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# EMPLOYMENT-OUTPUT LINK IN FINLAND: EVIDENCE FROM REGIONAL DATA*

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*This study examines the relation between employment and output using panel data on 452 Finnish municipalities regrouped into 85 areas, representing regions at the so called NUTS4 level in the EU. The results imply that: (i) the contemporaneous relation between changes in employment and output growth disappeared in the early 1990s; (ii) there is evidence of a recovery of this relation in the mid 1990s; (iii) there are differences in the employment-output relation between different regions; and (iv) the existing differences can be partly explained by differences in industrial specialisation. (JEL: E24, R11)*

## *1. Introduction*

In the early 1990s Finnish unemployment rose within three years from around 3 to more than 16 per cent, culminating in a fall of 20 per cent in the total number of employed persons. Since 1992 economic growth has been rapid with an annual GDP growth rate of around 4,5 per cent. This has led to a fall in unemployment of around 9 per cent. Although unemployment continues to show a steady decline, the process is generally regarded as too slow, and it has been argued that economic growth is producing less employment than it did before the recession.

For example, *Vihriälä and Virén* (1997), who find that the relationship between unemployment and output growth varies between recoveries and recessions, argue that the ongoing recovery is not sufficient to bring unemployment back to the level of the late 1980s. According to *Linden* (1996) unemployment and output growth showed a much stronger relation in the late 1980s than in the early 1990s. In particular, he finds that in 1991–93 an increase of one per cent in output resulted in a reduction in un-

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employment that was only half of the corresponding impact in the late 1980s. *Romppanen and Valppu* (1997), in turn, conclude that in Finland more output growth is required to keep employment constant than in, e.g., the US or the UK. According to their estimates the constant employment output growth rate in Finland in 1995 was about 2,5 per cent per annum. In the US, the corresponding figure was about 1 per cent. *Toivonen* (1996) reports similar results for Finland. According to his estimates the constant employment output growth rate in Finland is about 2,7 per cent per annum.

Although these studies are important contributions to the discussion on jobless growth and on the level of structural unemployment in Finland, they provide only limited information on whether the employment-output relation truly altered during the 1990s. Some light was shed on this issue in recent studies by *Pehkonen* (2000), *Kauhanen and Pehkonen* (1998) and *Sauramo* (1999), who focus on the stability of the employment-output relation at the aggregate level and in Finnish manufacturing, respectively. According to these studies no substantial changes in the employment-output relation have taken place: output growth produces employment in a same way that it did in the late 1980s. There is, however, some evidence that the relation altered in the early 1990s, but that the change was only temporary. The evidence is, however, rather weak and thus the issue requires closer scrutiny. This is the first aim of this study. The purpose of this study is, in fact, twofold.

First we examine the stability of the employment-output relation. To be specific, the stability of the employment-output relation is connected with the question of the *determination* of employment and that of the aggregate production process. In this study our aims are far more modest: we are solely interested in the stability of the employment-output *link*, and of possible changes in it. Furthermore, we do not give a causality interpretation to this relation. The second and novel aim of the study is to investigate what differences, if any, exist in the output-employment relation between the Finnish regions and, if such differences are found, whether they can be explained by differences in regional production structures. We approach the question by dividing Finland into three main regions, namely (1) Uusimaa and Åland (hereafter the Capital region), (2) the rest of Southern Finland and Western Finland, and (3) Eastern and Northern Finland. The production structure is divided into four sectors. These are agriculture, manufacturing, private services and public services.

The data used in this study consist of a panel of 452 Finnish municipalities, which have been grouped into 85 areas to represent regions at the so-called NUTS4 -level in the EU.[1] The grouping of the data is based on commuting districts. The study broadens the scope of the earlier debate on the Finnish employment-output relation, which focused either on aggregate time series data (Ilmakunnas 1989, Pehkonen 1992, Pehkonen 1999) or manufacturing industries (Sauramo, 1999; Pehkonen and Kauhanen 1998). As far as we know this is the first attempt to utilise regional level data in examining the stability of the employment-output relation.[2] Another strand of the literature investigates the process of adjustment of the labour market to a sudden drop in labour demand (Blanchard and Katz, 1992; Decressin and Fatas, 1994; Jimeno and Bentolila, 1995; Böckerman, 1998; Fredriksson, 1999; and Pekkala and Kangasharju, 2000). The present study takes another, complementary, point of view and scrutinises the reactions of the demand for labour to changes in production.

The remainder of the study is organised as follows. In Section 2, we outline the models used and discuss the data. The results on the stability of the relation are reported in Section 3. Section 4 reports the results on regional differences in the employment-output relation. Section 5 concludes the paper.

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[1] *Data sources are Statistics Finland Regional Accounts and Employment Statistics.*

[2] *Hernesniemi (1997) provides an interesting study where industries are classified into seven groups according to their expected employment potential. Industries that are likely to grow and generate employment include, e.g., private services and electronics. The group that is likely to show a decline in employment include industries such as agriculture and textiles. Hernesniemi does not, however, look at regional differences in the composition of industries or examine the stability of the employment-output relation.*

## 2. Employment and output across the Finnish regions 1988–1996

### 2.1 Models and data

To identify a causal relationship between output and employment, one could construct a model for labour demand based on the cost-minimising behaviour of firms. In this framework, one relates employment to exogenously given output, wages, capital stock etc. Due to the lack of data this alternative is not, however, pursued in this paper.[3] Instead, the empirical analysis is based on a model that relates employment in a region to current and lagged output as well as lagged employment. Moreover, our approach allows for possible effects of omitted and unobserved variables that may vary across either cross-sectional units or time periods. To alleviate the consequences of excluded covariates (observed or unobserved), we use panel data methods to take into account both time invariant (but cross-sectionally variant) and time-varying (but cross-sectionally invariant) effects.

Although one can interpret this approach as (misspecified) short-run employment relation derived from a production function, our sole concern is with the employment-output *link*, and possible changes in it: we do not give a causality interpretation to these relations. Furthermore, we do not provide any theoretical structure for our specifications.

Time-invariant effects, so-called fixed effects, are removed by taking time differences in the data in logarithmic form. This means that we estimate data that approximate growth rates. Note that the OLS estimates on differenced data equal the fixed effects estimates on data in levels.[4] We use the LM test to check whether or not time differencing has actually removed all fixed effects from the data. In the LM test here the null hypothesis is that there is no cross-sectional heterogeneity in the intercept terms when data are in the difference form.

However, we cannot use the OLS estimator in our most general model, where the lagged endogenous variable is included as a regressor. The lagged endogenous variable in differenced data correlates with the error term, which biases the results. To avoid this bias we use a GMM-estimator by Arellano and Bond (1991), where the lagged values of the variables (in levels) are used as instruments to remove the correlation between the regressors and the error term.[5] We use the Sargan test to check the validity of the instruments.

Apart from time-invariant effects there may still be time-varying effects that affect the employment-output link each year. These effects can be controlled by the use of time dummies and, where considered possible, the use of interaction terms between the time dummies and the slope coefficients. If the time dummies or interaction terms are statistically significant, we may conclude that the link between employment and output has not been a stable one.[6]

To sum up, the empirical employment-output equation is of the following basic form:

$$(1)\ \Delta \ln N_{it} = \gamma + \gamma_t + \gamma_{1t}\Delta \ln Q_{it} + \gamma_{2t}\Delta \ln Q_{it-1} + \gamma_3 \Delta \ln N_{it-1} + \mu_{it}$$

where subscript i refers to a region and t to time. The equation broadens a general, static employment-output relation by allowing for a lagged impact from output to employment and by including the lagged employment as an additional explanatory variable.

The empirical analysis is based on regional level data, in which the regions correspond to NUTS4 level regions in the EU. The regions – a total of 85 – are formed from 452 municipalities. The investigation period runs from 1988 to 1996, and thus includes the era of rapid employment growth of the late 1980s, the unem-

[3] *Empirical models based on a solution of the dynamic optimisation problem with forward-looking expectations, discussed for example by Nickell (1986) and analysed empirically by Ilmakunnas (1989) and Pehkonen (1992), are also beyond the scope of this paper.*

[4] *The fixed-effects estimator removes time-invariant effects by considering the observations in relation to their average over the time periods in question. The fixed-effects estimation in levels equals the OLS estimation in levels with dummy variables for each cross-sectional unit.*

[5] *According to Arellano (1989) it is preferable to use levels as instruments instead of differences.*

[6] *Alternatively, the interaction variables may simply reflect omitted variables and thus mark specification errors. This possibility must be noted in interpreting the results.*

ployment shock of the early 1990s and the years of recovery in the mid 1990s. Employment refers to the number of employees in an area, i.e. to the number of jobs.[7] The output variable is the regional gross domestic product (RGDP). The data source is Statistics Finland. The basic properties of the data are given in Table 1.

The turbulence of economic development over the period investigated shows up well in Table 1. In 1988–89 the average growth rate of RGDP was 5,4%, the regional difference between the maximum and minimum growth rates being 30 percentage points. Economic growth slowed down in 1990, and between 1991 and 1993 output declined by around 12 per cent in total. These were the gloomiest years of the recession. It should be noted that not all regions experienced a decline in output every year: there was at least one region every year that was off the general trend. Since 1993, the annual growth of output in the regions has been about 4,5 per cent per annum.

Variations in output growth affect employment. As expected, the worst years for employment are on a par with those for output, allowing for a lag of one year. It is worth noting, as in the case of output growth, that there were regions, which showed a steady increase in employment over the recession years, with the exception of 1990 and 1991.

Figure 1, which depicts the coefficients of variation for employment and output, suggests that there might have been a change in the data generating process in 1995 and 1996: the variation in output across the regions increased slightly in 1994–1996. It remains to be seen whether this trend will reverse in the near future. It should be noted that similar trends are typical for other regional measures, including income, unemployment and migration; see Kangasharju, Kataja and Vihriälä (1999), Böckerman (1998), Pehkonen and Tervo (1998).

Table 2 shows that there were considerable differences in output growth and employment across the five main regions. The average growth rate was highest in the Capital region (1,5%) and lowest in Eastern Finland (0,2%). These differences showed up in the development of employment. In the Capital region the annual decline in employment was 2,1%, while in Eastern Finland it was as high as 3,3%. As far as the sectoral compositions of the GDP of these regions are concerned, the Capital Region differs from the rest of the country by its low share of agriculture and forestry and by its high share of private services. Eastern Finland differs from the other areas by its proportion of agriculture and forestry, which is well above the regional average.

### *2.2 Stability of the employment-output relation*

To examine the stability of the employment-output relation, we allowed for time effects (a change in the constant over time) and interactions between the time effects and the independent variable (a change in the correlation between employment and current as well as lagged output). We started the analysis with the most general model, consisting of lagged variables of employment and output growth, time dummies and interaction terms.

Table 3 reports the GMM estimates of the specification obtained by the top-down modelling strategy and by utilising the panel properties of the data at hand.[8] Firstly, we estimated equation (1) above, also including the interaction terms of the time dummies and output variables. Since the lagged output variable and its interaction terms with the time dummies were insignificant, we ended up with the specification shown in Table 3. As shown in the bottom part of the Table, the Sargan test for the validi-

[7] *The quality of jobs is ignored here, although it can be argued that the issue is important in the case of regional and sectoral analyses.*

[8] *The results of the cross-section estimation of a simple model that relates annual change in employment to that in output distinguish two broadly defined sub-periods. Between 1988–1991 there seemed to be no contemporary effect from output to employment. For 1991–1996 such an effect was detected, the magnitude of the immediate impact being about 0.15. The results for the years 1991–1993 are consistent with the view that the extent of labour scrapping during the recession years was above the norm: at the given output level the annual decline in employment varied between 6–7%.*

Table 1. Employment and output growth; basic statistics.

| Year | RGDP change, per cent | | | | Employment change, per cent | | | |
|---|---|---|---|---|---|---|---|---|
| | Average | Min | Max | Std devn. | Average | Min | Max | Std devn. |
| 1988–89 | 5.4 | –15 | 15 | 4.8 | 0.3 | –5 | 6 | 2.0 |
| 1989–90 | 0.9 | –12 | 15 | 4.8 | –2.7 | –10 | 2 | 1.8 |
| 1990–91 | –7.1 | –27 | 8 | 4.4 | –6.9 | –11 | –2 | 1.8 |
| 1991–92 | –3.0 | –12 | 15 | 4.9 | –7.7 | –15 | 1 | 2.1 |
| 1992–93 | –0.3 | –25 | 14 | 5.7 | –6.7 | –19 | 2 | 2.4 |
| 1993–94 | 4.8 | –9 | 18 | 5.0 | 1.4 | –7 | 9 | 2.4 |
| 1994–95 | 4.5 | –11 | 25 | 5.6 | –1.1 | –7 | 7 | 2.7 |
| 1995–96 | 3.2 | –20 | 11 | 4.6 | –0.4 | –5 | 5 | 1.7 |

Table 2. Employment and output growth by main regions and by industrial specialisation, 1988–1996, per cent.

| | Capital Region**) | Southern Finland | Eastern Finland | Western Finland | Northern Finland |
|---|---|---|---|---|---|
| RGDP | 1.5 | 0.9 | 0.2 | 0.7 | 1.3 |
| Number of jobs | –2.0 | –2.6 | –3.3 | –2.5 | –2.4 |
| Sectoral composition*) | | | | | |
| Agriculture and forestry | 1 | 6 | 13 | 10 | 7 |
| Manufacturing and construction | 27 | 40 | 29 | 37 | 37 |
| Private services | 56 | 37 | 34 | 33 | 32 |
| Public sector | 16 | 18 | 24 | 20 | 23 |

Notes: *) As a proportion of the total value-added of the region in question.
**) Includes the province of Ahvenanmaa

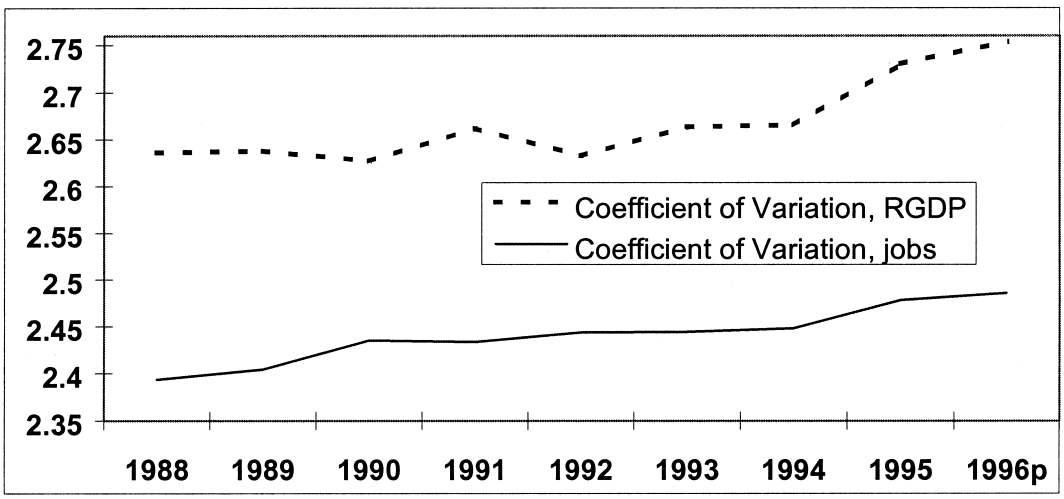


Figure 1. Coefficient of Variation for RGDP and the number of jobs in the regions (Sources: Statistics Finland Regional Accounts and Employment Statistics)

Table 3. GMM estimations of the employment-output relation, 85 regions, 595 observations, estimable years 1990–1996, dependent variable is $\Delta \ln N_{it}$.

| Explanatory Variables | | (1) |
|---|---|---|
| Constant | –0,03 | (11) |
| $\Delta \ln N_{t-1}$ | 0,57 | (15) |
| $\Delta \ln Q_t$ | 0,18 | (1,7) |
| $\Delta \ln Q_{t-1}$ | | – |
| Time dummies | | |
| 1991 | –0,04 | (6,6) |
| 1992 | –0,01 | (2,6) |
| 1993 | 0,01 | (2,1) |
| 1994 | 0,07 | (14) |
| 1995 | 0,01 | (2,5) |
| 1996 | 0,02 | (5,1) |
| Interaction terms | | |
| 1991*$\Delta \ln Q_t$ | –0,38 | (2,2) |
| 1992*$\Delta \ln Q_t$ | –0,33 | (1,7) |
| 1993*$\Delta \ln Q_t$ | 0,02 | (0,1) |
| 1994*$\Delta \ln Q_t$ | 0,05 | (0,3) |
| 1995*$\Delta \ln Q_t$ | 0,17 | (1,0) |
| 1996*$\Delta \ln Q_t$ | 0,24 | (1,3) |
| Long-run $\varepsilon_q$, min | –0,47 | |
| Long-run $\varepsilon_q$, max | 0,98 | |
| Joint Significance of | | |
| Time dummies, $\chi^2(6)$ | 1406,2*** | |
| Other variables, $\chi^2$(DF) | 649,6*** | (8) |
| Interaction terms, $\chi^2(6)$ | 99,03*** | |
| 2nd order serial correlation, N(0,1) | 0,716 | |
| Sargan test for validity of instruments, $\chi^2$(DF) | 58,70 | (48) |

Notes: Interaction terms refer to the product of the explanatory variable and time dummy. In the LM test the null hypothesis is that there is no variation in the intercept terms over cross-sectional units. *) denotes statistical significance at the 10% level; **) denote statistical significance at the 5% level; ***) denote statistical significance at the 1% level; degrees of freedom and t-values are given in parentheses.

ty of the instruments cannot be rejected.[9] Similarly, the specification does not display second-order autocorrelation. This is important since the consistency of the GMM estimator hinges upon the assumption that $E(v_{it},v_{it-2}) = 0$ where the $v_{it}$ are the first differences of serially uncorrelated errors; see Arellano and Bond (1991).[10] However, it must be emphasised that the analysis is based on seven cross-sections only. Consequently the results must be treated with care.

As far as the numerical results are concerned, the time dummies play an important role in explaining the data; see the individual t-statistics as well as the $\chi$-test for the joint significance. The importance of the interaction terms is less clear, although the joint significance of these terms cannot be rejected. These results imply that the time effects that capture the exogenous (annual) shift in employment at the given output level are far more important than the variables that capture changes in the correlation between employment and output.

According to the results employment declines, on average, about 2 per cent per annum if there is no growth in output. This varies, however, from +5 per cent in 1994 to –7 per cent in 1991. Between 1991–1992 the estimate varies between –4 and –7 per cent. In 1994, the estimate turns temporarily positive. In 1995–96 the estimates are again negative, around –2 per cent per annum. These results are in line with the view that that the extent of labour scrapping during the yearly years of recession was excessive.

The link between changes in employment and output appears, on average, to be rather strong, the estimate being 0,35. It, however, varies between –0,47 in 1992 and 0,98 in 1996. The results reflect the turbulence of the early 1990s, which shows up as a disappearing relation between changes in employment and in output in 1991–1992 and as the gradual recovery of this relation in 1993–96.[11]

### *2.3 Regional variation in the employment-output relation*

To examine regional variations in the employment-output relation, we compared three groups of regions, all representing distinct parts of Finland as well as different groups of regions in terms of their economic performance. The first group consists of the Capital region and the

[9] *The set of instrumental variables for $\Delta lnN_{it-1}$ are given by $lnZ_{it-2}$ where Z includes N and Q.*

[10] *See Lee et al. (1998) for an interesting study that examines the robustness of empirical results with respect to alternative estimators. The study suggests that the GMM estimator by Arellano and Bond yields plausible estimates on growth convergence.*

[11] *The elasticity results for 1991 and 1992 are: [(0,18–0,38)/(1–0,57) = –0,47] for 1991 and [(0,18–0,33) / (1–0,57) = –0,35] for 1992. For 1995 and 1996, in turn, the estimates are 0,87 and 0,98, respectively.*

province of Ahvenanmaa. This group is characterised by a lower-than-elsewhere rate of unemployment and relatively high per capita income. The Capital region has also experienced strong in-migration during the 1990s. The second group consists of the Eastern and Northern parts of Finland. This group represents regions with a higher-than-elsewhere rate of unemployment, out-migration, a relatively large agricultural sector and low per capita income. The third group of regions is located in Southern and Western Finland, and can be called Middle Finland, both in terms of economic performance as well as location. The number of regions in the three groups is 7, 34 and 44, respectively.

There are also certain differences in sectoral composition between the groups. Most visibly, the proportion of private services in the Capital region is higher than in the other groups; see Table 2 above. Moreover, the Middle Finland group of regions, i.e. the Southern and Western parts of Finland, is more heavily specialised in manufacturing than the other regions. The Eastern-Northern regions, in turn, have a higher focus on agriculture than the others.

The division of the data into the three groups shows up relatively well in the results.[12] The exogenous change in employment is slightly stronger for the Eastern-Northern group of regions than for the other two groups; see the coefficients for the constants and test for the similarity of the constants in Table 4. This suggests that the exogenous change strengthens as the share of agricultural production and the public sector increases. Similarly, there are differences in the slope coefficients between the groups of regions. Although we can equalise the slope coefficients for the Capital region and the Eastern-Northern group, this cannot be done for Middle Finland; the test for similarity of the coefficients in the latter case is 7,62. The results indicate that employment reacts to change in output more strongly in the manufacturing-oriented Middle Finland group of regions than elsewhere. The coefficient for the Middle Finland group is 0,198 and that for the other regions 0,139.

In Table 5, output growth was measured by sectors and the slope coefficients were equalised between the Capital and Eastern-Northern regions. The results indicate that, firstly, the estimate on exogenous change in employment for the Capital region is slightly lower than that for the Middle Finland or Eastern-Northern regions. The exogenous change in employment does not differ statistically, however, between the latter two groups. This suggests that the exogenous change in employment is the lowest in the regions oriented towards private services.

Secondly, the sectoral disaggregation of the output variable decreases the overall impact of output on employment; see Table 6 for the sectoral contributions, calculated by weighting the coefficients with their corresponding proportions of output. The sum of the contributions is 0,083 for the Capital and Eastern-Northern regions and 0,102 for Middle Finland. These two aggregates show us how much employment grows when a one-percent growth in total output results from sector growth where the growth rate of each sector relative to the others equals its relative size (share of total). It seems that these two regions do not differ much from each other at the aggregate level.

There are, however, substantial differences in the impacts of the output growth between the regions at the sectoral level (see contributions by sector in Table 6). The breakdown suggests that private services play a major role in determining the correlation between changes in employment and output for both the Capital and Eastern-Northern as well as Middle Finland group; the contributions are about 50% and 66% of the total impact, respectively. In the

[12] *The reported results were obtained by the top-down procedure used in the previous section. In other words, we started with the most general model, consisting of lagged variables of employment and output growth, time and regional dummies as well as interaction terms. The final specifications included the current and lagged period output variable for the Capital region and Eastern-Northern groups (included as interactions between region dummies and output), the current period output variable for the Middle Finland group, and time dummies for all regional groups. In contrast, lagged employment growth could be dropped from the equation. Empirical tests indicated that the data in time difference form have no heterogeneity in the intercept term; see the LM test in Table 4. Consequently, GMM or the fixed-effect estimator was unnecessary and the OLS method sufficient in the modelling of the regional output-employment link.*

Table 4. Panel data OLS estimations of the employment-output relation, restricted model.

| Coefficient | Capital region | Middle Finland | Eastern-Northern Finland |
|---|---|---|---|
| Constant | –0,025** | –0,030** | –0,035** |
| Long-run $\varepsilon_q$ | 0,139** | 0,198** | Restricted to be the same with the Capital region |
| Similarity of constants F(1) | | | |
| Middle Finland | 2,19 | – | – |
| Eastern-Northern Finland | 8,26** | 6,89** | – |
| Similarity of slope coefficients F(1) | | | |
| Middle Finland | 7,62** | – | – |
| Model diagnostics | | | |
| Joint significance of current period variables | | 54,76** | |
| Significance of the lagged variable | | 7,62** | |
| LM test, $\chi^2(1)$ | | 0,19 | |
| $R^2$-adj. | | 0,74 | |
| Joint significance of time dummies | | 775,41** | |

Notes: see table 3

Table 5. Panel data OLS estimations of the employment-output relation, dependent variable is $\Delta \ln N_{it}$.

| Coefficient | Capital region | Middle Finland | Eastern-Northern Finland |
|---|---|---|---|
| Constant | –0,030** | –0,035** | –0,038** |
| Agriculture, long-run $\varepsilon_q$ | 0,052** | 0,038** | Restricted to be the same with the Capital region |
| Industry, long-run $\varepsilon_q$ | 0,034** | 0,051** | |
| Private services, long-run $\varepsilon_q$ | 0,089** | 0,193** | |
| Public services, long-run $\varepsilon_q$ | 0,156** | 0,072** | |
| Similarity of constants F(1) | | | |
| Middle Finland | 3,18** | – | |
| Eastern-Northern Finland | 7,38** | 1,64 | |
| Similarity of slope coefficients F(4) | | | |
| Middle Finland | 20,60** | – | |
| Model diagnostics | | | |
| Joint significance of current period variables | 8,87** | 3,94** | |
| Joint significance of lagged variables | 2,98** | – | |
| LM test, $\chi^2(1)$ | | 1,43 | |
| $R^2$-adj. | | 0,75 | |
| Joint significance of time dummies F(6) | | 89,00** | |

Notes: see table 3

case of Middle Finland the second largest contributor is industry (its impact is 21% of the total). For the Capital region and Eastern-Northern Finland the respective estimate is only one half of that (12% of the total), public services being the second main contributor (34%) in those groups. Note that this breakdown by sector shows a potential only; it does not reveal

Table 6. Contribution of the changes in sectoral output.

| | Capital region and Eastern-Northern Finland | | | | Middle Finland | | | |
|---|---|---|---|---|---|---|---|---|
| | Share | Coefficient | Contribution %-points | Contribution % | Share | Coefficient | Contribution %-points | Contribution % |
| Agriculture | 0,06 | 0,052 | 0,003 | 4,0 | 0,08 | 0,038 | 0,003 | 3,0 |
| Industry | 0,30 | 0,034 | 0,010 | 12,0 | 0,40 | 0,051 | 0,021 | 21,0 |
| Private services | 0,47 | 0,089 | 0,041 | 50,0 | 0,34 | 0,193 | 0,066 | 64,0 |
| Public services | 0,18 | 0,156 | 0,028 | 34,0 | 0,17 | 0,072 | 0,012 | 12,0 |
| All | | | 0,083 | 100,0 | | | 0,102 | 100,0 |

how much output growth in each sector actually increases employment in that sector relative to the other sectors.

Finally, there are regional differences in the composition of sectoral contributions. Investigation of the relative shares and coefficients of the different sectors indicates that in the Capital region and Eastern-Northern Finland private services has the highest contribution because of both its large share of output and its high employment potential (high coefficient). In contrast, in Middle Finland private services has the highest contribution due more to its high employment potential than share of output.

## *3. Concluding remarks*

Finnish unemployment sky-rocketed from about 3 to more than 16 per cent within three years in the early 1990s. Since 1992 economic growth has been rapid with an annual GDP growth rate of around 4,5 per cent. This has resulted in a fall in the level of unemployment to around 9 per cent. Although unemployment continues to show a steady decline, the process is generally regarded as too slow and a number of economists have argued that economic growth is producing less employment than it did before the recession.

This study examined the employment-output relation using panel data on 452 Finnish municipalities grouped into 85 areas. The study thus broadens the scope of the earlier debate on the Finnish employment-output relationship, which focused either on aggregate time series data or manufacturing industries.

Three basic features emerged. First, the turbulence of the economic development of the early 1990s is clearly evident in the results: the link between changes in employment and changes in output disappears in 1991–92 and, in 1994, the estimate on the exogenous decline in employment at a given output turns out to be positive. Second, there is evidence of a tendency towards normality. The results for the last year of the sample, 1995–1996, are in line with a priori beliefs as to a typical employment-output relation. Third, although the findings of the correlation between changes in employment and in output are, to some extent, sensitive to model specification, all the specifications imply a similar pattern in the development of the employment-output link over the investigation period.

As far as the regional features of the data are concerned, we find certain divergent signs. The exogenous change in employment is slightly stronger for the Eastern-Northern group of regions than for the other two groups. This suggests that the exogenous change becomes stronger as the share of agricultural production and the public sector increases. In contrast, the exogenous change in employment is the lowest in the regions oriented to private services.

Similarly, there is certain evidence of differences in the slope coefficients between the groups of regions. In particular, the results of the aggregate model indicate that employment reacts to change in output more strongly in the

Middle Finland group of regions than elsewhere. This result cannot be taken too far since sectoral disaggregation of the output variable reduces the differences in the overall output coefficients between the two groups of regions. It is, however, worth noting that the disaggregated analysis implies substantial differences in the relation on the sectoral level between these two groups. Private services play a major role in determining the correlation between changes in employment and in output in both groups, contributing about 50% and 66% of the total, respectively. In the case of Middle Finland the second main contributor is industry. For the Capital region and the Eastern-Northern region public services are the second main contributor.

It should be noted that the differences observed between the regions as well as over time are relatively small and may reflect a number of alternative factors, including the quality of jobs and/or the migration process. Furthermore, the sensitivity observed in the results may reflect, in part, the turbulence of the period. Similarly, its brevity may have affected the reliability of the estimation methods. Thus, any policy implications of the results are premature. This calls for further empirical investigation with more disaggregated data, including control variables such as the regional wage level.

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