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Regional evolutions in Finland

PALKANSAAJIEN TUTKIMUSLAITOS

LABOUR INSTITUTE FOR ECONOMIC RESEARCH

REGIONAL EVOLUTIONS IN FINLAND*

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TIIVISTELMÄ

Tutkimuksessa tarkastellaan Suomen työmarkkinoita alueellisesta näkökulmasta käyttäen työvoimapiirittäistä aineistoa. Työn tuottavuus on korkein Uudenmaan työvoimapiirissä. Itä- ja Pohjois-Suomessa työttömyyden suhdanne- ja kausivaihtelu on huomattavasti voimakkaampaa kuin Etelä-Suomessa. Lisäksi kokonaistuotannon heilahtelut ovat olleet Kainuussa ja Turussa vähiten yhteisiä Uudenmaan kanssa. Kasvun työllistävyys näyttäisi olevan jonkin verran voimakkaampaa Etelä-Suomessa verrattuna Itä- ja Pohjois-Suomeen. Tämä johtuu Etelä-Suomen elinkeinorakenteen palveluvaltaisuudesta, sillä kauppa ja liikenne sekä muut palvelut ovat toimialoja, joissa kasvun työllistävyys on voimakkainta. Tutkimuksessa tarkastellaan myös alueellisten työttömyysasteiden pitkän aikavälin yhteyttä. Uudenmaan työttömyysaste on yhteisintegroitunut Satakunnan, Mikkelin, Vaasan, Kuopion ja Pohjois-Karjalan työttömyysasteiden kanssa. Pohjois-Suomen työttömyysasteiden osalta mielenkiintoisin havainto on se, että Lapin työttömyysaste on yhteisintegroitunut Oulun työttömyysasteen kanssa, ja pitkän aikavälin kerroin työvoimapiirien työttömyysasteiden välillä on ykkösen suuruinen. Muuttoliike Lapista Oulun alueelle luo voimakkaan pitkän aikavälin yhteyden näiden työvoimapiirien työttömyysasteiden välille. Lopuksi tarkastellaan alueellisten työmarkkinoiden sopeutumista työn kysynnän muutoksiin VAR-mallien avulla. Tärkein havainto on se, että sopeutuminen näyttäisi tapahtuvan lähinnä työttömyysasteen kautta. Osallistumisasteen muutoksella ei ole juurikaan roolia alueellisten työmarkkinoiden sopeutumisessa. Osallistumisasteen heilahtelujen rooli on lisäksi pienin Uudenmaan työvoimapiirissä.

CONTENTS

1. INTRODUCTION

The export-led recovery from the great slump of the early 1990s in Finland was characterized by widening unemployment rate disparities among regions. This development has sparked some interest in regional economics and, in particular, to the regional employment and unemployment dynamics in Finland.

This paper investigates the regional employment and unemployment dynamics in Finland from several different angles. The study is conducted through the use of data from the Finnish labour districts. The paper is built around three themes. The first theme of this paper is the relationship of output and employment from a regional perspective. It is interesting to find out whether there indeed exist large disparities in the job-intensivity of regional growth among the Finnish labour districts. Some tentative explanations are also offered for the observed disparities in the job-intensivity of regional growth. The second theme of this paper is the long run relationship of regional unemployment rates in Finland. At the beginning of the cointegration analysis the leading and lagging relationship of the Finnish regional unemployment rates is studied by using a standard causality inference in econometrics. The aim of this analysis is to discover possible cointegrating vectors among the regional unemployment rates in Finland and to identify the speed of adjustment to the long run equilibrium of regional unemployment rates by using a set of error-correction models. The cointegration of regional unemployment rates is studied through the use of the *Johansen* (1995) procedure. I also consider the internal dynamics of Northern Finland. The third theme of this paper is the adjustment of regional labour markets to labour demand shocks in Finland. The adjustment to labour demand shocks can occur through three channels, which are the unemployment rate, the participation rate and interregional migration. This analysis is carried out with a set of vector autoregressive models.

2. OUTPUT AND EMPLOYMENT – A REGIONAL PERSPECTIVE

A lively discussion on ”jobless growth” provides the motivation to study the relationship of output and employment from a regional perspective. The followers of the so-called ”new paradigm” have claimed the breakdown of some key economic principles. One of them is the very relationship of output and employment. The recovery from the great slump of the early 1990s has made this theme very topical in Finland. It is nowadays quite common to argue especially in a public discussion, that the effect of increasing output has been milder on employment than during the past decades or even that this relationship is absent. *Peltola* (1997) has recently studied the relationship of output and employment across the regions of Finland covering the years from 1993 to 1995. He has expressed a somewhat sceptical view about this key relationship of traditional economics. This means that some further investigation is badly needed to clarify the relationship of output and employment, especially from a regional perspective.

2.1 The data

The foremost choice in any regional economics exercise is quite naturally the geographical unit of analysis. The labour district was chosen in this paper to be the basic (and for consistency reasons, the only) geographical unit, mainly on the basis of the availability of data. Mainland Finland is divided into thirteen labour districts.

The job-intensivity of regional growth is studied within six industries. The observation unit of the data set is a labour district. The six industries of this study are agriculture, forestry and logging (SIC95[1]: A, B), manufacturing

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[1] SIC refers to Standard Industry Classification.

(SIC95: C–E), construction (SIC95: F), wholesale and retail trade, and transportation (SIC95: G, I), other business and personal service activities (SIC95: H, J, K, O) and public activities (SIC95: L–N). The regional output data is from Statistics Finland and is taken from their regional data set, which was created in 1988. The data on employment is also from Statistics Finland and is taken from their Labour Force Survey. The output and employment data is on a yearly basis and the years covered are 1988–1995. This is the main problem of the data set because in Finnish economic history all these years can be considered to be highly exceptional years. Namely, the years from 1988 to 1995 cover the hectic boom in the late 1980s, the great slump in the early 1990s and the following export-led recovery from 1993 onwards[2]. This means that the results of the following analysis, which utilizes only yearly observations from 1988 to 1995, should be interpreted with necessary caution. The magnitude of a structural break in the behaviour of Finnish regional unemployment rates is reflected in the instability of recursively estimated parameters of VAR models in the period of the early 1990s. However, one must stress the fact that this is the only available data set which allows one to evaluate the relationship of output and employment from a regional perspective in Finland.

In order to conclude this section it is useful to illustrate briefly two interesting features of the data set of this study. Through the use of the regional output and employment data it is possible to create a simple (and equally crude) measure of regional labour productivity[3]. **Fig. 1** illustrates the regional disparities in labour productivity across the labour districts of Finland. The output in a given labour district is simply divided by the number of those employed. The pattern seems to be that regional labour productivity is somewhat higher in Southern Finland (and especially in the labour district of Uusimaa) compared with the other parts of the country. However, the labour district of Lappi seems to be an exception in this respect. *Ciccone* and *Hall*

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[2] *Kiander* and *Vartia* (1996) is a useful paper on the causes and the consequences of the great Finnish slump in the early 1990s.

[3] A more accurate measure of regional labour productivity would be output per hour.

(1996) have recently studied the same issue more carefully across U.S. states. They have found out that regional labour productivity is closely related to the density of economic activity (also after including a set of control variables such as education). By the density of economic activity they mean the intensivity of labour, and human and physical capital relative to physical space. An obvious explanation of this particular observation is the role of various externalities that arise from the agglomeration of economic activity. This general principle seems to fit the Finnish data quite well, since the core of economic activity evidently lies in Southern Finland.

The second interesting feature of the Finnish regional output data relates to symmetrical and asymmetrical fluctuations. This analysis is performed through the use of the regional output data from the labour districts of Finland covering the years from 1988 to 1995 and so-called Aoki factorization. In this method the variabilities of the symmetric system (the sums of the output of labour districts other than Uusimaa and the output of Uusimaa) and the asymmetric system (the differences between the output of labour districts other than Uusimaa and the output of Uusimaa) are compared[4]. On the basis of this exercise it is possible to conclude that the fluctuations of output in Kainuu and Turku are least similar to Uusimaa, of the labour districts in Finland (**Table 1**). However, in the case of all the labour districts in Finland, symmetrical output fluctuations seem to dominate asymmetrical output fluctations. This result is not surprising because the labour districts are tied together by free trade, capital movements and also by voluminous fiscal transfers.

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[4] The factorization procedure originates from *Aoki* (1981). The method was commonly used in "older optimum currency literature". The papers by *Cohen* and *Wyplosz* (1989), and *Haaparanta* and *Heinonen* (1991) are some applications of Aoki factorization in the context of optimum currency areas. Aoki factorization does not require any estimation of underlying parameters, so in this respect a short time span of regional output data is not a major problem.

Table 1. The ratio of symmetrical output fluctuations to asymmetrical output fluctuations with the labour district of Uusimaa from 1988 to 1995. The method is Aoki factorization

Labour district	***Ratio***
Turku	3.05
Satakunta	3.13
Häme	7.16
Kymi	4.36
Mikkeli	3.67
Vaasa	6.30
Keski-Suomi	5.66
Kuopio	5.37
Pohjois-Karjala	5.50
Kainuu	1.91
Oulu	4.02
Lappi	4.26

2.2 The analysis and results

It is useful to study the job-intensivity of regional growth in the Finnish labour districts by using a set of simple panel data techniques. The idea is that the efficiency of the estimations can be improved by taking into account the fact that the data consists of observations of the very same individuals (i. e. labour districts) over eight years. This somewhat reduces the problem that the only available data set does not contain abundant observations.

In order to begin the analysis of the job-intensivity of regional growth it is quite convenient to illustrate the close association of output and employment by using the Finnish regional data set. **Fig. 2** plots the log of output and employment in the labour district of Uusimaa from 1988 to 1995 within the six industries of this study. **Fig. 3** does the same exercise for the manufacturing sector within the thirteen Finnish labour districts of this study. Both figures point out strongly that there almost seems to exist a one-to-one relationship between output and employment (when considering these two variables in log-level form). This indicates that employment is closely related to output, given a particular labour district or an industry.

The relationship of output and employment can also be illustrated from a slightly broader perspective. **Fig. 4** plots the averages of changes both in output and employment across industries in the labour districts of Finland from 1988 to 1995. This figure suggests that there also seems to exist quite a evident relationship between output and employment in terms of average changes. This means that regional growth is a key element for understanding regional employment development in Finland, at least within the period of a decade. The important role of output fluctuations is largely a neglected issue in the regional labour market analysis. This is mainly due to the lack of decent regional output data.

Firstly, it is convenient to set up random effects models that attempt to capture the pattern of the job-intensivity of regional growth among the thirteen Finnish labour districts. The estimation method is GLS. The first set of random effects models is specified as follows[5]:

(1) $$\mathrm{Log}(E_{it}) = a_i + b\mathrm{Log}(Q_{it}) + e_{it} + u_i$$

$$E(u_i) = 0,\ \mathrm{VAR}(u_i) = \sigma_u^2,\ \mathrm{COV}[e_{it}, u_i]=0$$

$$\mathrm{VAR}[e_{it} + u_i] = \sigma^2 = \sigma_e^2 + \sigma_u^2$$

$$\mathrm{CORR}[e_{it} + u_i,\ e_{is} + u_i] = \rho = \sigma_u^2 / \sigma^2$$

where E stands for employment (for each of the six industries of the data set), Q for output (also for each of the six industries of the data set) and t

[5] The estimations were performed with the Limdep 7.0 econometric modelling system. The random effects models were chosen on the basis of Hausman and LM tests (see Appendixes 1 and 3). Essentially the same conclusions can be drawn from the corresponding fixed effects models for equations (1) and (3). The results of the fixed effects models are not reported here but they can be obtained from the author.

refers to a year. These random effects models are estimated separately for all the labour districts of Finland. The stratification variable in these models is an industry. u_i captures all industry-specific features in the job-intensivity of regional growth. It is also assumed that the error term follows an AR1 process[6]. The estimation results of these random effects models for the labour districts of Finland are reported in **Appendix 1**. A more interesting kind of evidence would be to establish *qualitatively* the same relationship in changes rather than levels[7]. This aspiration builds the motivation to take the differences of the variables (which in turn eliminates the fixed effects) and run a set of the following pooled OLS-regressions:

$$(2) \qquad [\mathrm{LogE}_t - \mathrm{LogE}_{t-1}] = a_i + b_i[\mathrm{LogQ}_t - \mathrm{LogQ}_{t-1}] + e_i$$

The key parameter is, naturally, b, which is the elasticity of employment with respect to output in a given labour district. It is a natural measure of the job-intensivity of regional growth. These OLS-models are estimated and the parameter b is identified for each thirteen of the labour districts of Finland. The six industries of the data set mean that the data consists of 42 observations (after differencing the series of output and employment) for each of the labour district of this study.

The results are reported in **Table 2**. Several interesting conclusions can be drawn. With the exception of Satakunta, Pohjois-Karjala, Kainuu and Lappi, output is a statistically significant factor for explaining employment. This fact is consistent with *a priori* belief and solid common sense. The only real outlier is the labour district of Kainuu because in the cases of Satakunta,

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[6] See *Greene* (1995, 299–301) for details.

[7] This allowes one to compare the results to some earlier studies.

Pohjois-Karjala and Lappi the parameter b obtains t-statistics that are quite close to the standard five-per-cent significance level[8].

Table 2. An elasticity of employment with respect to output in the labour districts of Finland from 1988 to 1995

Labour district	*b*	*t-statistics*	*Log-L ##*	R^2
Uusimaa	0.69	3.57*	45.1 (39.2)	0.24
Turku	0.56	4.19*	59.5 (51.9)	0.30
Satakunta	0.19	1.45	41.7 (40.7)	0.05
Häme	0.70	5.59*	60.5 (48.4)	0.44
Kymi	0.45	3.55*	58.8 (53.1)	0.24
Mikkeli	0.78	4.96*	48.0 (37.9)	0.38
Vaasa	0.43	2.61*	50.8 (47.5)	0.15
Keski-Suomi #	0.50	2.57*	40.3 (34.3)	0.14
Kuopio	0.41	2.71*	44.3 (40.8)	0.16
Pohjois-Karjala	0.38	1.51	26.5 (25.4)	0.05
Kainuu #	-0.08	-0.05	33.6 (33.6)	0.00
Oulu	0.39	3.15*	50.7 (46.1)	0.20
Lappi	0.34	1.72	37.3 (35.8)	0.09

* Indicates statistically significant result at the 5 % level
# Two outliers excluded
Log-L refers to log-likelihood (and in parentheses restricted (β=0) log-likelihood)

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[8] Kainuu is a special case among the Finnish labour districts. It is a small labour district but persistently characterized by a high unemployment rate. One might even speculate that perhaps the strong doses of active labour market policies allocated to Eastern and Northern Finland, and especially to the labour district of Kainuu, tend to blur the simple relationship between output and employment in the eastern and the northern part of the country. In this respect it is worth pointing out that from 1993 to 1995 employment did not deteriorate in the labour district of Kainuu in spite of the fact that the recovery from the great slump of the early 1990s was extremely fragile in terms of economic growth during the very same period.

On the basis of these results one can make quite a strong conclusion that the claims for "jobless growth" are almost complete nonsense, when the data on the Finnish labour districts is considered, since it must be remembered that in Finland economic activity is concentrated heavily in the southern part of the country, where the link between output and employment is evidently a strong one[9]. The estimation results in Table 2 are also in line with a recent study by *Toivonen* (1996). He has studied aggregate time series data on economic growth and employment in Finland covering the yearly observations from 1975 to 1995. According to his estimations the elasticity of employment with respect to output is about 0.7 (*Toivonen* 1996, 9).

It is also interesting to note that the fluctuations in output explain about 25-per-cent of the employment fluctuations in the labour districts of Finland. This is quite a reasonable amount because there are always a number of exogenous factors (especially the rude interest rate hikes in the early 1990s as a result of defending the overrated exchange rate of the Finnish markka) that tend to blur the simple relationship between output and employment. *Manning* (1993) and *Phelps* (1994a, 1994b) have recently emphasized the fact that the real interest rate has a major effect on the labour demand of firms because the recruitment of new employees is strongly a long-term investment decision from the point view of firms[10]. Moreover, the R^2 of these pooled OLS-regressions seems to be somewhat smaller in Northern Finland compared with the labour districts of Southern Finland. This means that the various exogenous factors are more important for the employment fluctuations in the northern part of the country.

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[9] Another important theme in the "jobless growth" discussion is, of course, the claim that the nexus between output and employment has changed over the years and nowadays faster economic growth is needed to keep employment steady than used to be the case. *Rifkin* (1996) has recently made some colourful propaganda for this dubious view. On the basis of the above results it is not possible to comment on this particular (and equally controversial) proposition.

[10] This argument assumes that physical and human capital are complements in a production process.

There also exists an interesting regional pattern in the elasticity of employment with respect to output among the Finnish labour districts. It seems to be the case that in Southern Finland the job-intensivity of regional growth is somewhat stronger compared wth Eastern and Northern Finland. This raises the question: "What explains these apparent disparities in the job-intensivity of regional growth?". It is indeed quite natural to try to reduce the regional disparities in the job-intensivity of growth to the industry-structure among the Finnish labour districts. The idea is that "in reality" there exists a production function for each industry but not for the labour districts, which are, after all, purely administrative units. **Appendix 2** contains some basic information on the industry-structure in the Finnish labour districts. It is evident that there indeed exist large disparities in the industry-structure among the Finnish labour districts.

In order to investigate the disparities in the job-intensivity of growth within the six industries of this study more closely, it is necessary to set up a second set of random effects models. These models are specified as follows:

(4) $$\mathrm{Log}(E_{it}) = a_i + b\mathrm{Log}(Q_{it}) + e_{it} + u_i$$

$$E(u_i) = 0,\ \mathrm{VAR}(u_i) = \sigma_u^2,\ \mathrm{COV}[e_{it}, u_i]=0$$

$$\mathrm{VAR}[e_{it} + u_i] = \sigma^2 = \sigma_e^2 + \sigma_u^2$$

$$\mathrm{CORR}[e_{it} + u_i,\ e_{is} + u_i] = \rho = \sigma_u^2 / \sigma^2$$

where E stands for employment (for each of the thirteen labour districts of the data set), Q for output (also for each of the thirteen labour districts of the data set) and t refers to a year. These random effects models are estimated separately for all the six industries of the regional data set. The stratification variable in these models is a labour district. u_i captures all specific features of the labour districts in the job-intensivity of growth. It is also assumed that the error term follows an AR1 process. The estimation results of these random effects models for the six industries of this study are reported in

Appendix 3. However, as previously, it is convenient to take the differences of the variables and run a set of the following pooled OLS-regressions:

(4) $[LogE_t - LogE_{t-1}] = a_i + b_i[LogQ_t - LogQ_{t-1}] + e_i$

The key parameter is, naturally, b, which is a natural measure of job-intensivity of growth within industries. These pooled OLS-regressions are estimated and the parameter b is identified for each of the six industries of this study. The thirteen labour districts of the data set mean that the data consists of 91 observations (after differencing the series of output and employment) for each industry of this study.

The results are reported in **Table 3**. The results can be considered to be broadly consistent with *a priori* beliefs. The estimation results can also be summarized quite easily. Within the manufacturing sector the elasticity is quite small because it is known to be a highly capital-intensive activity[11]. Due to its labour-intensive character the job-intensivity of growth is stronger for the other industries of this study. Agriculture, logging and forestry is the only industry of this study where the relationship between output and employment fluctuations can indeed be considered to be very loose one. The reason for this result may be that in the case of this particular industry it takes some time before output fluctuations are reflected in employment. In this analysis (due to the limitations of the only available data set) it is not possible to take into account the lag from output fluctuations to employment. The issue concerning the exact dynamics of regional output and employment fluctuations remains a topic for further research.

[11] It is equivalent to say that within the manufacturing sector an improvement in labour productivity has been stronger compared with the other industries of this study from 1988 to 1995. This observation is in line with common sense.

Table 3. An elasticity of employment with respect to output within industries by using the regional data set from 1988 to 1995

Industry	*b*	*t-statistics*	*Log-L ##*	R^2
Agriculture, logging and forestry	-0.16	-1.65	114.2 (112.8)	0.03
Manufacturing #	0.20	2.17*	11.3 (11.0)	0.05
Construction	0.53	6.91*	82.8 (63.3)	0.35
Wholesale and retail trade, and transportation	0.63	5.64*	109.1 (95.1)	0.26
Other business and personal service activities**	0.99	1.86*	38.2 (36.4)	0.04
Public activities	0.74	4.16*	153.4 (145.3)	0.16

* Indicates a statistically significant result at the 5 % level
\# Two outliers excluded
** One outlier excluded
\## Log-L refers to log-likelihood (and in parentheses restricted (β=0) log-likelihood)

In order to close the discussion on the job-intensivity of regional growth, it is convenient to carry out some simple crossplot exercises by using the estimates of the job-intensivity of regional growth (as reported in Table 2), and the data on the proportions of wholesale and retail trade, and transportation, and other service activities in the labour districts of Finland (as reported in Appendix 2) (**Figs. 5–6**). These crossplots are basically meaningful because in the short run the industry-structure is fixed across the regions. Some preliminary observations can be briefly stated. In particular, these figures seem to suggest that the higher elasticity of employment with respect to output in the southern part of Finland is mainly due to the high proportion of wholesale and retail trade, and transportation, and other service activities[12]. This means that the results reported above are in their

[12] This is not a comprehensive explanation for the strong job-intensivity of growth in the labour district of Mikkeli.

essence consistent because wholesale and retail trade, and transportation, and other service activities are the very industries with a high elasticity of employment with respect to output. It should also be noted that a high portion of agriculture, logging and forestry, and manufacturing in a given area tends to depress somewhat the job-intensivity of regional growth in Finland.

3. LONG RUN RELATIONSHIP OF REGIONAL UNEMPLOYMENT RATES

A prominent feature of the regional unemployment experience in Finland during the last couple of decades is that the regional unemployment rates tend to rise and fall together, but exhibit no tendency to converge to a common value[13]. A straightforward interpretation for this observation is that "the equilibrium rate of unemployment" has been continuously lower in the labour districts of Southern Finland compared with the labour districts of Eastern and Northern Finland (*Pehkonen & Tervo* 1995, 10–12). This stylized fact leads one quite naturally to the question: "Are the regional unemployment rates indeed cointegrated in Finland?". An answer to this question can be given through the use of the *Johansen* (1995) procedure[14]. The cointegration tests are done *bilateraly* for each labour district with the regional unemployment rate of Uusimaa. In the case of the internal dynamics of Northern Finland the cointegration tests are done bilateraly for Pohjois-Karjala, Kainuu and Lappi with the regional unemployment rate of Oulu. However, in order to give an interpretation for the cointegrating vectors identified in Section 3.3 of this paper it is useful to investigate somewhat the causal relationship of regional unemployment rates in Finland.

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[13] However, the data on regional per capita income reveals a strong convergence of regional disparities during the past few decades in Finland (*Kangasharju* 1996; 1997). The exact mechanism behind this phenomenon is not completely known. *Persson* (1995) found out that in the case of Sweden migration has had a positive effect, albeit small, on the speed of convergence.

[14] The papers by *Byers* (1991) and *Chapman* (1991) are some earlier studies which use various cointegration techniques to investigate the behaviour of regional unemployment rates in Great Britain. They have pointed out that it is quite difficult to find any clear cointegrating vectors among the regional unemployment rates in Great Britain.

3.1 The data

The data on the regional unemployment rates covering the period from 1983:1 to 1997:1 comes from Statistics Finland and is taken from their Labour Force Survey. The raw data on the regional unemployment rates is on a quarterly basis and is not seasonally adjusted. It is also worth noting that the labour district of Satakunta was created in 1984. This means that in the case of Satakunta one can study only the period 1984:1–1997:1. The basic statistical properties of the quarterly regional unemployment data are reported in **Appendix 4.** The following analysis uses the logarithm of the regional unemployment rates.

The cointegration analysis assumes that the regional unemployment rates are nonstationary by their nature. According to the conventional augmented Dickey-Fuller tests (including five lags) the regional unemployment rates in Finland are indeed I(1) series[15] (**Table 4**). The result is consistent with *a priori* belief and a visual impression. This fact also builds the motivation for the use of first differences in some of the following sections of this paper.

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[15] It must be noted that the unemployment rate is "in reality" a bounded variable and, allowing for break points in the data, can *in principle* deliver the conclusion that the regional unemployment rates in Finland are stationary around a shifting mean (*Perron* 1989; *Pehkonen & Tervo* 1995, 10–12; *Roøed* 1997, 408–409). With the help of the assumption that the regional unemployment rates in Finland are indeed stationary ones, I did some impulse-response exercises with the quarterly data from 1983:1 to 1997:1. The impulse-response functions were calculated on the basis of autoregressions including three lags. The most interesting observation was that the regional unemployment rates of Uusimaa, Turku and Oulu exhibit the strongest self-reinforcing effect to a (unity) unemployment rate shock. *Roøed* (1997, 391) reports a similiar impulse-response for EU countries. In the case of Uusimaa it takes about two years before the peak of the unemployment rate is reached after a (unity) unemployment rate shock. The dynamics of Uusimaa, Turku and Oulu is perhaps related to their urban character. Kainuu is interesting in respect to the impulse-response because it exhibits no self-reinforcing effect at all to a (unity) unemployment rate shock. I presume that this feature can be explained by the small size of the labour district of Kainuu, and with the observation made by *Pehkonen* and *Tervo* (1995) that interregional migration plays a larger role in the adjustment process of smaller geographical units. The results concerning the impulse-responses of regional unemployment rates in Finland are available from the author.

Table 4. ADF-test results for the regional unemployment rates of Finland from 1983:1 to 1997:1. The reported ADF-test statistics were obtained from a model with five lags. In the case of Satakunta the estimation period is from 1984:1 to 1997:1

Labour district	***Levels***	***1st differences***
Uusimaa	1.23	-3.66**
Turku	0.70	-5.83**
Satakunta	1.07	-4.70**
Häme	0.75	-5.10**
Kymi	0.65	-6.43**
Mikkeli	0.23	-6.92**
Vaasa	0.82	-5.08**
Keski-Suomi	0.83	-6.24**
Kuopio	0.71	-7.27**
Pohjois-Karjala	0.79	-8.15**
Kainuu	0.49	-7.07**
Oulu	0.68	-4.88**
Lappi	0.59	-5.88**

Critical value for the ADF test is -1.95 at the 5 % level.

A noticeable feature of the regional unemployment rates in Finland relates to the magnitude of seasonal fluctuations. The fact is that the seasonal fluctuations in the regional unemployment rates seem to be much stronger in the eastern and the northern part of the country. The magnitude of seasonal and business cycle fluctuations of the regional unemployment rates is illustrated in **Fig. 7** by using the standard deviations of estimated seasonal components of regional unemployment rates ("seasonal fluctuations") and the standard deviations of seasonally adjusted regional unemployment rates ("business cycle fluctuations")[16]. This pattern can be

[16] The estimation was done with the STAMP 5.0. The data was the quarterly regional unemployment rate observations from 1983:1 to 1997:1. The seasonal component was allowed to vary in time (see *Koopman, Harvey, Doornik & Stephard* 1995). In respect to the variation of the seasonal component over the years there are large disparities among the labour districts of Finland but it is difficult to find any clear

explained mainly by a higher proportion of agriculture, logging and forestry in the industry-structure of the eastern and the northern part of Finland compared with Southern Finland. These traditional industries are characterized by strong seasonal fluctuations. In the eastern and the northern part of the country the business cycle fluctuations of unemployment rates are also much stronger than in Southern Finland[17]. This observation corresponds to a study by *Beaulieu, MacKie-Mason* and *Miron* (1992). They found out that there is a strong, positive correlation across countries and industries between the standard deviation of the seasonal component and the standard deviation of the nonseasonal component of various aggregate variables. *Beaulieu, MacKie-Mason* and *Miron* (1992) try to explain this feature by the hypothesis that firms endogenously choose their degree of technological flexibility as a function of the amounts of seasonal and nonseasonal variation in demand.

3.2 The leading and lagging relationship of regional unemployment rates

The leading and lagging relationship of the Finnish regional unemployment rates can be studied by using a set of simple vector autoregressive models. The model specification is a VAR (2, 3). In these two-variable VAR settings one variable is always the regional unemployment rate of Uusimaa and the other variable is, in turn, the regional unemployment rate of all other labour districts. The regional unemployment rates are lagged by three quarters. The idea of this analysis is that if present y can be predicted with better accuracy by using past values of x rather than not doing so, one can

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regional pattern.

[17] An explanation is a high proportion of services in the industry-structure of Southern Finland compared with Eastern and Northern Finland. This is due to the fact that the volatility of growth in services is lower than in the case of other sectors of economy (*Pagan* 1997, 25).

conclude that *x* has indeed a "causal influence" on *y* (*Charemza & Deadman* 1992, 190).

The CHI^2 tests for change in the log-likelihood ratio after the above described restrictions concerning the information set are put into force in these two-variable VAR settings are reported in **Table 5.** Some interesting conclusions concerning the leading and lagging relationship of the Finnish regional unemployment rates can be drawn[18]. The unemployment rate of Uusimaa has a causal influence on the regional unemployment rates of all other labour districts in Finland. This is indeed a sensible result because a major part of the economic activity of Finland lies in the southern part of the country. This fact builds a key motivation for the specification of error-correction models used in Section 3.3 of this paper.

It is also interesting to note that there exists a symmetrical causal relationship between Uusimaa and the labour districts of Häme, Mikkeli, Vaasa, Keski-Suomi, Kainuu, Oulu ja Lappi. The analysis indicates that there seems to be no symmetrical causal relationship between Uusimaa and the nearby labour district of Turku. This particular result is not in line with an *a priori* belief in the deep economic integration of the nearby labour districts of Uusimaa and Turku. The causal influence of the unemployment rate of Kainuu on the unemployment rate of Uusimaa is also difficult to explain properly. A possible (but highly dubious) explanation for this feature is that the labour districts of Uusimaa and Kainuu were characterized by the same kind of exogenous shocks over the estimation period.

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[18] The causality tests for the first differences of the regional unemployment rates also produced identical results except in the cases of Kymi and Lappi. In the case of Kymi the use of first differences of regional unemployment rates bears witness to symmetrical causality. In the case of Lappi the results indicate no causal influence of the regional unemployment rate of Lappi on the regional unemployment rate of Uusimaa.

Table 5. Causality tests for the regional unemployment rates of Finland, VAR (2, 3) specifications. The estimation period is 1983:1–1997:1

A pair of labour districts	*Likelihood Ratio Test* of over-identifying restrictions (CHI^2)
UUD -> TUR TUR -> UUD	34.16** 0.919
UUD -> SAT[19] SAT -> UUD	48.33** 2.744
UUD -> HÄM HÄM -> UUD	52.16** 14.00**
UUD -> KYM KYM -> UUD	52.84** 5.75
UUD -> MIK MIK -> UUD	59.85** 21.85**
UUD -> VAA VAA -> UUD	47.92** 11.89**
UUD -> K-S K-S -> UUD	33.69** 11.29*
UUD -> KUO KUO -> UUD	33.94** 5.22
UUD -> P-K P-K -> UUD	28.39** 6.89
UUD -> KAI KAI -> UUD	35.96** 15.56**
UUD -> OUL OUL -> UUD	40.00** 22.37**
UUD -> LAP LAP -> UUD	36.66** 10.96*

[19] The estimation period is 1984:1–1997:1.

The identical VAR analysis as described above was also done to study the internal dynamics of Northern Finland. The labour district of Oulu is evidently a core of economic activity in Northern Finland. This fact builds a motivation for the VAR settings in which the other variable is always the regional unemployment rate of Oulu. The other labour districts used in this analysis are Pohjois-Karjala, Kainuu and Lappi. The CHI^2 tests for change in the log-likelihood ratio concerning the restrictions used in these particular VAR specifications are reported in **Table 6**. The results indicate that the unemployment rate of Oulu has a causal influence on the unemployment rates of all the other labour districts of Northern Finland. As in the case of the whole country this fact builds a key motivation for the specification of error-correction models used in Section 3.3 of this paper to study the internal dynamics of Northern Finland[20]. It is also interesting to note that there seems to be a symmetrical causal relationship between the unemployment rate of Oulu and the unemployment rates of Pohjois-Karjala and Kainuu, but not in the case of Lappi.

Table 6. Causality tests for the regional unemployment rates in Northern Finland, VAR (2, 3) specifications. The estimation period is 1983:1–1997:1

A pair of labour districts	***Likelihood Ratio Test*** **of over-identifying restrictions (CHI^2)**
OUL -> P-K	17.99**
P-K -> OUL	11.50**
OUL -> KAI	42.43**
KAI -> OUL	61.25**
OUL -> LAP	54.68**
LAP -> OUL	6.54

[20] This causality analysis of the internal dynamics of Northern Finland was also done with the first differences of the regional unemployment rates. The results are identical to the reported ones.

3.3 The cointegration of regional unemployment rates

The cointegration of regional unemployment rates in Finland can be studied by through the use of the *Johansen* (1995) procedure[21]. The cointegration relationship is tested between the regional unemployment rate of Uusimaa and the regional unemployment rates of all the other labour districts in Finland. After this, the analysis focuses on the internal dynamics of regional unemployment rates in Northern Finland.

The cointegration tests based on VAR (2, 3) models and the Johansen procedure are reported in **Table 7**. On the basis of the test statistics it is possible to conclude that there indeed exists a cointegration relationship between Uusimaa and the labour districts of Satakunta, Mikkeli, Vaasa, Kuopio and Pohjois-Karjala. In the case of these labour districts, test statistics exceed the five-per-cent critical value, and the null hypothesis of no cointegration can be rejected. In fact, the *Johansen* (1995) test statistics clearly reveal that there exists one (and only one) cointegrating vector between Uusimaa and each regional unemployment rate noted above.

The next logical step in this cointegration analysis is to associate the system with rank 1 (because in each case there exists only one cointegrating vector) and to identify the stationary cointegrating vector in these particular cases. **Table 8** reports the standardized unrestricted and the restricted cointegrating vectors associated with rank 1 in the case of Uusimaa contra Satakunta, Mikkeli, Vaasa, Kuopio and Pohjois-Karjala. However, it is possible to give a causal interpretation for these cointegrating vectors only if

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[21] I would like to emphasize that this analysis is a preliminary one. A more sophisticated and complete analysis would include all regional unemployment rates in the same cointegration system. However, this is not possible with the quarterly data because of the short time span of the observations. Through the use of the monthly regional unemployment rate data from 1983:1 to 1997:3 and five lags in the *Johansen* (1995) procedure, one can find up to four cointegrating vectors in the whole system of regional unemployment rates in Finland. At least this exercise implies that the regional labour markets are not completely *economically* integrated in the long run because the case of full market integration would require *p-1* cointegrating vectors among *p* regional unemployment rates. These issues remain a topic for further research.

there exists a one-way causal relationship between the labour districts under consideration. As analysed in Section 3.2 of this paper and above, the unemployment rates of Satakunta, Kuopio and Pohjois-Karjala are the only

Table 7. The cointegration tests for the regional unemployment rates of Finland through the use of the *Johansen* (1995) procedure. The other labour district in these spesifications is, in each case, Uusimaa. The estimation period is from 1983:1 to 1997:1

Labour district	*Ho: rank=p*	*-Tlog(1-μ)*	*using T-nm*	***95%***	*-Tlg(1-μ)*	*using T- nm*	***95%***
Turku	p=0	5.176	4.601	**14.1**	7.599	6.754	**15.4**
	p<=1	2.422	2.153	**3.8**	2.422	2.153	**3.8**
Satakunta[22]	p=0	17.53**	14.76**	**14.1**	20.08**	16.91*	**15.4**
	p<=1	2.556	2.153	**3.8**	2.556	2.153	**3.8**
Häme	p=0	5.215	4.635	**14.1**	6.121	5.441	**15.4**
	p<=1	0.9061	0.8054	**3.8**	0.9061	0.8054	**3.8**
Kyme	p=0	10.52	9.347	**14.1**	12.84	11.41	**15.4**
	p<=1	2.324	2.066	**3.8**	2.324	2.066	**3.8**
Mikkeli	p=0	18.02*	16.02*	**14.1**	20.74**	18.43**	**15.4**
	p<=1	2.716	2.414	**3.8**	2.716	2.414	**3.8**
Vaasa	p=0	17.81*	15.83*	**14.1**	20.27**	18.02	**15.4**
	p<=1	2.457	2.184	**3.8**	2.457	2.184	**3.8**
Keski-Suomi	p=0	9.995	8.884	**14.1**	13.52	12.01	**15.4**
	p<=1	3.521	3.13	**3.8**	3.521	3.13	**3.8**
Kuopio	p=0	15.55*	13.82	**14.1**	17.68*	15.72*	**15.4**
	p<=1	2.136	1.898	**3.8**	2.136	1.898	**3.8**
Pohjois-Karjala	p=0	19.61**	17.43**	**14.1**	21.58**	19.18*	**15.4**
	p<=1	1.975	1.756	**3.8**	1.975	1.756	**3.8**
Kainuu	p=0	11.32	10.06	**14.1**	14.49	12.88	**15.4**
	p<=1	3.171	2.819	**3.8**	3.171	2.819	**3.8**
Oulu	p=0	6.974	6.199	**14.1**	8.102	7.202	**15.4**
	p<=1	1.128	1.002	**3.8**	1.128	1.002	**3.8**
Lappi	p=0	9.666	8.592	**14.1**	13.13	11.67	**15.4**
	p<=1	3.464	3.079	**3.8**	3.464	3.079	**3.8**

[22] The estimation period is 1984:1–1997:1.

Table 8. The standardized unrestricted and the restricted cointegrating vectors associated with rank 1. LUUD is the log of the unemployment rate of Uusimaa

Unrestricted cointegrating vectors	***Restricted cointegrating vectors***
LUUD-1.661LSAT=0	LUUD-1.6LSAT=0 LSATAD=0.63LUUDAD*
LUUD-1.628LMIK=0 LUUD-1.525LVAA=0	LUUD-1.6LMIK=0 LUUD-1.5LVAA=0
LUUD-1.575LKUO=0	LUUD-1.6LKUO=0 LKUO=0.63LUUD*
LUUD-1.897LPOH=0	LUUD-1.9LPOH=0 LPOH=0.53LUUD*

* In the case of Satakunta, Kuopio and Pohjois-Karjala it is possible to give a causal interpretation for the cointegrating vector because as noted in Section 3.2 of this paper in the case of these labour districts there exists a one-way causality running from the unemployment rate of Uusimaa

labour districts in Finland which are both cointegrated with the unemployment rate of Uusimaa, and there also exists a one-way causal influence of the unemployment rate of Uusimaa on the unemployment rates of these particular labour districts. This means that in the case of Satakunta, Kuopio ja Pohjois-Karjala it is easy to give a meaningful and clear causal interpretation for the results of Table 8. For instance, in the case of Kuopio a ten-per-cent increase in the unemployment rate of Uusimaa leads to a six-per-cent increase in the unemployment rate of Kuopio in the long run. The estimate is a reasonable one because the unemployment rate of Uusimaa cannot completely determine the behaviour of the unemployment rate of Kuopio even in the long-run. An obvious conclusion is that local economic performance is also, in the long run, an important factor for the determination of the unemployment rate in the labour district of Kuopio[23]. It is worth stressing that in the cases of Satakunta, Kuopio and Pohjois-Karjala there seem to be no major disparities in the role of Uusimaa in the determination of the unemployment rates in these labour districts in the long

[23] This remark is in line with the results reported in Section 2.2 of this paper.

run. This particular result is interesting and is not completely in line with solid common sense because *a priori* one might conclude that Uusimaa should have a more important role in the determination of the regional unemployment rate of the nearby labour district of Satakunta than in the case of Pohjois-Karjala. This conjecture emerges from the fact that nearby regions are often assumed to be more deeply integrated economically through trade flows[24].

In order to get an impression of the speed of adjustment to the long-term equilibrium of cointegrated regional unemployment rates it is necessary to estimate a set of yet other VAR models, this time by using the cointegrating vectors of Table 8 as error-correction terms. The estimated parameter of the error-correction term describes the speed of adjustment to the long run equilibrium in the case of particular labour district pairs. The results in the case of Satakunta, Mikkeli, Vaasa, Kuopio and Pohjois-Karjala are reported in **Table 9**. The results indicate that the speed of adjustment to the long run

Table 9. The estimated speed of adjustment to the long run equilibrium implied by the cointegrating vectors of Table 8. The VAR (2, 3) model specification. The data is the first differences of seasonally adjusted quarterly observations covering the period from 1983:1 to 1997:1. CIVECT refers to a cointegrating vector and it is lagged by one quarter

Labour district	*CIVECT*	*t-statistics*	*RSS*
Mikkeli	-0.83	-4.03*	0.78
Vaasa	-0.30	-2.18*	0.45
Kuopio	-0.31	-2.68*	0.44
Pohjois-Karjala	-0.18	-1.85	0.90

[24] See for example *McCallum's* (1996) paper. He has studied the effect of distance on trade flows by using Canadian and U.S. data. The idea that trade and economic integration is proportional to the mutual distance of the regions is postulated by the so-called gravity equation of trade flows.

equilibrium seems to be fastest in the case of Mikkeli. The speed of adjustment to the long run equilibrium is indeed fast in the case of Mikkeli because about eighty-per-cent of what can be considered to be a long run equilibrium error melts away just within one quarter. **Fig. 8** illustrates the close connection of the regional unemployment rates of Uusimaa and Mikkeli from 1983:1 to 1997:1. In the case of labour districts other than Mikkeli according to the above error-correction analysis there seem to be no serious regional disparities in the speed of adjustment to the long run equilibrium with respect to Uusimaa.

The analysis of cointegration through the use of the Johansen procedure was also performed in the case of the internal dynamics of Northern Finland. The results are reported in **Table 10**. On the basis of these test statistics one can conclude that there indeed exists a cointegration relationship between Oulu and the labour districts of Kainuu and Lappi. **Table 11** reports the standardized unrestricted and the restricted cointegrating vectors associated with rank 1 in the case of Oulu contra Kainuu ja Lappi. Only in the case of Lappi is it easy to give a meaningful and clear causal interpretation for the results of Table 11 because Lappi is the only labour district in Northern Finland characterized by a one-way causal influence running from the unemployment rate of Oulu. It is indeed quite interesting to

Table 10. The cointegration test for the regional unemployment rates of Northern Finland through the use of the *Johansen* (1995) procedure. The other labour district in these specifications is, in each case, Oulu. The estimation period is from 1983:1 to 1997:1

Labour district	*Ho: rank=p*	*-Tlog(1-m)*	*using T-nm*	***95%***	*-Tlg(1- m)*	*using T- nm*	***95%***
Pohjois-Karjala	p=0	9.24	8.213	**14.1**	10.34	9.189	**15.4**
	p<=1	1.098	0.9759	**3.8**	1.098	0.9759	**3.8**
Kainuu	p=0	28.21	25.07**	**14.1**	30.27**	26.91**	**15.4**
	p<=1	2.066	1.836	**3.8**	2.066	1.836	**3.8**
Lappi	p=0	23.63**	21**	**14.1**	24.88**	22.11**	**15.4**
	p<=1	1.249	1.11	**3.8**	1.249	1.11	**3.8**

Table 11. The standardized unrestricted and the restricted cointegrating vectors associated with rank 1, the case of Northern Finland. LOUL is the log of the unemployment rate of Oulu

Unrestricted cointegration vectors	***Restricted cointegration vectors***
LOUL-1.206LKAI=0	LOUL-1.2LKAI=0
LLAP-1.016LOUL=0	LLAP-1.0LOUL=0 LLAP=1.0LOUL*

* In the case of Lappi it is possible to give a causal interpretation for the cointegrating vector because as noted in Section 3.2 of this paper in the case of Lappi there exists a one-way causality running from the unemployment rate of Oulu to the unemployment rate of Lappi.

note that in the case of Lappi a ten-per-cent increase in the unemployment rate of Oulu seems to lead to a ten-per-cent increase in the unemployment rate of Lappi in the long run. This fact can be explained by assuming that the regional labour markets of Oulu and Lappi are *economically* deeply integrated in the long run. The apparent reason for this feature is the large migration flows from the labour district of Lappi to the labour district of Oulu during the past and the current decade. As previously, in order to get an impression of the speed of adjustment to the long-term equilibrium of cointegrated regional unemployment rates, it is necessary to estimate a set of yet other VAR models, this time by using the cointegrating vectors of Table 11 as error-correction terms. The results are reported in **Table 12** and they reveal that the speed of adjustment to the long run equilibrium is much faster in the case of Kainuu than in the case of the labour district of Lappi.

Table 12. The estimated speed of adjustment to the long run equilibrium in the case of the internal dynamics of Northern Finland implied by the cointegrating vectors of Table 11. The VAR (2, 3) model specification. The data is the first differences of seasonally adjusted quarterly observations covering the period from 1984:1 to 1997:1. CIVECT refers to a cointegrating vector and it is lagged by one quarter

Labour district	***CIVECT***	***t-statistics***	***RSS***
Kainuu	-0.88	-3.04*	0.59
Lappi	-0.39	-3.58*	0.38

4. ADJUSTMENT OF REGIONAL LABOUR MARKETS TO SHOCKS

The adjustment of regional labour markets to labour demand shocks can occur *in principle* through three channels, which are the unemployment rate, the participation rate and interregional migration. This evokes the question: "How do the regional labour markets adjust to labour demand shocks in Finland?". It is convenient to start the analysis of regional labour market adjustment with some characterization of the persistence of labour market performance in the labour districts of Finland. **Figs. 9–11** illustrate the persistence of the unemployment rate, the employment growth and the participation rate in the labour districts of Finland. These plots indicate the strong persistence of the unemployment rate and an even stronger persistence in the case of the participation rate, but also exhibit a much weaker persistence in the case of the employment growth[25]. These findings correspond quite closely to the observations made by *Bentolila* and *Jimeno* (1995) for the regions of Spain. *Blanchard* and *Katz* (1992) noted that in the case of the U.S. the persistence of the employment growth is strong across states but, on the other hand, the persistence of regional unemployment rates is weak across states.

The characterization of the persistence of regional labour market performance gives only a hazy clue about the underlying dynamics. However, it suggests that the role of participation fluctuations across the labour districts in Finland is small compared with unemployment rate fluctuations in response to labour demand shocks. The adjustment of regional labour markets to shocks can be clarified with an application of vector autoregressive models.

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[25] This is a general impression obtained through the use of several periods.

4.1 The data

A decent VAR modelling requires a lot of observations. For instance, if a VAR model contains three variables and they are lagged by four quarters, then one has to estimate, in total, 36 parameters. This is the main motivation to use monthly observations in the following VAR analysis[26]. The data covers the period from 1984:1 to 1997:3. It comes from Statistics Finland and is taken (as previously) from their Labour Force Survey. The data was adjusted seasonally through the use of STAMP 5.0, and the estimated seasonal component in the regional unemployment rates was allowed to vary over the estimation period. The basic statistical properties of the monthly data set are quite similiar to the quarterly data used in earlier sections of this paper, so they are not reported here. The three variables of this analysis are employment, the unemployment rate and the participation rate. The monthly data concerning the labour district of Satakunta is only available for the period 1987:1–1997:3, so it is not included in this analysis. This means that one also has to exclude the labour districts of Turku, Häme and Kymi because the labour district of Satakunta was created from these three labour districts.

4.2 The framework and some earlier results

A recent study by *Blanchard* and *Katz* (1992) provides the basic framework for this analysis. They estimate three-variable VAR models in order to investigate the adjustment of regional labour markets to labour demand shocks. The variables are employment, the unemployment rate and the participation rate. *Blanchard* and *Katz* (1992, 24) associate an unpredictable movement in employment with an innovation in labour demand. Their main finding concerning the adjustment to shocks in the regional labour markets of the U.S. is that net migration between states plays a substantial role in the

[26] The main drawback is that high-frequency data tends to contain more "noise" as a by-product of strong seasonal fluctuations. However, this is not a problem with the labour district of Uusimaa. I use monthly data too in order to have at least some observations before the hectic boom that emerged in the late 1980s.

adjustment, even in the first year of a shock. The conclusion is made on the basis of impulse-response functions which show that a decrease in employment has only a limited impact on the unemployment rate and the participation rate. To the extent that regional labour demand shocks are not reflected in unemployment or labour force participation rates they must be absorbed by interregional migration. This means that one can *indirectly* conclude that in the case of the U.S. a great number of workers respond to falling employment by migrating to nearby states.

Blanchard and *Katz`s* (1992) paper set a bright stage for numerous applications of the same framework. A VAR analysis has also been used to investigate the adjustment of regional labour markets in Europe. *Decressin* and *Fatás* (1995) studied EEC regions by using the very same framework as *Blanchard* and *Katz* (1992). Their analysis shows that in the case of EEC regions in the first three years, most of the shock is absorbed by changes in the participation rate while, in the U.S., it is immediately reflected in migration[27]. As in the case of the U.S., the unemployment rate plays only a small role in adjustment to labour demand shocks in EEC regions. *Decressin* and *Fatás* (1995) rationalize their finding by giving two points[28]. The first reason is that the employers in Europe rely considerably on early retirement to adjust the size of the workforce in their firms. The second

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[27] *Card`s* (1990) paper provides a kind of "natural experiment" on the ability of U.S. labour markets to adjust to exogenous shocks through interregional migration. *Eichengreen* (1990, 162) scrutinizes the adjustment of regional labour markets in the U.S. and the EU. *Faini`s* (1996) paper contains a useful discussion on labour mobility with a special emphasis on the reasons behind declining interregional migration flows in Europe during the past few decades. However, in the future, economic integration may, in fact, increase interregional migration in a somewhat indirect way because in the case of greater regional specialization migration is an option for risk-averse households to reduce their overrall risk exposure.

[28] *Begg* (1997, 22) notes that sometimes labour force participants will be close to indifferent about whether they work or not; the private costs of changes in participation will then be small. However, this is not the norm. Even if it was, there may be beneficial externalities from being in the labour force. The social cost of having labour force participation to take the burden of adjustment to labour demand shocks is therefor likely to be large in Europe.

reason for labour force participation to change considerably in response to labour demand shocks is that women bear a disproportionate burden of adjustment to shocks.

Fredriksson (1995) has also used the same framework as *Blanchard* and *Katz* (1992) to investigate the adjustment of regional labour markets to labour demand shocks in Sweden. He includes wage movements and notes that wage movements in response to regional labour demand shocks are minor. Thus, according to his study, labour migration appears to be the main equilibrating force in Sweden. *Frediksson* (1995) also found that the provision of various active labour market programs has not prolonged the regional labour market adjustment by impending migration flows. *Bentolila* and *Jimeno* (1995) is yet another, but an interesting, application of *Blanchard* and *Katz`s* (1992) framework. They found that in the case of Spain the responses of migration and participation rates to labour demand shocks seem to be significantly lower than in U.S. states and in the case of EEC regions. In Spain employment demand shocks are immediately and strongly reflected in the unemployment rate of a given region. The studies by *Decressin* and *Fatás* (1995), *Frediksson* (1995) and *Bentolila* and *Jimeno* (1995) imply that there seems to exist an interesting variation in adjustment channels to labour demand shocks across the regions in Europe[29].

4.3 A VAR analysis

As noted earlier, there are three basic adjustment channels to a regional labour demand shock which is associated with an unpredictable movement in employment. These adjustment channels are migration across regions (as in the case of the U.S.), or the participation rate (as in the case of EEC regions) or a labour demand shock can be reflected immediately and strongly in the unemployment rate of a given area (as in the case of Spain).

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[29] *Nickell* (1997) also emphasizes that labour markets in Europe exhibit an enormous diversity. The differences within Europe are, in fact, much stronger than is the difference between the European average and North America.

Therefore it is interesting to find out how the Finnish regional labour markets indeed adjust to labour demand shocks.

Thus, a set of three-variable VAR models with employment growth, the unemployment rate and the participation rate is estimated as follows:

$$(8) \qquad \mathbf{X}_t = \mathbf{A} + \mathbf{B}(L)\mathbf{X}_{t-1} + \Sigma.$$

where $\mathbf{X} = [\Delta e, u, pa]$ and Σ is a vector of employment demand shocks. The VAR models are estimated separately for the restricted set of labour districts in Finland (as described in Section 4.1 of this paper). All variables (employment, unemployment rate and participation rate) are also measured relative to the average of the whole country[30]. This means that innovations in these variables can be interpreted as a *regional* shocks. The VAR models were estimated by using six lags[31]. The identifying assumption amounts to examining the responses of the three variables to an innovation in the first variable of Choleski orthogonalization of the VAR, with the ordering of the variables being Δe, u, pa. It is important to note that in this VAR setting the ordering of the variables determines the very structure of a VAR model[32]. This also implies that employment responds contemporaneously only to

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[30] The variables are defined as follows. The variable Δe is the first difference of the logarithm of employment in labour district *i* minus the first difference of the logarithm of the average employment in Finland. The variable u is equal to the logarithm of the unemployment rate in labour district *i* minus the logarithm of the average unemployment rate in Finland and the variable pa is equal to the logarithm of the participation rate in labour district *i* minus the logarithm of the average participation rate in Finland.

[31] The estimation results of these VAR models are not reported here but they are available from the author.

[32] A more sophisticated way to structure a VAR model is to use some combination of short run and long run restrictions. The restrictions can be constructed on the basis of economic theory. Choleski orthogonalization is, in fact, an application of short run restrictions.

labour demand shocks (*Bentolila & Jimeno* 1995, 7). The identifying assumption used in this analysis is less controversial in the case of monthly data than in the case of annual and quarterly data. *Blanchard* and *Katz* (1992) use annual data and *Bentolila* and *Jimeno* (1995) quarterly data with the very same identifying assumption.

The accumulated responses of employment growth, and the responses of the unemployment rate and the participation rate to a (positive) regional labour market demand shock in the cases of Uusimaa, Vaasa and Oulu are illustrated in **Figs. 12, 13** and **14**. These labour districts can be considered to be presentative benchmark cases because the adjustment of Mikkeli, Keski-Suomi, Kuopio, Pohjois-Karjala and Lappi is quite similiar to Vaasa. At least two interesting conclusions can be drawn. The first important conclusion is that the impulse-response analysis confirms that labour demand shocks in the Finnish regions seem to be reflected immediately and strongly in the unemployment rate. The participation rate fluctuations play only a minor role compared with unemployment rate fluctuations in the adjustment process. Also, the role of migration is a tiny one[33]. In fact, if there was no interregional migration, there would be no relative employment effects, while employment effects should be large with highly elastic migration flows (*Bentolila & Jimeno* 1995, 8). The analysis reveals that the adjustment to labour demand shocks in the regional labour markets of Finland is very similiar to that of Spain. The second conclusion is that it also seems to be the case that the response of the participation rate to an employment demand shock is somewhat weaker in the case of Uusimaa

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[33] *Tervo* (1997) has recently studied the role of migration in labour market adjustment in Finland. He concludes that the equilibrating process of interregional migration is slow in Finland and becomes even slower as regional unemployment disparities fall. However, it is interesting to note that in the case of Italy growing regional unemployment rate disparities have been realized together with falling interregional migration (*Faini, Galli, Gennari* and *Rossi* 1997). This fact confirms that there exist major disparities in adjustment to shocks across the regions in Europe.

compared with the other labour districts of Finland[34]. I presume that this observation can be explained by the fact that the industry-structure in other labour districts of this study than Uusimaa is, in a somewhat larger degree, characterized by agriculture, forestry and logging, which as traditional sectors are more flexible in terms of participation.

The forecast error variance decompositions for employment growth and the unemployment rate in the cases of Uusimaa and Vaasa are reported in **Tables 13** and **14.** The variance decompositions are abbreviated, only the 1-step, 50-step and 100-step ahead forecast error variances are reported[35]. They indicate that the employment growth is dominated by the employment demand shocks in the cases of Uusimaa and Vaasa over the whole 100-step horizon. It is also interesting to note that the role of participation rate shocks in the behaviour of unemployment rate is minor in the labour district of Uusimaa but the role of participation shocks is indeed somewhat larger in the case of Vaasa.

[34] During the great slump of the early 1990s the participation rate fluctuations were indeed stronger in Eastern and Northern Finland compared with the labour districts of Southern Finland.

[35] The analysis was done with the procedures of RATS (see *Enders* 1996, 140–148).

Table 13. The forecast error variance decompositions for employment growth (Δe) and for the unemployment rate (*u*) in the case of Uusimaa

Δe	Δe	*u*	*pa*
Horizon			
1	100.00	0.00	0.00
50	94.13	4.06	1.80
100	94.12	4.08	1.80

u	Δe	*u*	*pa*
Horizon			
1	14.66	85.34	0.00
50	8.28	91.30	0.42
100	7.63	91.95	0.42

In the table forecast error variance has been decomposed to three sources. For instance, of the 50-step forecast error variance of Δe, 94% is accounted for by its own shocks, 4% by unemployment rate shocks and 2% by participation rate shocks, respectively.

Table 14. The forecast error variance decompositions for employment growth (Δe) and for the unemployment rate (*u*) in the case of Vaasa

Δe	Δe	*u*	*pa*
Horizon			
1	100.00	0.00	0.00
50	92.79	2.92	4.29
100	92.79	2.92	4.29

u	Δe	*u*	*pa*
Horizon			
1	17.58	82.42	0.00
50	17.89	79.33	2.77
100	17.89	79.33	2.77

In the table forecast error variance has been decomposed to three sources. For instance, of the 50-step forecast error variance of *u*, 79% is accounted for by its own shocks, 18% by employment shocks and 3% by participation rate shocks, respectively.

5. SOME CONCLUDING REMARKS

1. It is convenient to restate some basic features of regional economics in Finland. The first point is that the case seems to be that labour productivity is somewhat higher in the labour district of Uusimaa compared with the other parts of the country. The second important point is that in the eastern and the northern part of the country the business cycle fluctuations of the unemployment rate and also the seasonal fluctuations of the unemployment rate are strikingly stronger than in Southern Finland. These two stylized facts are in line with international observations. The third interesting point is that the output fluctuations of Kainuu and Turku are least similar to the output fluctuations of Uusimaa.

2. There also exists quite large disparities in the job-intensivity of regional growth among the Finnish labour districts. In particular, the job-intensivity of growth seems to be somewhat weaker in Eastern and Northern Finland compared with the labour districts of Southern Finland. At first glance, it also seems that this pattern in the job-intensivity of regional growth can be reduced to the disparities in the industry-structure across the Finnish labour districts. The conclusion is that a high proportion of wholesale and retail trade, and transportation and other service activities seems to raise the job-intensivity of growth in Southern Finland.

3. The unemployment rate of Uusimaa has a ”causal influence” on the unemployment rates of all other labour districts in Finland. This result is in line with *a priori* belief and solid common sense because a major part of economic activity in Finland lies within the labour district of Uusimaa. It is also interesting to note that there exists a symmetrical causal relationship between Uusimaa and the regional unemployment rates of Häme, Mikkeli, Vaasa, Keski-Suomi, Kainuu, Oulu ja Lappi. At least this causality analysis clarifies the indicative role of the unemployment rate of Uusimaa with respect to all other labour districts in Finland. It also helps to provide a meaningful interpretation for the cointegrating vectors among the labour districts.

4. An application of the *Johansen* (1995) procedure reveals that there indeed exists a cointegrating vector between the unemployment rate of Uusimaa and the regional unemployment rates of Satakunta, Mikkeli, Vaasa, Kuopio and Pohjois-Karjala. The investigation of the internal dynamics of the Northern Finland concluded that the regional labour markets of Oulu and Lappi are deeply economically integrated in the long run. This observation can be explained by migration flows from Lappi to the labour district of Oulu during the past few decades. According to this explanation a decline in the unemployment rate in the labour district of Oulu triggers a major migration flow from Lappi to the labour district of Oulu. This is a mechanism that creates a nexus between the regional labour markets of Oulu and Lappi in the long run.

5. A three-variable VAR analysis reveals that labour demand shocks in the labour districts of Finland seem to be reflected immediately and strongly in the unemployment rate. Migration and participation rate fluctuations play only a minor role as adjustment channels. It also seems to be the case that the response of the participation rate to employment demand shocks is somewhat milder in the labour district of Uusimaa compared with the other regions in Finland.

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Appendix 0

The list of labour districts:

Uusimaa (UUD)

Turku (TUR)

Satakunta (SAT)

Häme (HÄM)

Kymi (KYM)

Mikkeli (MIK)

Vaasa (VAA)

Keski-Suomi (K-S)

Kuopio (KUO)

Pohjois-Karjala (P-K)

Kainuu (KAI)

Oulu (OUL)

Lappi (LAP)

Appendix 1. The results of random effects models for the job-intensivity of regional growth in the labour districts of Finland from 1988 to 1995. The models were estimated separately for each labour district. The random effects models were chosen on the basis of LM and Hausman test statistics

Labour district	*b*	*t-statistics*	*Estimated autocorrelation*	R^2	*LM test***	*Hausman test****
Uusimaa	0.90	10.48	0.34	0.94	85.54	0.01
Turku	0.84	7.23	0.36	0.85	71.93	0.17
Satakunta	0.74	5.80	0.22	0.78	62.27	0.97
Häme	0.99	10.37	0.34	0.91	74.70	0.11
Kymi	0.84	7.70	0.33	0.84	63.76	0.56
Mikkeli	1.17	8.58	0.42	0.79	52.79	0.07
Vaasa	0.89	5.75	0.46	0.68	84.28	0.43
Keski-Suomi	0.86	3.88	-0.18	0.54	30.63	0.01
Kuopio	0.87	5.70	0.38	0.70	58.79	0.45
Pohjois-Karjala	0.87	5.67	0.39	0.69	16.52	4.31
Kainuu	0.83	4.35	0.15	0.62	12.87	2.23
Oulu	0.69	5.12	0.44	0.62	82.59	0.34
Lappi	0.68	3.97	0.37	0.59	54.90	0.62

** LM test for the presence of random effects
*** Hausman test for fixed vs. random effects model

Appendix 2. The basic industry-structure in the labour districts of Finland (a situation in 1993)

	UUD	TUR	SAT	HÄM	KYM	MIK	VAA	K-S	KUO	P-K	KAI	OUL	LAP
Agriculture, logging and forestry	0.01	0.07	0.08	0.06	0.07	0.20	0.13	0.10	0.13	0.15	0.15	0.08	0.09
Manufacturing	0.23	0.37	0.38	0.34	0.40	0.21	0.32	0.35	0.26	0.25	0.25	0.37	0.32
Construction	0.06	0.06	0.07	0.06	0.06	0.06	0.07	0.06	0.06	0.08	0.07	0.07	0.07
Wholesale and retail trade, and transportation	0.24	0.18	0.15	0.17	0.17	0.15	0.16	0.13	0.17	0.14	0.14	0.15	0.15
Other service activities	0.31	0.17	0.17	0.20	0.15	0.18	0.15	0.16	0.17	0.16	0.15	0.14	0.14
Public activities	0.15	0.16	0.16	0.17	0.16	0.19	0.17	0.19	0.21	0.22	0.24	0.19	0.22

Appendix 3. The results of random effects models for the job-intensivity of growth within industries from 1988 to 1995. The models are estimated separately for each industry. The random effects models were chosen on the basis of LM and Hausman test statistics

Industry	*b*	*t-statistics*	*Estimated autocorrelation*	R^2	*LM test***	*Hausman test****
Agriculture, logging and forestry	0.98	12.55	0.31	0.85	20.59	11.24
Manufacturing	0.86	16.84	0.14	0.89	8.93	55.92
Construction	1.01	31.81	0.15	0.96	36.36	5.72
Wholesale and retail trade, and transportation	0.92	37.50	0.35	0.98	40.29	3.59
Other business and personal service activities #	0.91	6.89	0.22	0.97	0.25	0.52
Public activities	0.99	41.98	0.28	0.99	81.77	7.94

**LM test for the presence of random effects
***Hausman test for fixed vs. random effects model
One outlier excluded

Appendix 4. The basic statistical properties of the regional unemployment rates in Finland (from 1983:1 to 1997:1)

	UUD	*TUR*	*SAT*	*HÄM*	*KYM*	*MIK*	*VAA*	*K-S*	*KUO*	*P-K*	*KAI*	*OUL*	*LAP*
MIN	1.1	2.2	3.9	2.9	3.7	3.3	2.8	4	4.6	5.3	4.7	3.5	4.9
MAX	15.7	17.8	24	21.7	22.6	23.1	19.2	24.6	22.9	23.9	27.8	21.7	26.3
MEAN	6.2	7.9	12	10.5	10.5	10.5	8.6	11.6	11.2	12.8	15	11.6	14.7
STD	5.2	5.1	6.5	6.1	5.8	6	5.1	6.5	6.3	6.1	6.5	5.6	7

Fig. 1. The regional labour productivity in Finland (based on output and employment in 1993)

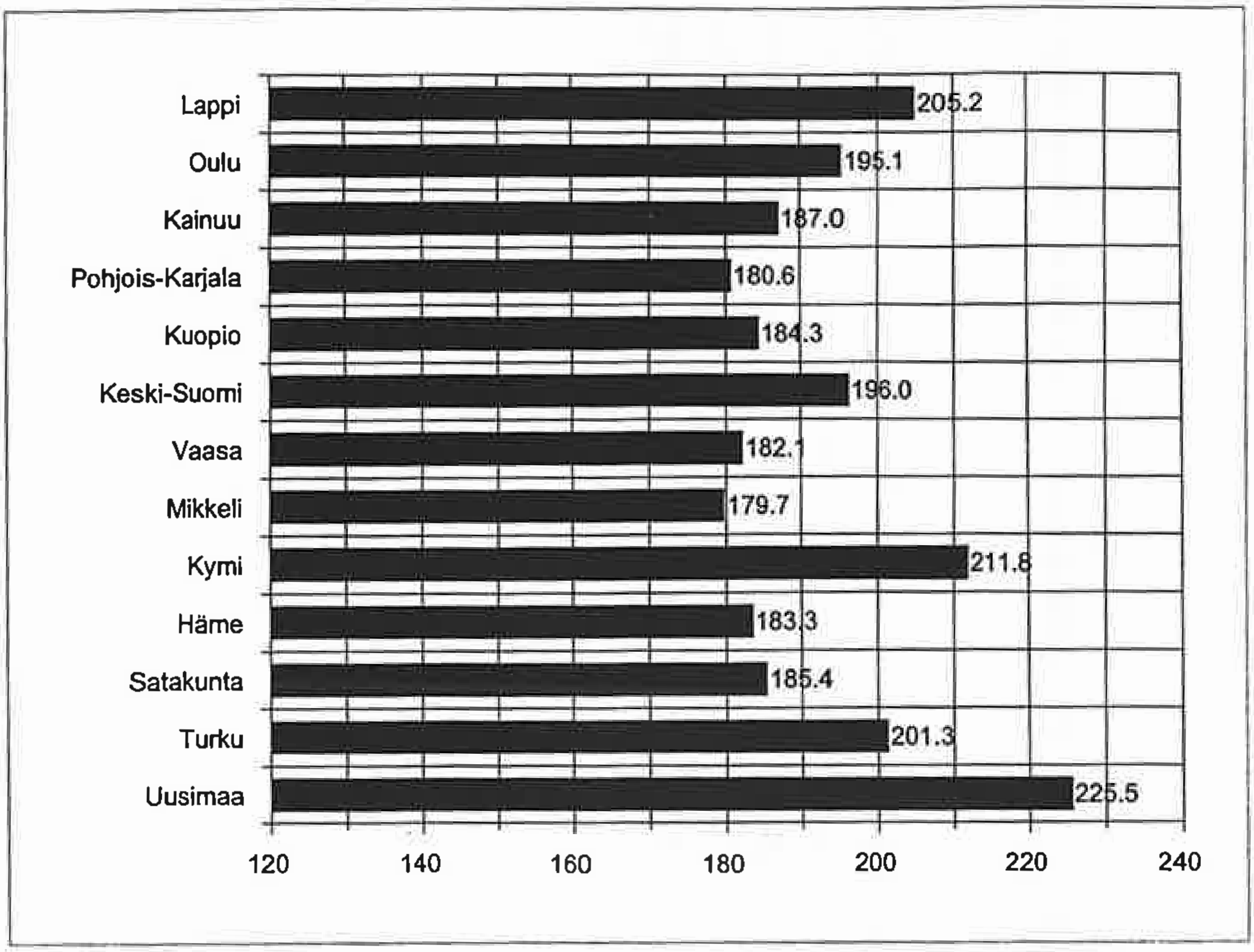

Fig. 2. The output and employment in the labour district of Uusimaa (from 1988 to 1995)

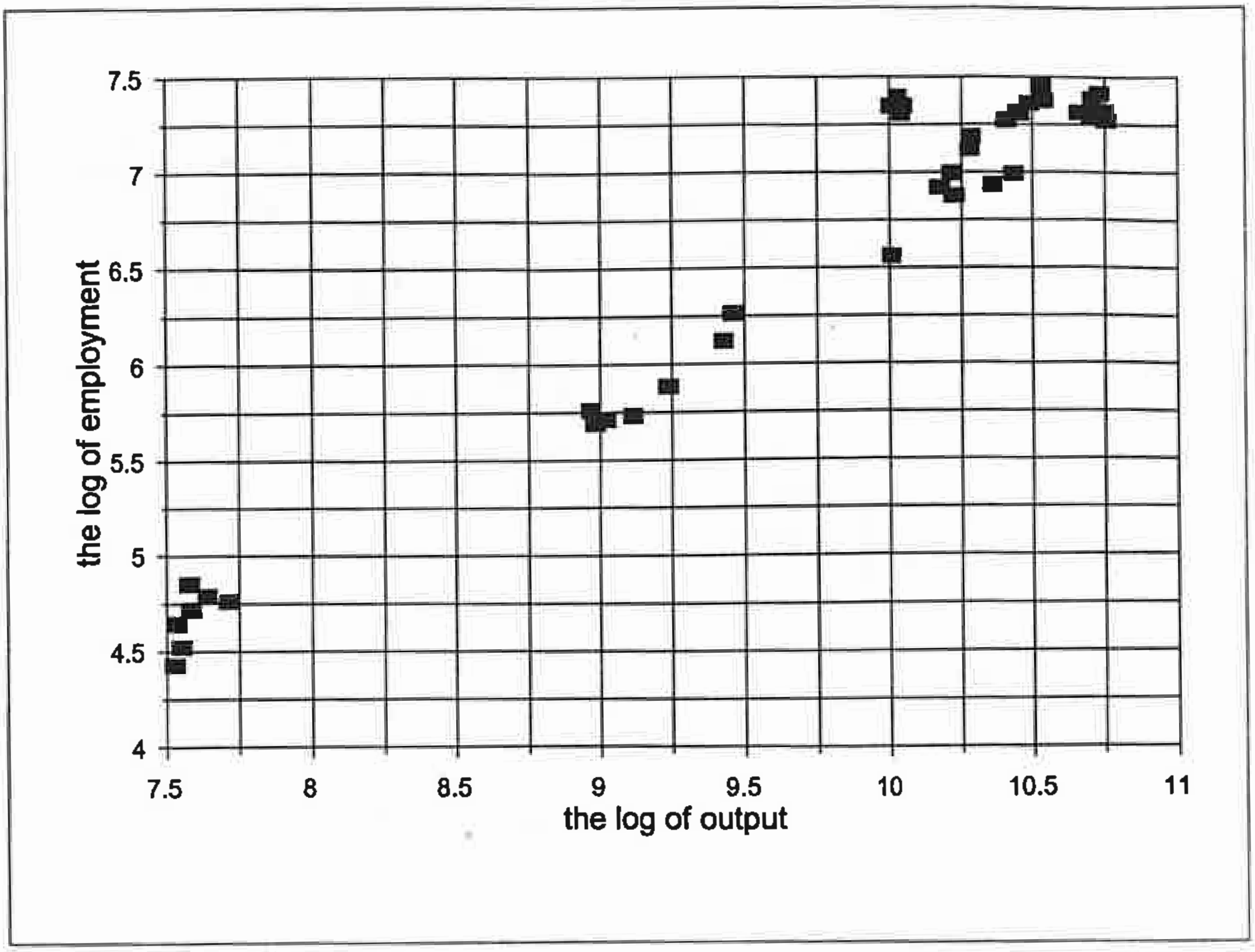

Fig. 3. The output and employment in manufacturing based on the regional data set (from 1988 to 1995)

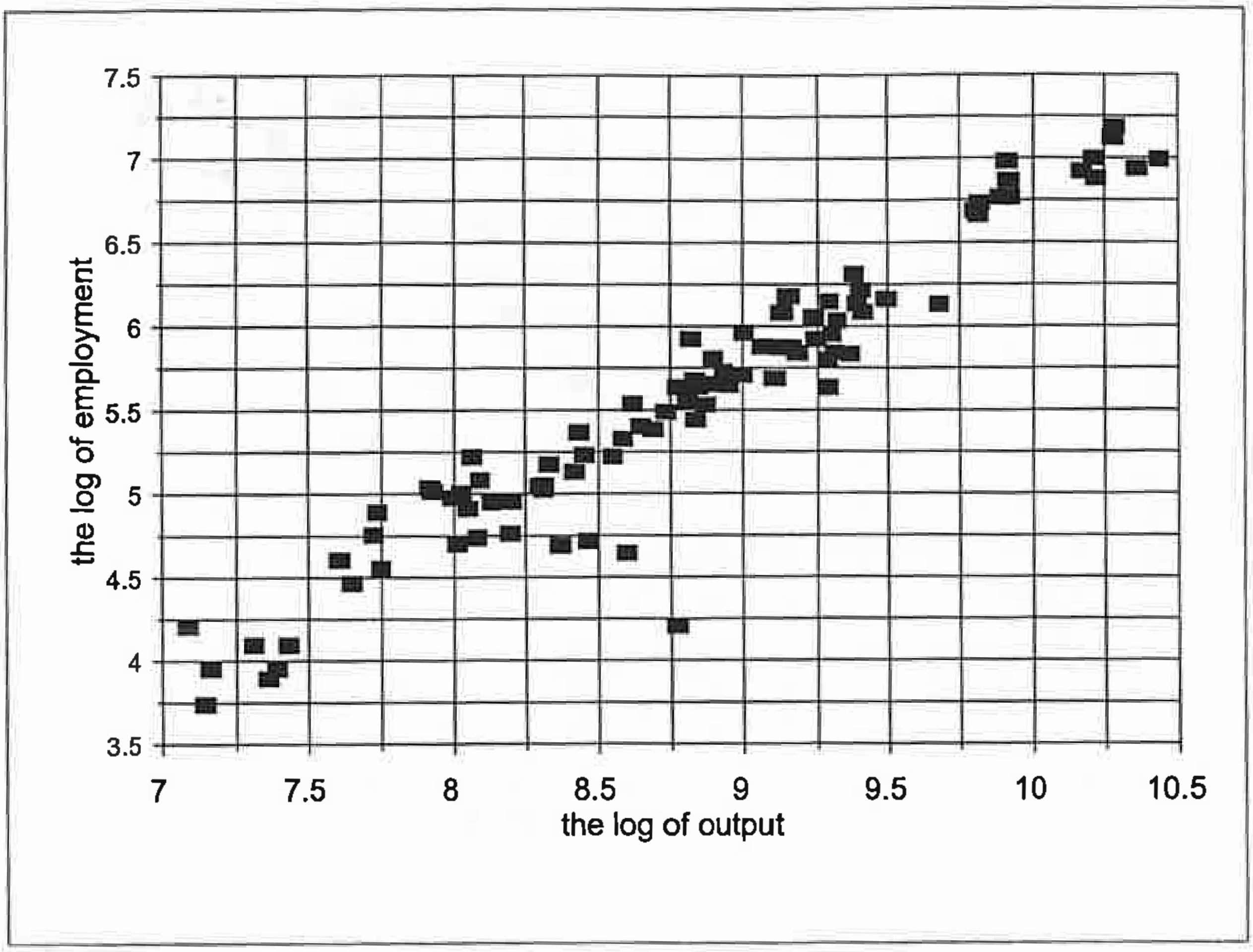

Fig. 4. The average of output and employment changes in the labour districts of Finland (from 1988 to 1995)

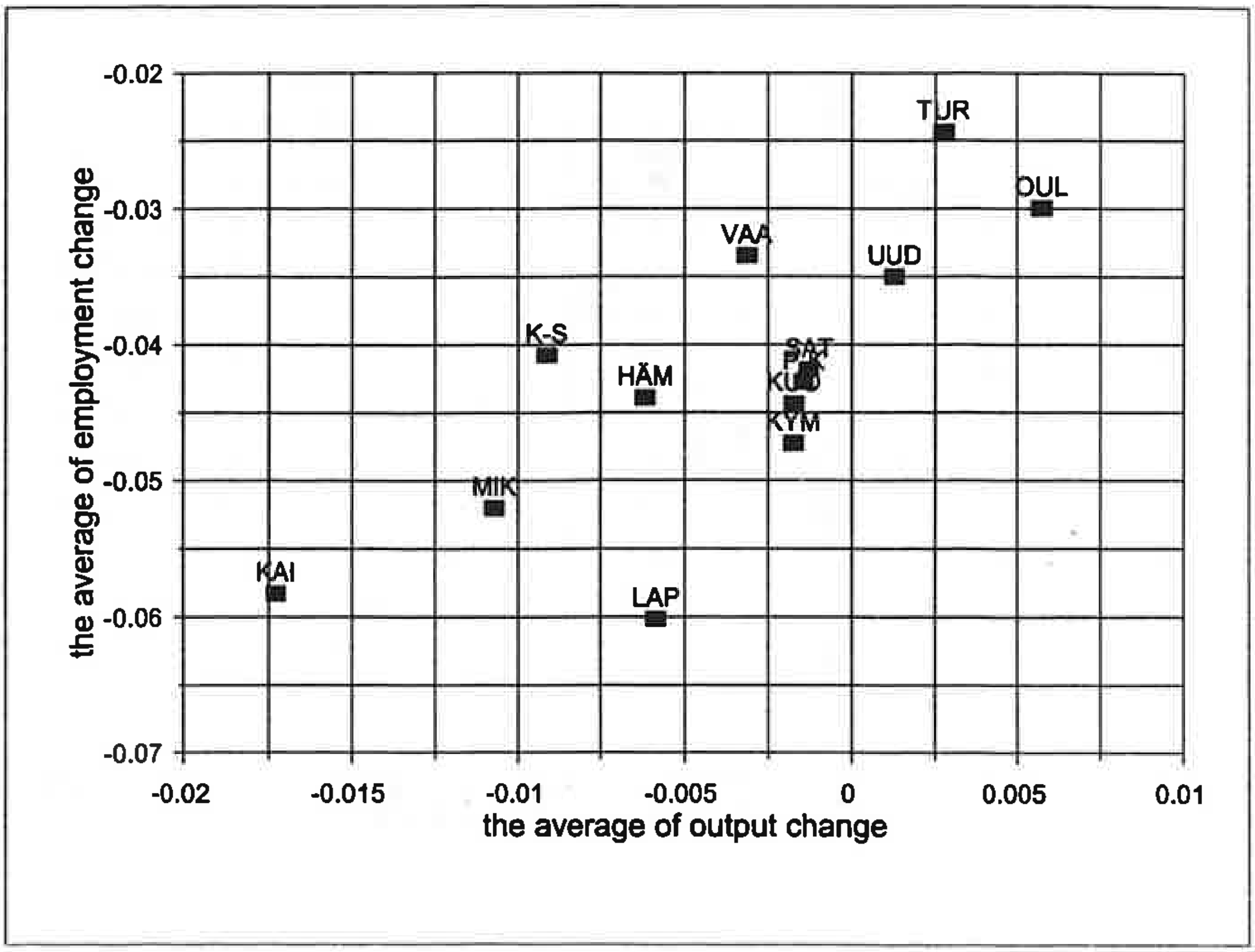

Fig. 5. An elasticity of employment with respect to output and the proportion of wholesale and retail trade, and transportation in the labour districts of Finland

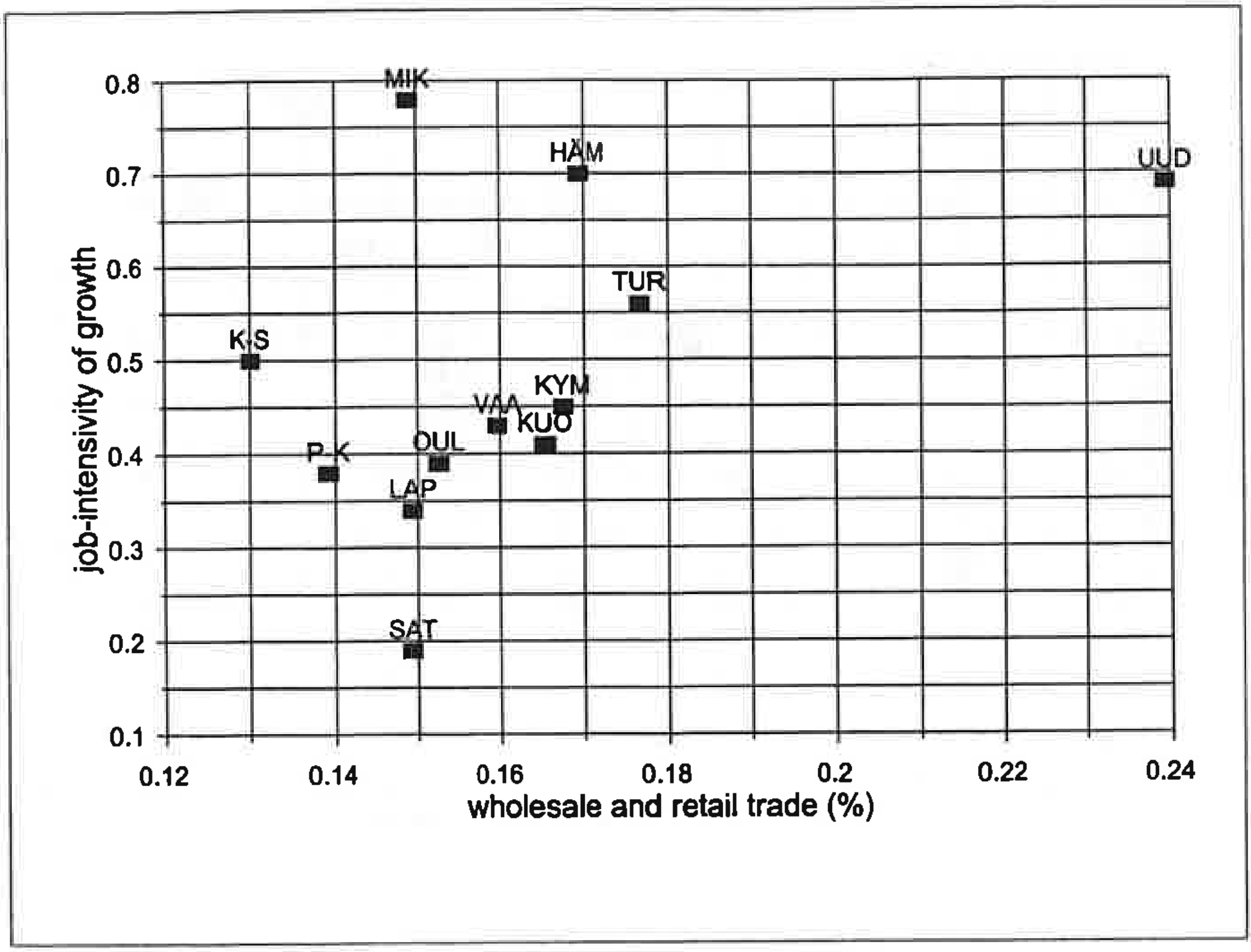

Fig. 6. An elasticity of employment with respect to output and the proportion of other service activities in the labour districts of Finland

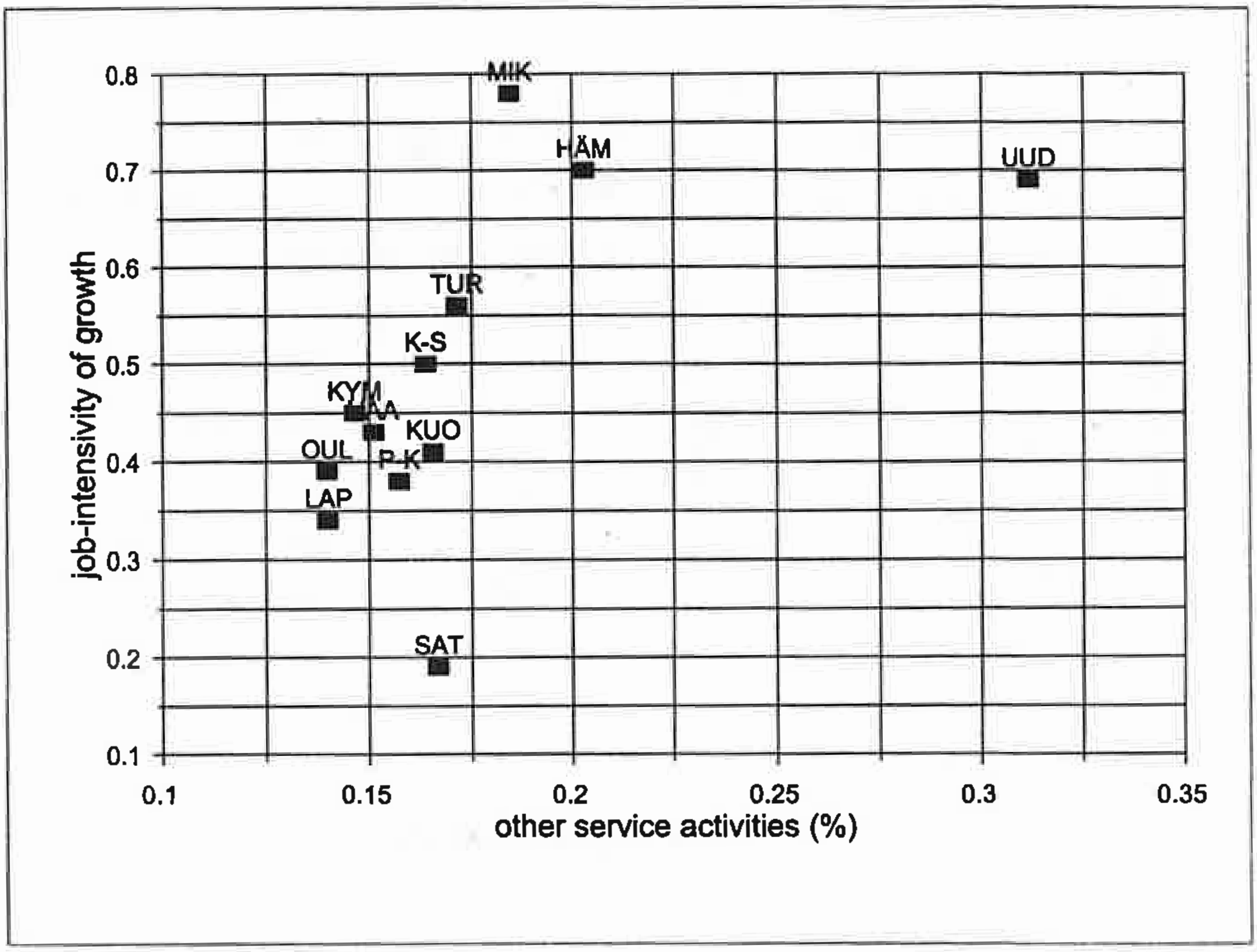

Fig. 7. The magnitude of seasonal and business cycle fluctuations of the regional unemployment rates in Finland (from 1983:1 to 1997:1)

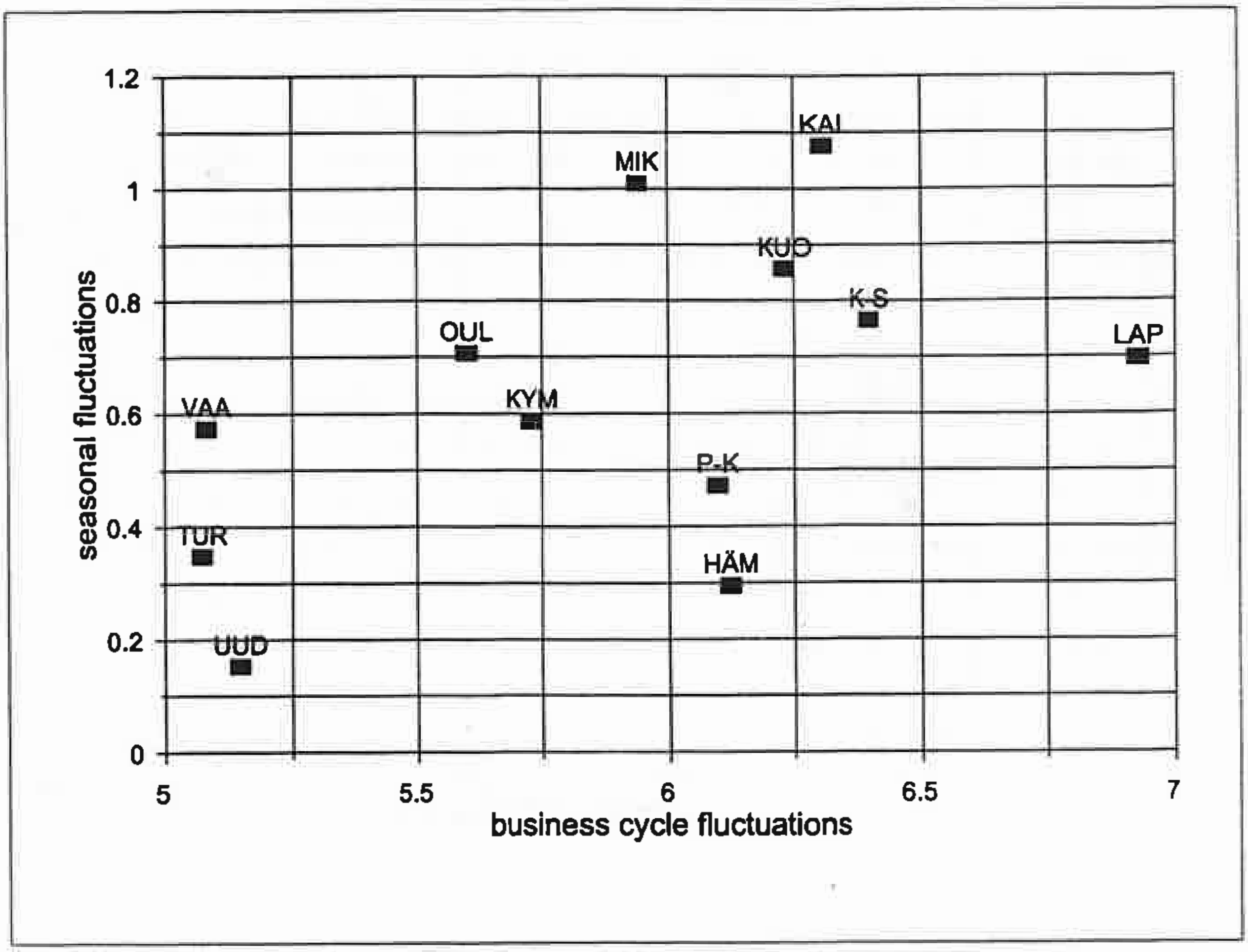

Fig. 8. The log of the seasonally adjusted regional unemployment rates of Uusimaa and Mikkeli from 1983:1 to 1997:1

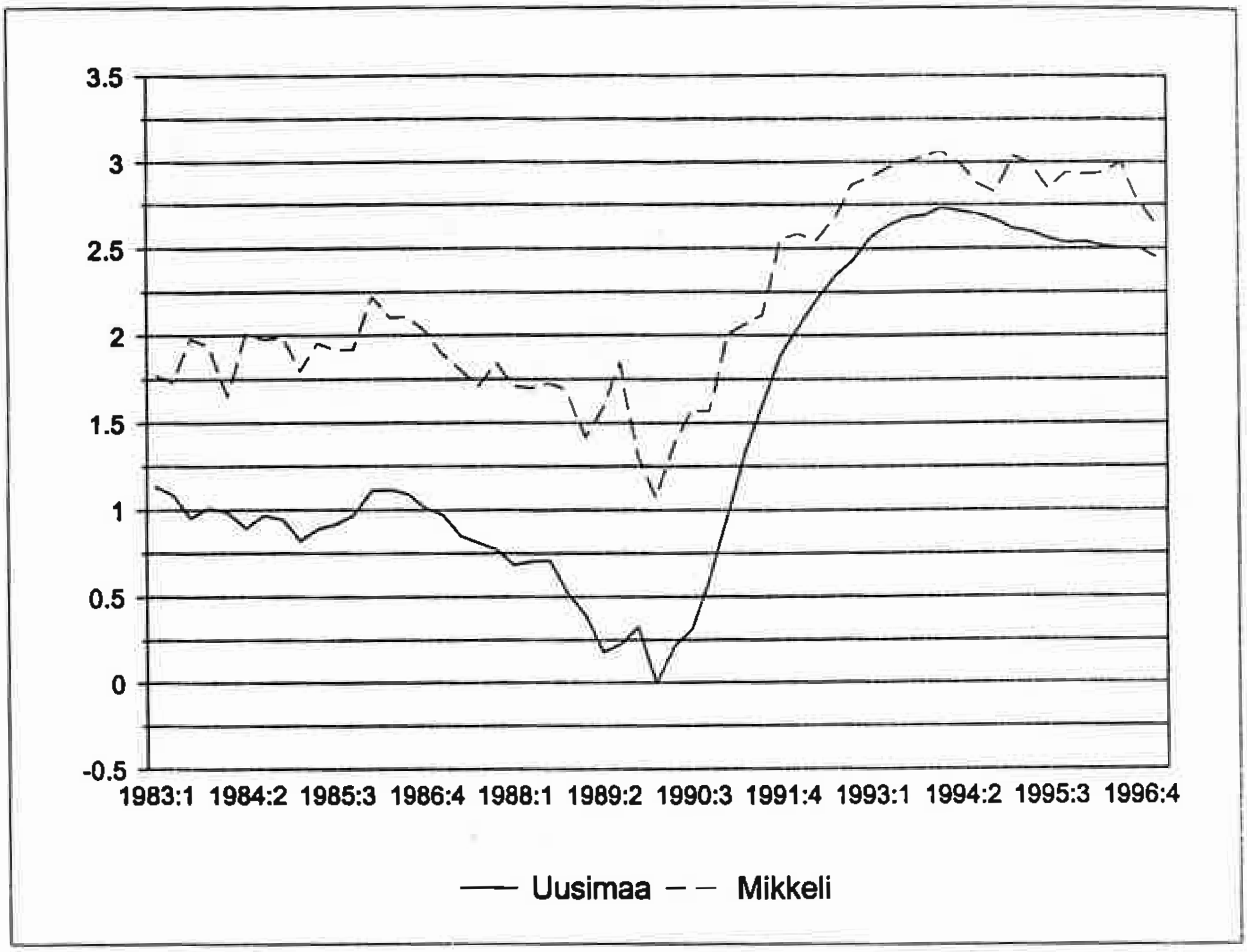

Fig. 9. The persistence of regional unemployment rates in Finland (the average unemployment rate from 1984:1 to 1987:1 and the average unemployment rate from 1990:1 to 1994:1)

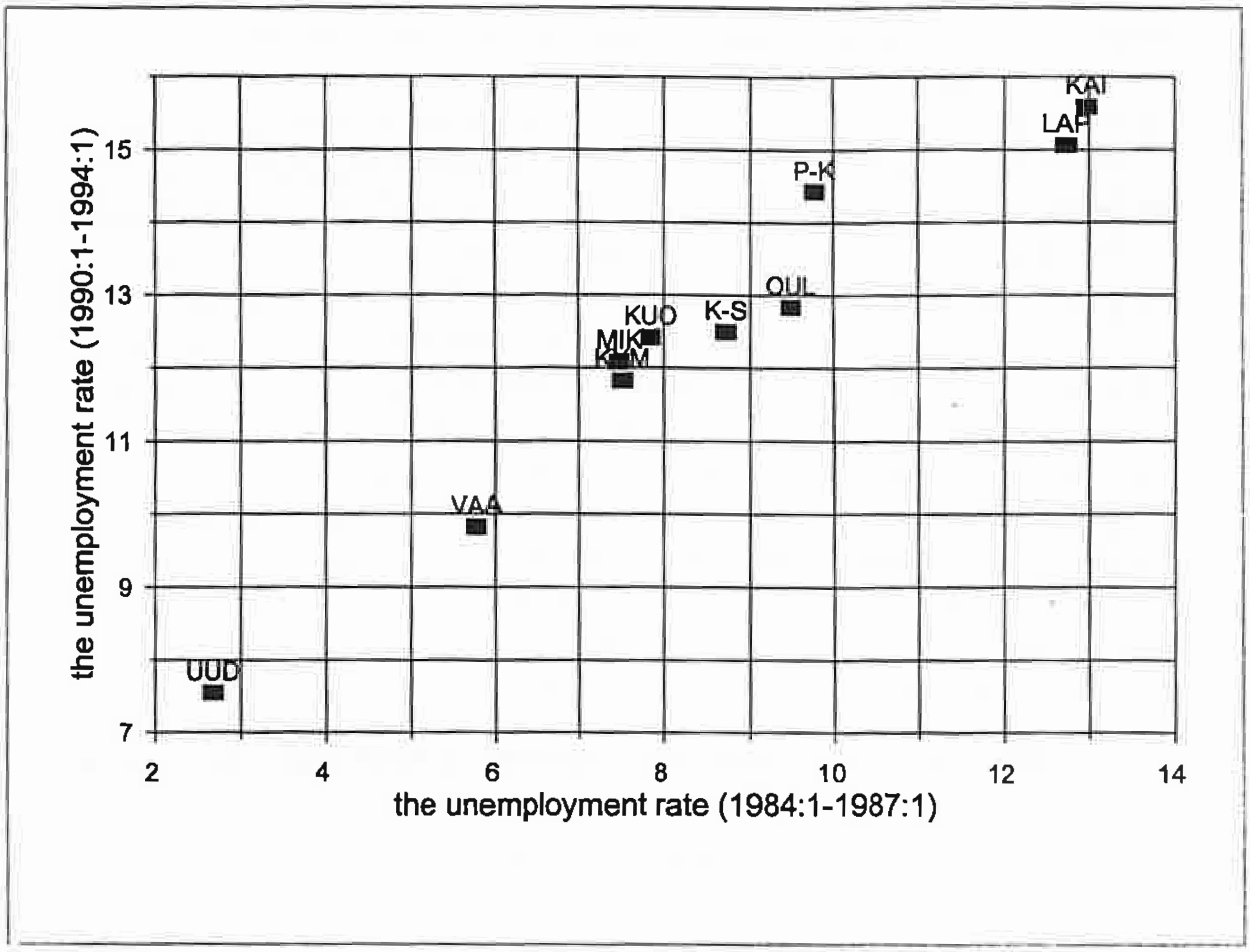

Fig. 10. The persistence of regional employment growth in Finland (the average change in the log employment from 1984:1 to 1987:1 and the average change in the log employment from 1990:1 to 1994:1)

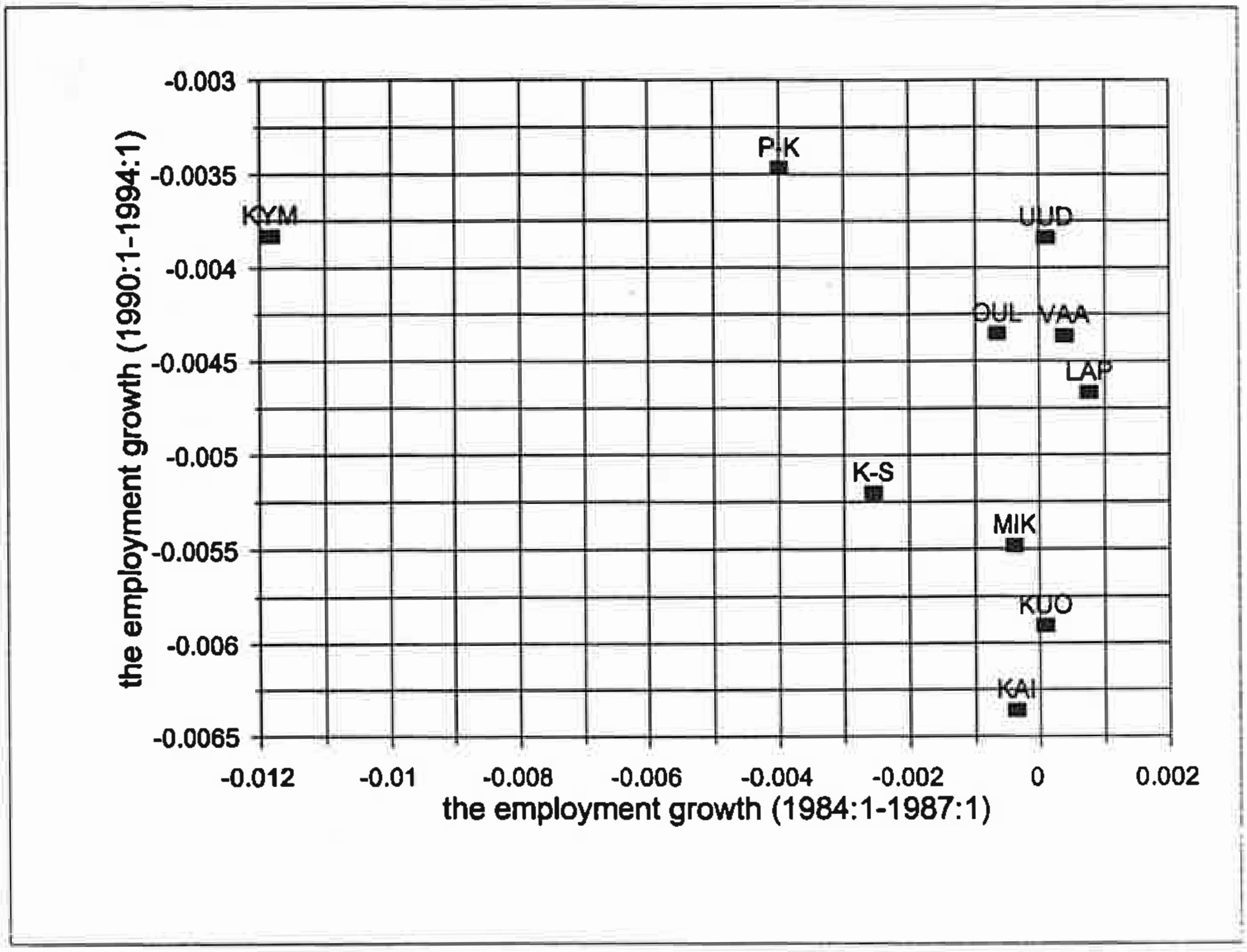

Fig. 11. The persistence of regional participation rates in Finland (the average participation rate from 1984:1 to 1987:1 and the average participation rate from 1990:1 to 1994:1)

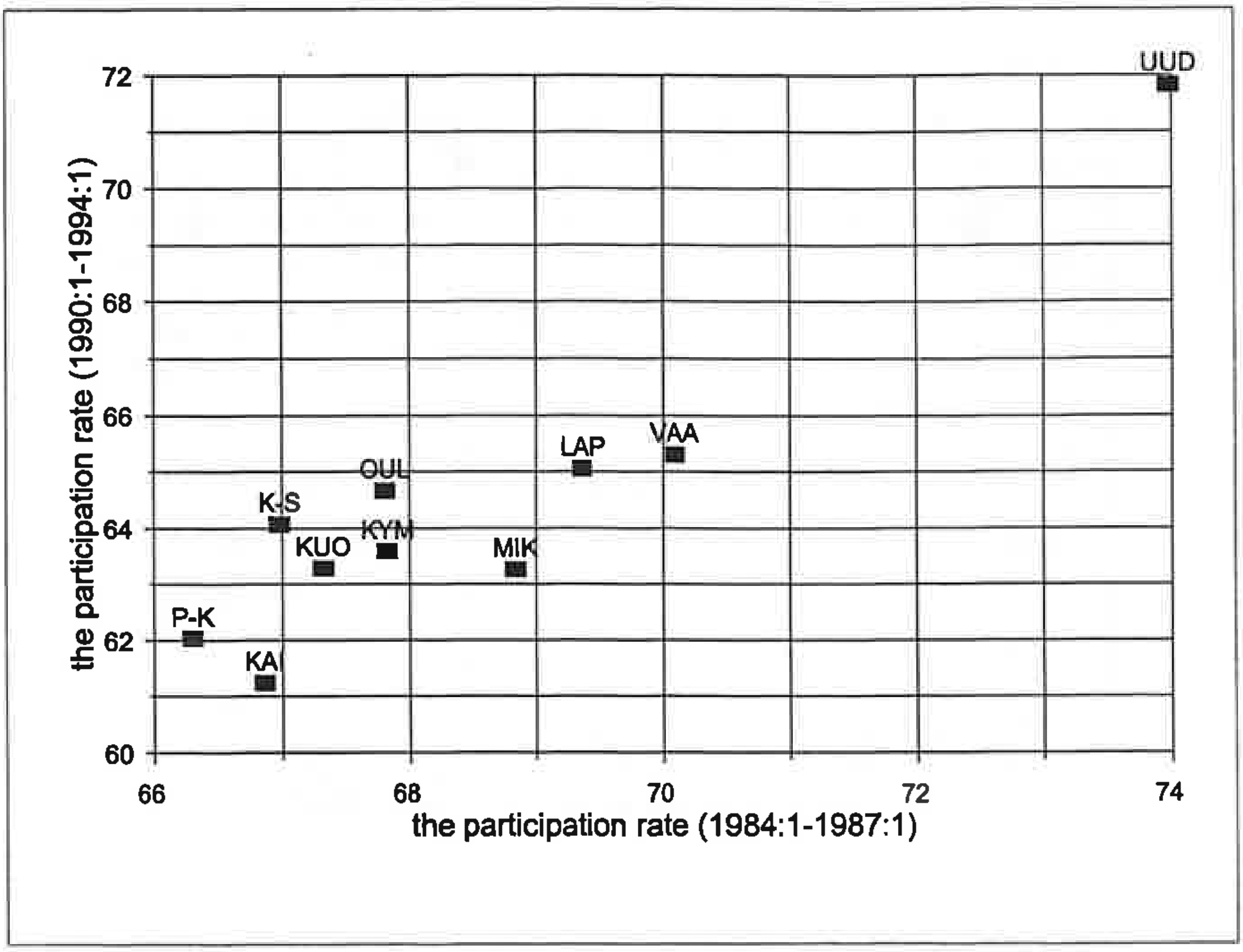

Fig. 12. The accumulated response of employment growth, and the responses of the unemployment rate and the participation rate to a (positive) labour demand shock in the case of Uusimaa

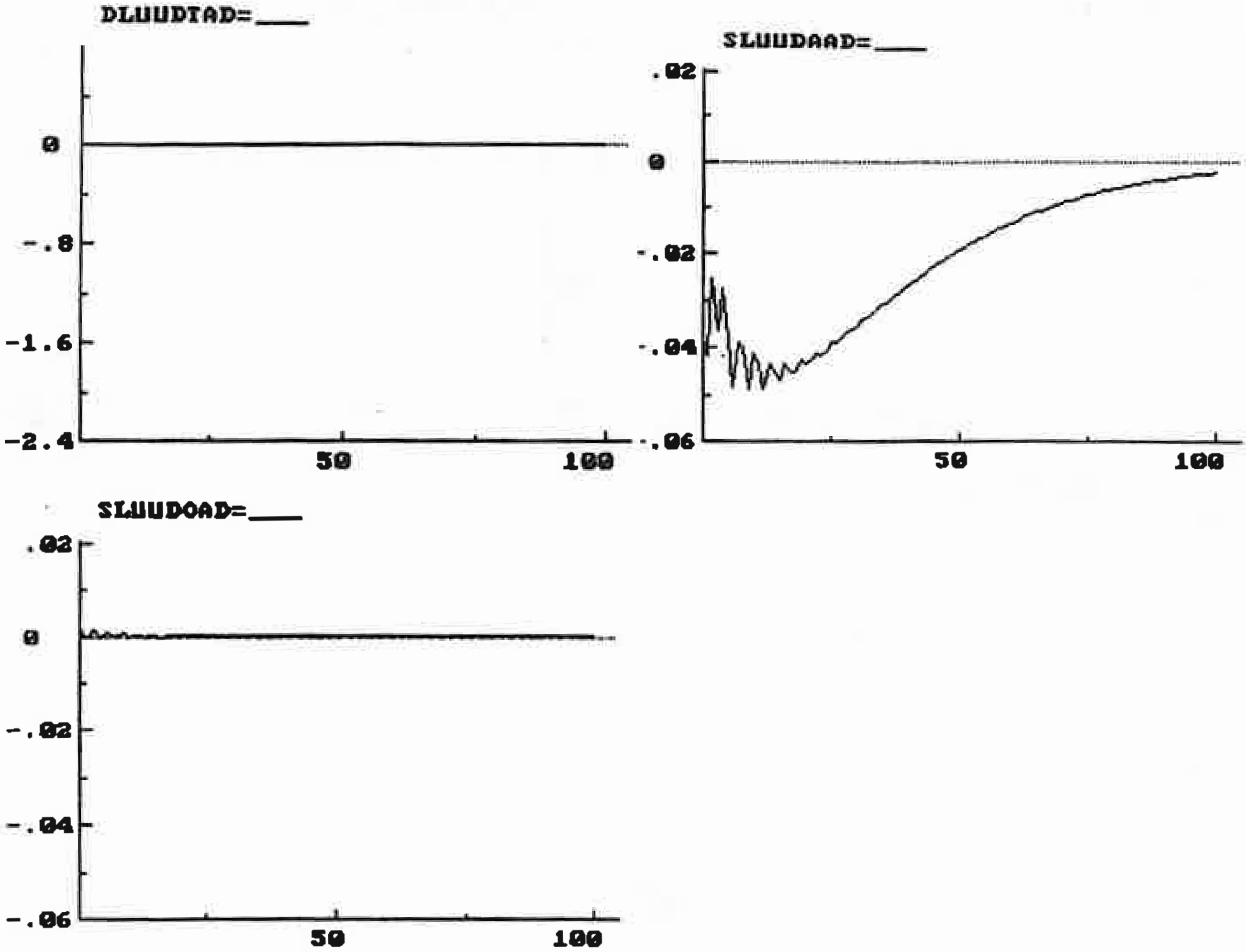

Fig. 13. The accumulated responses of employment growth, and the responses of the unemployment rate and the participation rate to a (positive) labour demand shock in the case of Vaasa

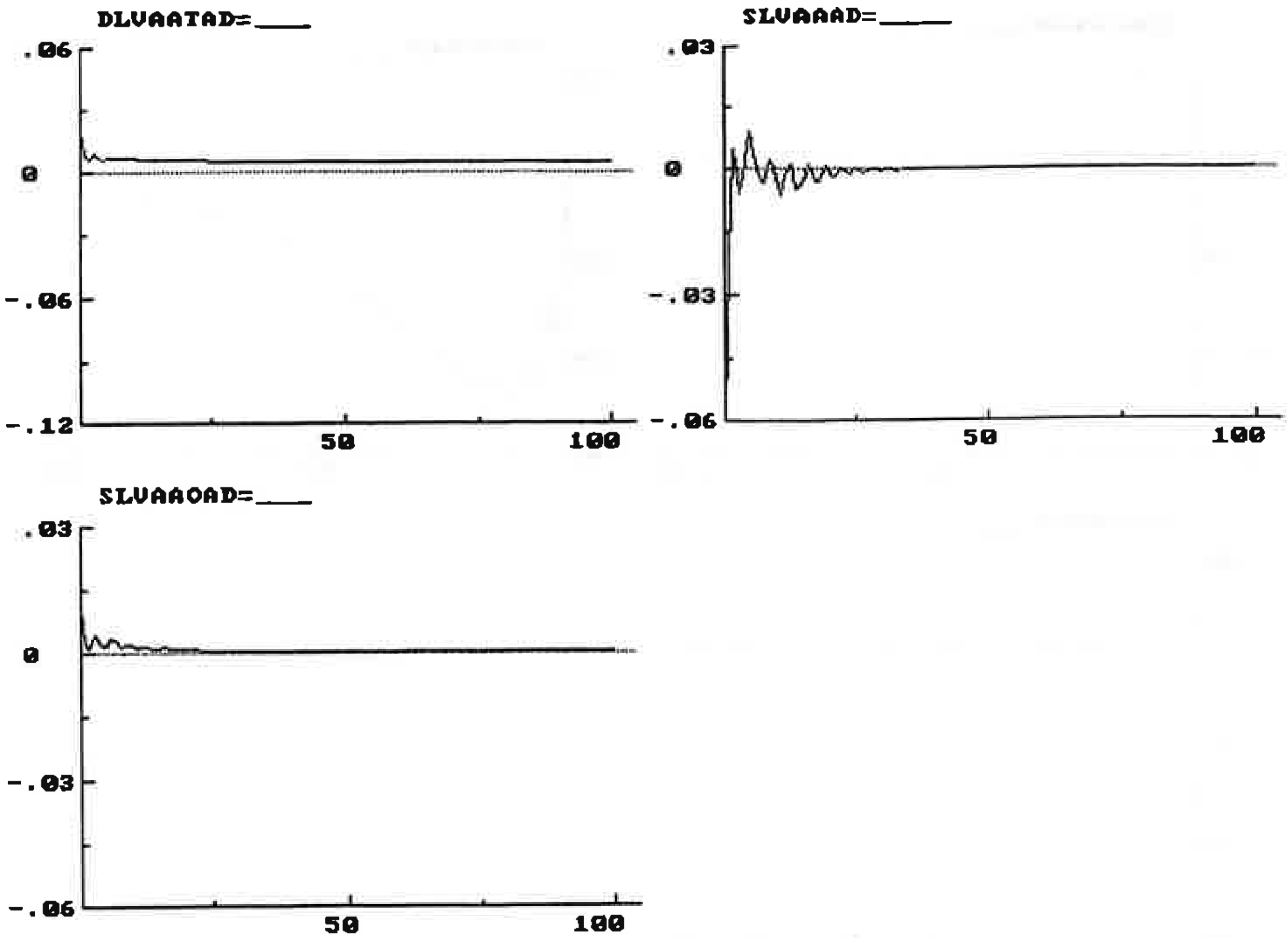

Fig. 14. The accumulated responses of employment growth, and the responses of the unemployment rate and the participation rate to a (positive) labour demand shock in the case of Oulu