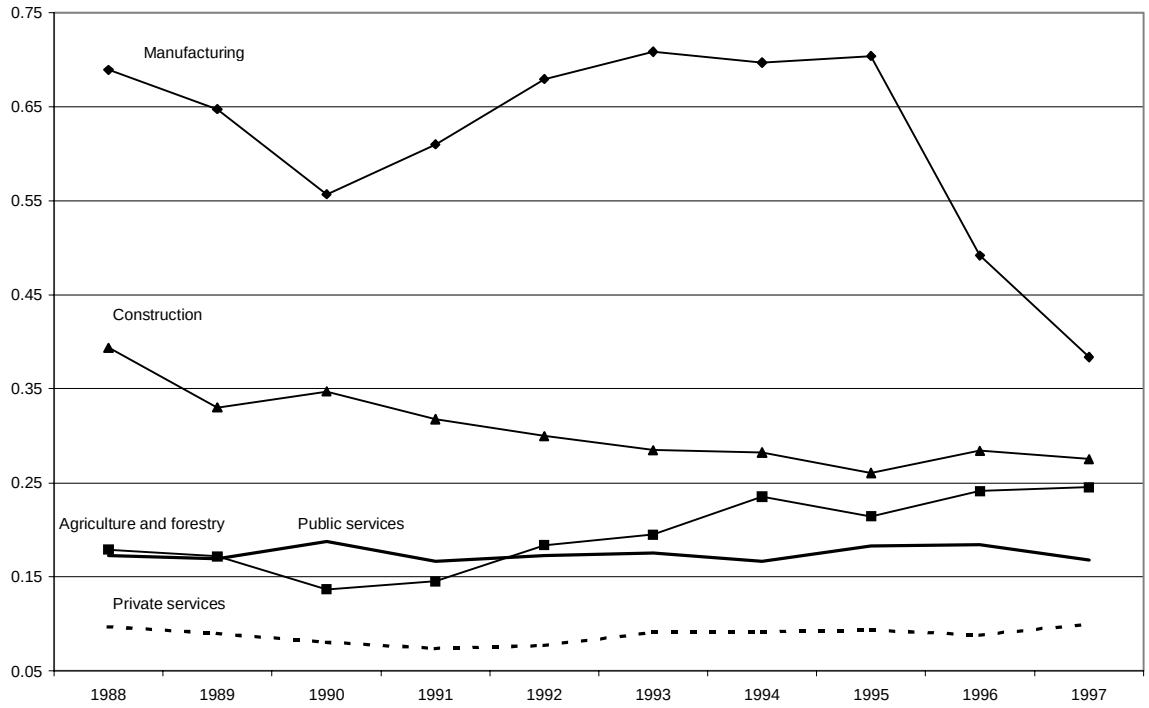


**Figure 5: Subregional labour productivity by sector: Coefficient of variation**

However, when compared with the convergence and divergence patterns obtained above, we note that the evolution of productivity disparities may not result in similar patterns across rich and poor regions. In other words, regional divergence of productivity in a sector does not necessarily contribute to regional divergence of per capita GDP. A different result may occur, either due to the fact that the evolution of productivity within the sectors is different in the rich group from that in the poor one, or due to differences in sectoral composition between rich and poor subregions.

Let us first focus on the effect of differences on the evolution of productivity within sectors. Using the same division of rich and poor regions as above, we analyse whether the sectors contribute to divergence or convergence of the productivity component of per capita GDP during 1990-1995. On average overall productivity grew annually faster by 0.7

percentage points in the rich than in the poor regions (Table 4). This difference in favour of the rich regions was the greatest in the lead sectors, i.e. construction and manufacturing (top panel). For manufacturing, this result is similar to that obtained above, implying that on average the richer subregions also have a higher level of labour productivity. For construction, however, the result is the opposite to that obtained above, implying that on average the level of productivity is lower in the richer subregions than that in the poorer subregions. In other words, productivity in the construction sector grew more in the subregions with initially a lower level of productivity and in the subregions with initially a higher level of per capita GDP. This is why the coefficient of variation points to convergence, but productivity increases more in the rich group than in the poor one. To put it differently, the construction sector had a convergent effect on productivity differentials, but a divergent effect on per capita GDP.

**Table 4: Average annual change in productivity by sector, 1990-1995**

| | Agriculture and forestry | Manufacturing | Construction | Private services | Public services | All sectors |
|---|---|---|---|---|---|---|
| **Unweighted** | | | | | | |
| **Rich regions** | 6,5 % | 7,2 % | 3,6 % | 2,6 % | -0,5 % | 3,6 % |
| **Poor regions** | 6,2 % | 5,4 % | 0,5 % | 2,2 % | -0,2 % | 2,9 % |
| **All regions** | 6,3 % | 6,2 % | 1,9 % | 2,4 % | -0,3 % | 3,2 % |
| **Difference, %-points** | 0,3 % | 1,8 % | 3,1 % | 0,4 % | -0,3 % | 0,7 % |
| **The job share of sector** | | | | | | |
| **Rich** | 5 % | 18 % | 7 % | 35 % | 35 % | 100 % |
| **Poor** | 20 % | 19 % | 5 % | 24 % | 32 % | 100 % |
| **All** | 8 % | 18 % | 6 % | 33 % | 35 % | 100 % |
| **Weighted by share of jobs** | | | | | | |
| **Rich** | 0,3 % | 1,3 % | 0,2 % | 0,9 % | -0,2 % | 3,6 % |
| **Poor** | 1,2 % | 1,0 % | 0,0 % | 0,5 % | -0,1 % | 2,9 % |
| **All** | 0,5 % | 1,2 % | 0,1 % | 0,8 % | -0,1 % | 3,2 % |
| **Difference, %-points** | -0,9 % | 0,3 % | 0,2 % | 0,4 % | -0,1 % | 0,7 % |

Note: Sectoral growth rates in the bottom panel do not sum to that of all sectors, since growth rates are the averages over the time period and regional units.

Second, let us consider the effect of sectoral composition on the results. Weighting the sectors by their job shares, private services also contribute to divergence together with manufacturing and construction (bottom panel).[11] In fact, because they have largest proportion of jobs, private services make the largest contribution to overall divergence between the rich and poor subregions. Further comparison between the rich and poor group (not shown in Table) shows that divergence in private services is particularly due to a stronger drop in the number of jobs in the richer areas and to a far lesser extend due to a

smaller drop in value added. Conversely, in agriculture and forestry as well as public services the average productivity dropped less in the poorer regions than in the richer ones. The convergent effect of the primary sector is particularly strong. Convergence in primary sector is mainly caused by a slower drop in the number of jobs in the richer groups (not shown in Table 4).

### 4.4 Modelling the effects of recession on regional growth disparities

In this final section a simple model is developed to quantify the relative effects of the productivity and employment components on the divergence of per capita GDP. Divergence is measured by a growing gap in per capita GDP compared to the richest subregion, Helsinki. The gap variable (GAP) measures per capita GDP in Helsinki relative to the subregion in question:

$$(3) \qquad GAP_i=[(GDP/population)_{Helsinki} / (GDP/population)_i]-1.$$

In 1990 the Helsinki region was 69 % richer than the average, and the average GAP rose by 3.9 percentage points between 1990 and 1995 (see the left-hand side columns in Table 5). During that period, productivity rose on average by 3.2 % per annum and the "employment rate" fell by 7.7 %. This development was very heterogeneous over the subregions, however, since only 54 out of the 84 subregions diverged from Helsinki during the period. Appendix 1 provides a detailed description of the convergent and divergent subregions.

**Table 5. The aggregate model**

| Variable | | | The model | | | Model forecast |
|---|---|---|---|---|---|---|
| | The mean | Std. Devn. | Coefficient | t-value | | |
| ΔGAP | 0,0390 | 0,179 | | | With mean values | 0,043 |
| Constant | | | 0,110 | 3,0 | + a 1-percentage point improvement in | |
| Δ(GDP/E) | 0,032 | 0,0197 | -7,872 | -21,2 | Δ(GDP/E) | -0,036 |
| Δ(E/N) | -0,077 | 0,0187 | -2,425 | -6,0 | Δ(E/N) | 0,018 |
| Åland | 0,024 | 0,1525 | -0,150 | -3,0 | | |
| $R^2$ (σ) | | | 0,86 (0,065) | | | |

Firstly, the change in GAP is regressed on the aggregate change in the productivity and employment rates (Middle column in Table 5). Note that we use the first decomposition of regional per capita GDP presented in Table 2. In addition, a dummy variable is added for

the two Åland subregions, since these subregions differ from those of continental Finland (see e.g. Kangasharju, 1998). Both the productivity and employment variables are statistically significant and negative, indicating that an increase in productivity growth or a smaller drop in the "employment rate" decreases divergence. These variables (plus the dummy) explain 86 % of the variation in the change in GAP.

The previous sections indicate that divergence is caused by both productivity and employment, the former being the dominant factor. The regression results support this view (the right-hand side columns in Table 5). With the mean values, the model predicts that on average GAP grew by 4.3 percentage points between 1990 and 1995. A one-percent improvement in productivity growth is so strong that it reduces the divergence by 8 percentage points, to –3.6 percentage points, causing in fact a partial catching up. With a similar improvement in the employment component the reduction is only 2.4 percentage points, from 4.3, to 1.8 percentage points.

**Table 6. The sector model**

| Variable | | | The model | | Model forecast | |
|---|---|---|---|---|---|---|
| | The mean | Std. Devn. | Co-efficient | t-value | | |
| ΔGAP | 0,0390 | 0,1790 | | | With mean values | 4,7 |
| Constant | | | -0,0516 | -0,8 | + a 1-percentage point improvement in | |
| Δ(value-added/E), agriculture and forestry | 0,06321 | 0,0399 | -0,9628 | -3,4 | Δ(value-added/E), agriculture and forestry | 3,8 |
| Δ(value-added/E), manufacturing | 0,06244 | 0,0509 | -2,3492 | -9,6 | Δ(value-added/E), manufacturing | 2,4 |
| Δ(value-added/E), construction | 0,01932 | 0,0585 | -0,7961 | -3,8 | Δ(value-added/E), construction | 3,9 |
| Δ(value-added/E), private services | 0,02378 | 0,0136 | -0,9239 | -1,0 | Δ(value-added/E), private services | 3,8 |
| Δ(value-added/E), public services | -0,0034 | 0,0211 | -2,0912 | -3,4 | Δ(value-added/E), public services | 2,6 |
| Δ(E/N) | -0,077 | 0,0187 | -4,3708 | -6,5 | Δ(E/N) | 0,4 |
| Åland | 0,02353 | 0,1525 | -0,3501 | -3,7 | | |
| $R^2$ (σ) | | | 0,71 (0,101) | | | |

Secondly, the productivity variable is decomposed into sectors. Apart from private services, all the other sectors induce divergence in a statistically significant manner (Table 6). However, the explanatory power of the model is somewhat lower than that in the previous model. Now, the employment component contributes to divergence more than any

individual sector. A one-percent improvement in employment slows down divergence by 4.4 percentage points (from 4.7 to 0.4 percentage points), whereas a similar improvement in the productivity of any individual sector results in a much smaller decrease in divergence. Of all five sectors, manufacturing has the greatest impact on catching up. A one-percent improvement in its productivity cuts divergence by 2.3 percentage points (from 4,7 to 2,4 percentage points). Among the sectors, construction has the lowest impact on divergence.

## 5. Conclusions and discussion

The tradition of analysing the causes and consequences of regional business cycle fluctuations is not a very old or solid one, and these subjects have been somewhat neglected in regional economics. The present study has analysed the effects of the 1990s recession on the evolution of Finnish regional economic disparities. The change in per capita GDP was decomposed into labour productivity and employment components also taking advantage of regional sector shares.

Our results support the view that regional economic disparities tend to widen during recessions. The recession of the 1990s marked a break in the long-term convergence of per capita GDP across the 85 subregions of Finland. Our main finding is that regional differences in the evolution of both labour productivity and employment contributed to the per capita GDP divergence observed during 1990-1995. As far as productivity is concerned, private services contribute the most to divergence, whereas the primary sector and public services are the convergent sectors. The finding that the evolution of regional "employment rate" differentials also contributed to the widening of per capita GDP disparities implies that more than in the poorer areas, the labour market in the richer areas is diversified, providing recently unemployed people with chances for re-employment.

It is reasonable to expect that the regional effects of the recession will be rather permanent in nature. We found that the job component caused even more regional divergence of GDP than the productivity component. Moreover, divergence in the job component refers to more permanent effects than that in the productivity component, due to possible temporary changes in production volumes in capital intensive production. Apart from these possible temporary changes in production, the differences in the evolution of productivity are

otherwise rather permanent in nature, since there is no theoretical reason to expect that the productivity gap emerging during a recession would be caught up during subsequent upturns. Instead, abundance of evidence suggests that convergence is a slow and long-lasting process. In addition, we did not find evidence allowing the observed divergence to be attributed mainly to regional differences in the timing of recession, to or declined migration, which would have produced only temporary regional differences.

Another conclusion is that the centrifugal forces have been gaining in strength. Since the sectoral share of the primary sector in particular, but also that of the public services sector is decreasing, divergent forces are gaining at the expense of convergent ones, and during future economic downturns the widening of economic disparities are likely to be faster than that observed so far.

We also found that the regional divergence of productivity does not result in similar divergence of per capita GDP. The effect of the evolution of productivity depends on the development of productivity between rich and poor subregions as well as the sectoral composition of the industries in regions. Finally, we found that the effects of recession last longer in Finland at the regional than aggregate level. The aggregate measures of economic activity pointed to recovery in 1994, whereas the regional economic measures gave this indication only after 1995.

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## Endnote

[1] The subregions are NUTS4-level regional units in EU standards.

[2] Particularly important is the mobility of human capital, i.e. highly educated individuals, during labour market shocks, as it has been suggested that they are the most prone to move away from the worst hit labour market areas (Mauro and Spilimbergo, 1999). This has serious consequences for the worst-off regions, as they may lose some of their productive labour force, and this will certainly have a long-lasting impact on their future economic growth.

[3] The real employment rate, of course, relates the number of employees to the working age population.

[4] We are of course talking here about labour productivity, which may have evolved very differently from total factor productivity.

[5] These figures are taken from the recently renovated National Account, and may not match precisely with the regional data analysed here.

[6] Note that the new "resident municipality law" accounts for a large part of the increase in the concentration of population since 1994. Before 1994 students could not become official residents of the municipality of their school or university.

[7] The attentive reader may wonder why a rise in the coefficient variation of per capita GDP was lower between 1990 and 1995 than that of productivity, even when the coefficient variation of the "employment rate" also rose. One reason is that the partial correlations between the growth rates of per capita GDP, productivity and the "employment rate" are not all very high. The correlation coefficient between the growth rate of per capita GDP during 1990-1995 and the productivity growth rate is 0.91, whereas that between the per capita growth rate and the change in the "employment rate" is 0.59. The correlation between productivity change and the change in the "employment rate" is as low as 0.21.

[8] The job component is either a convergent or a divergent factor depending on the equation. In the productivity equation it has a convergent effect, as it is the denominator. On the other hand, in the employment equation the effect is divergent, since it is the numerator.

[9] See e.g. Pekkala and Kangasharju (2000), who recently investigated the adjustment of regional labour markets in Finland.

[10] Manufacturing includes here mining and the supply of electricity, heating and water.

[11] The reason why job shares are used is the following:
$GDP/E=(GDP_1+GDP_2)/(E_1+E_2)= (GDP_1/E_1)*(E_1/E)+(GDP_2/E_2)*(E_2/E)$, where subscripts refer to industries in an area and E without a subscript to the total of industries.

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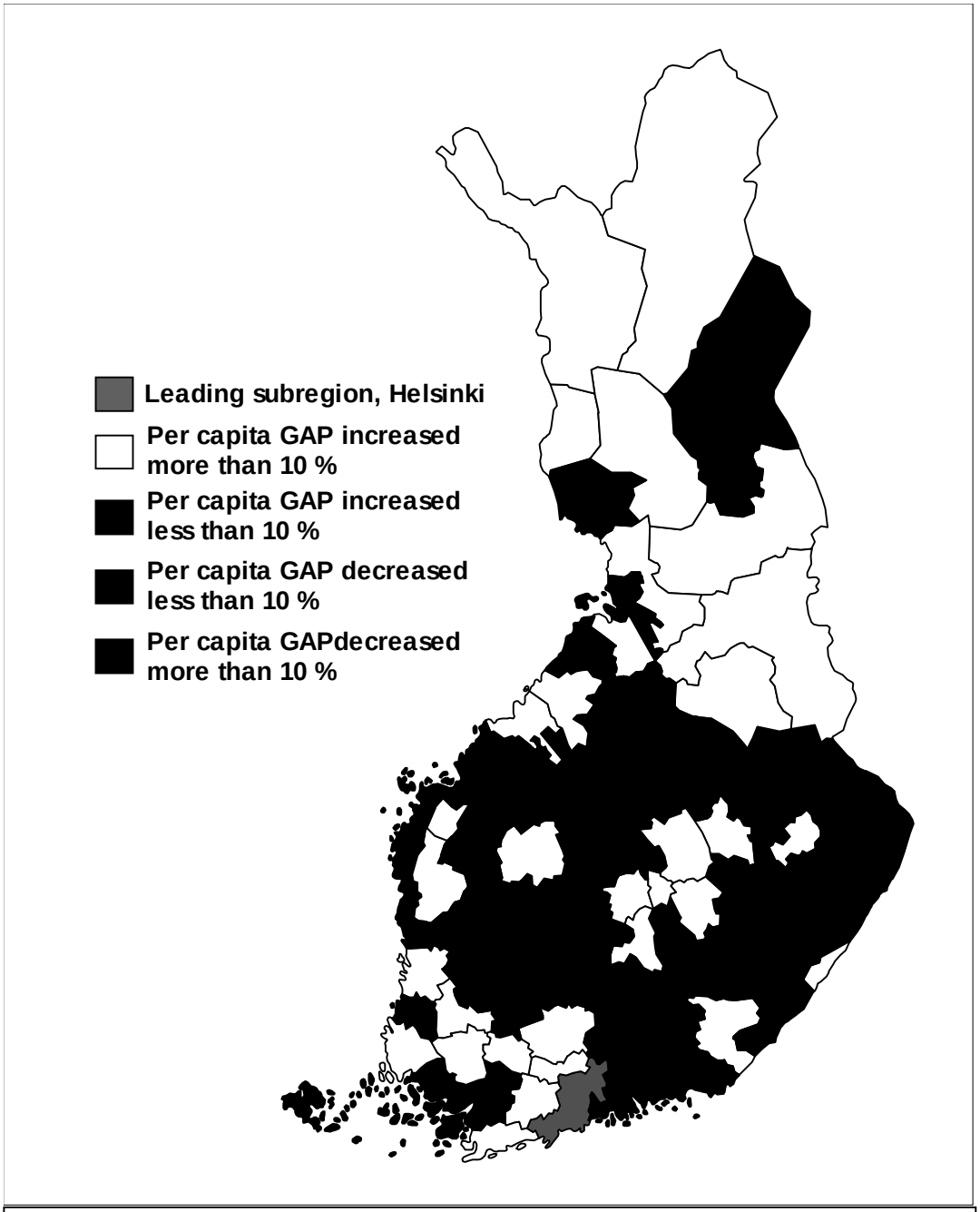
**Appendix. Diverging and converging subregions**

Here we provide a description of four groups of subregions that were catching up or lagging behind the leading subregion, Helsinki, between 1990-1995. The two catching-up groups mainly comprise the coastal or border subregions (Map 1). With a few exceptions, all the Northern subregions belong to the group that lagged the most behind Helsinki. Although the overall development was one of divergence, nonetheless 30 out of the 84 subregions partially caught up with Helsinki (Table 1A). As a result of divergence during the period, the catching-up groups consisted of richer subregions than the lagging-behind groups. The catching-up groups also have higher labour productivity. Sectoral composition shows that the catching-up groups are more specialised in manufacturing and less specialised in the other sectors than the lagging-behind groups. They are also smaller than the lagging-behind groups in terms of population.

As far as the extreme groups are concerned, there are 16 subregions that caught up with Helsinki by more than 10 percentage points (mean –23 percentage points). In this group, labour productivity and the proportion of the population with higher education was larger than elsewhere. In terms of sectoral specialisation, these subregions were less specialised in primary production than the others and more specialised in manufacturing. 31 subregions lagged more than 10 percentage points behind Helsinki. In this group, the subregions were poorer and had lower a “employment rate” than the others. On the other hand, their net fertility (birth rate - mortality rate) was surprisingly high. This group is less specialised in manufacturing and more specialised in public services than the others.

**Table 1A. Descriptive statistics for convergent and divergent subregions**

| | Subregions that | | | |
|---|---|---|---|---|
| | Catch up more than 10 %-points | Catch up less than 10 %-points | Lag behind less than 10 %-points | Lag behind more than 10 %-points |
| Number of subregions | 16 | 14 | 23 | 31 |
| Mean change in GAP 1990-1995, percentage points | -0,23 | -0,05 | 0,05 | 0,21 |
| GDP per capita 1990 | 80499 | 76237 | 74953 | 72543 |
| GDP per capita 1995 | 91931 | 75630 | 69683 | 62411 |
| Population 1990 | 47107 | 33124 | 63478 | 41370 |
| Population 1995 | 47772 | 32888 | 64601 | 41930 |
| Labour productivity 1990 | 199019 | 183614 | 177454 | 181594 |
| Labour productivity 1995 | 268914 | 221574 | 201962 | 198576 |
| Jobs per capita 1990 | 0,41 | 0,41 | 0,42 | 0,40 |
| Jobs per capita 1995 | 0,35 | 0,34 | 0,34 | 0,31 |
| Population with higher Education, proportion 1990 | 7,5 | 6,8 | 7,2 | 7,0 |
| Population with higher Education, proportion 1995 | 9,9 | 8,9 | 9,5 | 9,3 |
| Net fertility/1000 Inhabitants, 1990-1995 | 4,6 | -3,7 | 3,8 | 8,0 |
| Net migration/1000 inhabitants, 1990-1995 | -9,2 | -11,6 | -8,4 | -10,1 |
| GDP proportion | | | | |
| Agriculture and forestry | 0,12 | 0,19 | 0,16 | 0,16 |
| Manufacturing | 0,34 | 0,26 | 0,23 | 0,21 |
| Construction | 0,09 | 0,10 | 0,11 | 0,12 |
| Private services | 0,28 | 0,28 | 0,32 | 0,31 |
| Public services | 0,17 | 0,17 | 0,18 | 0,20 |




**Map 1. Divergent and convergenent subregions, 1990-1995**