Finnish Economic Papers – Volume 5 – Number 1 – Spring 1992

THE DEVELOPMENT OF REGIONAL UNDERUTILISATION OF LABOUR RESOURCES IN FINLAND 1972 – 89

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In this paper the regional utilisation of labour resources in Finland over the period 1972 – 89 is analysed. According to the results, underutilisation has increased in Southern Finland (excluding Uusimaa), while elsewhere the upward trend is not so apparent. Even though hidden unemployment has decreased at the expense of open unemployment, the hidden unemployment component remains the largest of the three components of regional underutilisation. The econometric analysis showed that regional differences in utilisation of labour resources tend to grow during upturns and diminish during downturns. Market conditions, however, seem to have no effect on regional underutilisation in the long run. The results concerning the effects of migration and regional policy were less clear. Some support was obtained for the hypothesis that underutilisation grows if barriers to migration increase.

1. Introduction

Following Thirlwall (1966) and Brechling (1967), a considerable number of studies have examined the dynamics and causes of regional unemployment disparities. The long-term persistence of marked unemployment differentials between regions has been seen as representing one of the most crucial problems confronting regional theory and regional policy (cf. Martin, 1981; Gordon, 1985a; Gordon, 1987).

An earlier study (Tervo, 1990) showed there to be marked regional differences in the utilisation of labour resources in Finland. A central feature of the approach developed was the use of a broader measure than the normal unemployment rate for the measurement of regional underutilisation. It was revealed that the registered unemployment rate fails to give a complete picture both of the variation in and, in particular, magnitude of non-utilisation.

Instead of a cross-sectional analysis of a single year, 1989, as in the earlier analysis, the present paper concentrates on a time-series analysis of regional underutilisation thus continuing work focusing on the dynamics of regional unemployment disparities, even though the regional underutilisation rate is analysed in place of registered unemployment differentials. The analysis includes two main goals. The first is to examine the main features of the development of the regional utili-

* *I would like to thank Heikki Eskelinen, Tuomo Nenonen, Paavo Okko and Jaakko Pehkonen and two anonymous referees for their useful comments on this paper. The research reported in this paper has received financial support from the Yrjö Jahnsson Foundation, which is gratefully acknowledged.*

sation of labour over time. Questions such as whether the development has been stable, or has been subject to fluctuations or shown any definite trend, are interesting from the point of view of both the development of aggregate underutilisation and its components.

The second goal is to model regional underutilisation. There are several 'schools of thought' with regard to the causes of regional unemployment disparities (cf. Martin, 1981; Tiller and Bednarzik, 1983; Fischer and Nijkamp, 1987). In this study three main factors underlying this medium-term development are hypothesised. Firstly, labour mobility is expected to have an effect on the development of the usage of labour resources: the fewer the barriers to migration the less the amount of regional underutilisation. Secondly, the economic situation of the national economy is hypothesised to influence regional underutilisation, since it is very likely that the cyclical sensitivity of different areas varies.

Thirdly, it is assumed that regional policy will have influenced regional underutilisation. One of the main goals of regional policy in Finland as well as elsewhere, especially in the 1970s, has been to bring unemployed labour resources into use. Whether this goal has been achieved is an open question. According to Tervo (1985), the level of employment would have been 12–17 % lower in the manufacturing industries of the assisted areas in 1981, if regional policy had not been pursued in Finland. Earlier examination of regional unemployment differentials in Finland has revealed that there are significant differences in (open) unemployment, but it has been difficult to determine whether the gaps have been narrowing or widening (Okko, 1981).

The present analysis is restricted to analysing developments over a relatively short study period, with the consequence that the basic determinants of regional unemployment disparities are hard to establish. From a longer-term perspective, these three factors are not expected to account solely for the prevailing, long-standing regional differences in the usage of labour resources. The determinants of these differences are obviously due to those factors which have affected the emergence of regional economic disparities in general.

This paper is organised as follows. First, the measurement of regional underutilisation is recapitulated. Then follows an account of the development of regional non-utilisation and its different components in Finland over the period 1972–89. The results of the econometric analysis are then presented, and the final section summarises the findings.

2. *Measurement of regional underutilisation*[1]

A measure of the regional underutilisation of labour resources should describe the difference between the hypothetical full-utilisation rate and the actual rate of utilisation in a region. The counterfactual situation of regional full-utilisation will be estimated by means of the data for the region of highest economic activity when allowance is made for structural differences.

The analysis assumes that the labour input of the reference labour market represents the 'normal' or 'possible' labour input-level for every regional labour market. This assumption is clearly invalid from a short-term perspective. Because of long-run regional differences, employment levels can vary in different labour markets so that it would be hard to mobilise all the 'unused' resources. For example, the activity rate can be high in developed labour markets because of urbanisation, the level of development or efficient labour market functioning. Wage rates and other labour market conditions may also vary between labour markets and, because of these existing incentives, the utilisation of labour resources becomes different in the regional labour markets. One way to disentangle the effect of the various factors influencing the differences between the reference and other labour markets is to make explicit allowance for structural differences. In practice, data limitations prevent a complete analysis of the various structural causes, but it is possible to take the most important of them into consideration.[2]

The aggregate measure of underutilisation

[1] *For a detailed discussion, see Tervo (1990) (cf. Taylor, 1974; Maddison, 1980 and De Neuborg, 1989, for a discussion of the measurement of cyclical underutilisation).*

[2] *Besides that it is useful to distinguish the effects arising from structural differences this will also save degrees of freedom in the estimations.*

is composed of three parts: open unemployment, hidden unemployment and underemployment. The value of each component will be estimated according to the same principle as the aggregate measure.

Accordingly, the aggregate underutilisation rate, uu, is defined as follows:

$$(1) \quad uu = (e^\circ - e)/e^\circ$$

where $e = H/N$ is the actual number of hours worked per person of working age and e° is the corresponding reference value. Equation (1) describes the share of non-utilised labour resources of the potential supply of labour in the region.

Analogously, the three components ou, hu and ue describing open unemployment, hidden unemployment and underemployment, respectively, can be defined as follows:

$$(2) \quad ou = (up - u^\circ p^\circ)/(1 - u^\circ)p^\circ$$

$$(3) \quad hu = (p^\circ - p)/(1 - u^\circ)p^\circ$$

$$(4) \quad ue = [(h^\circ - h)/e^\circ](L_e/N)$$

where $u = L_u/L$ is the unemployment rate, $p = L/N$ the labour force participation rate, $h = H/L_e$ the number of hours worked by the number of employed persons, u° the reference unemployment rate, p° the reference participation rate and h° the reference average working time. It can be shown that the total of the three components defined above equals the aggregate measure:

$$(5) \quad uu = ou + hu + ue$$

The reference values p° and h° will be estimated as follows:[3]

$$(6) \quad \hat{p}^\circ = \sum_j (N_j p^r_j)/N$$

$$(7) \quad \hat{h}^\circ = \sum_l (L_{el} h^r_l)/L_e$$

where j refers to age and l to industry and p^r and h^r are the values of participation rate and average working time, respectively, in the reference region. Accordingly, for example, the reference participation rate $\hat{p}^\circ$ is a weighted average of the age-specific participation rates of the reference region using the population shares of the study region. The reference value $\hat{e}^\circ$ is specified now as follows:

$$(8) \quad \hat{e}^\circ = \hat{h}^\circ (1 - \hat{u}^\circ)\hat{p}^\circ$$

The analysis is, of course, not without problems. As well as in the analysis of the non-utilisation of labour resources over time, a major problem of the regional analysis is to define the counterfactual situation of full-utilisation with which the actual situation could be compared. In the regional analysis this problem is perhaps not so serious as in the cyclical analysis, where long term economic and social changes make it difficult to estimate reliably the hypothetical reference situation. In the regional analysis, where the reference values are estimated from the data of another region, this difficulty is avoided provided that long term changes have similar effects in all regions.

In the regional analysis a problem of the same type, however, is encountered, if structural differences lead to divergences in labour market conditions so that, for example, there is variation in the natural rates of unemployment. The problem of structural differences can be handled only to some degree by the help of structural adjustments. On the other hand, from a longer perspective the problem of structural differences may not be regarded as a problem at all, since in the long run differences in the utilisation rate are not stable anyway. After all, these differences indicate the existence of unused potential labour resources.

In principle, regional differences in the degree of labour force utilisation may also be the consequence of voluntary supply decisions. Interpersonal differences in tastes and preferences influence individual supply decisions. Provided that people within the same areas behave similarly, for example because of local social or cultural customs, regional differences in the underutilisation rates may also follow from these voluntary supply decisions. Presumably these effects are not great, however.

[3] *Contrary to the previous cross-section analysis, the structural adjustments based on sex (i) and occupation (k) were not possible in this time-series analysis because of data limitations. Therefore the estimated reference value $\hat{u}$ equals u^r, the unemployment rate of the reference region, in this analysis.*

Still one shortcoming of the analysis is attached to the reference values. The analysis presupposes that labour resources are being utilised best in the 'leading region'. However, the labour market situation of that region may be overheated during economic booms. Unemployment would then be below its natural or NAIRU-level (non-accelerating inflation rate of unemployment) and there would be overutilisation of labour resources. This would have adverse effects on the inflation rate and, as a whole, on the equilibrium of the economy. Thus, even though resources are being utilised best in the reference region, this does not imply optimal utilisation.

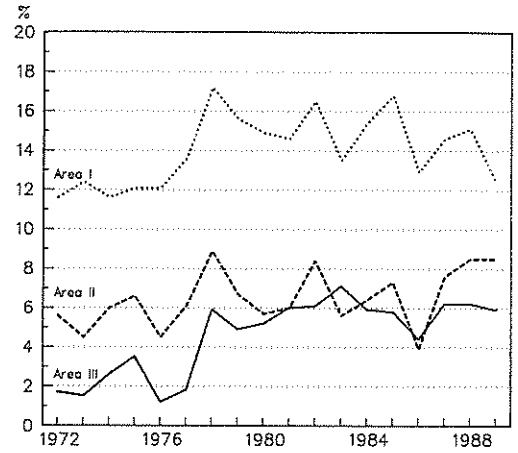

Figure 1. Aggregate regional underutilisation, 1972–89.

3. *Regional underutilisation in 1972–89*

For the empirical analysis Finland has been divided into four sub-regions. The province of Uusimaa is the reference region and the three other regions are composed of the other provinces of Finland. The analysis of these three regions is based on aggregated data. Uusimaa has been chosen as a reference region since it is assumed that economic activity there has been highest in every prevailing economic situation. The unemployment rate has also been lowest in Uusimaa.

The three other regions are called areas I, II and III. Area I consists of the northern and eastern parts of the country, which are the provinces of Lappi, Oulu and Pohjois-Karjala. Area I is very sparsely populated. The middle part of Finland belongs to area II and it consists of the provinces of Vaasa, Keski-Suomi, Kuopio and Mikkeli. The county of Ahvenanmaa (Åland) is also included in this area. Area III consists of the southern part of Finland, excluding Uusimaa. The provinces of Kymi, Häme and Turku & Pori belong to this area.

Roughly, the areas are in order of development so that the least developed parts of Finland are included in area I and the most developed parts in area III. However, large differences also exist within provinces so that a rude classification like this does not fully correspond to the actual situation of development or to the regional policy delimitation which has also changed somewhat during the

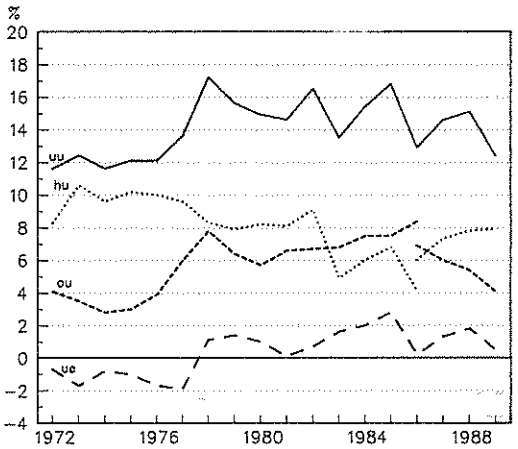

Figure 2. Regional underutilisation and its components in area I, 1972–89.

history of regional policy. In any case, regional assistance has been highest in area I, of medium strength in area II and lowest (or totally absent) in area III.

The results of the calculations are presented in Figures 1–4 (see also Table in Appendix). Regional underutilisation has been more evident in area I than in the two other areas, as Figure 1 clearly reveals. Annual variation in the three time-series seems to have run parallel in most years. However, the development of aggregate underutilisation in areas I and II does not seem to include any obvious (linear)

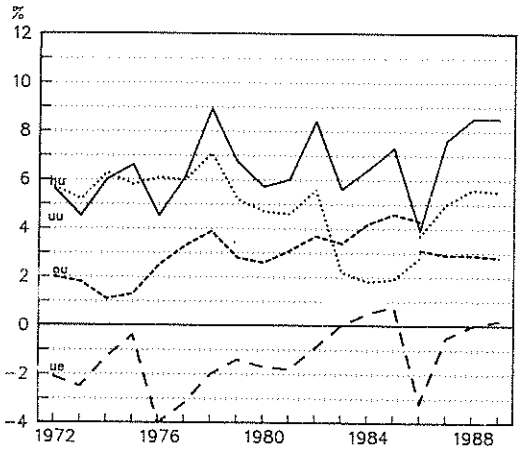

Figure 3. Regional underutilisation and its components in area II, 1972–89.

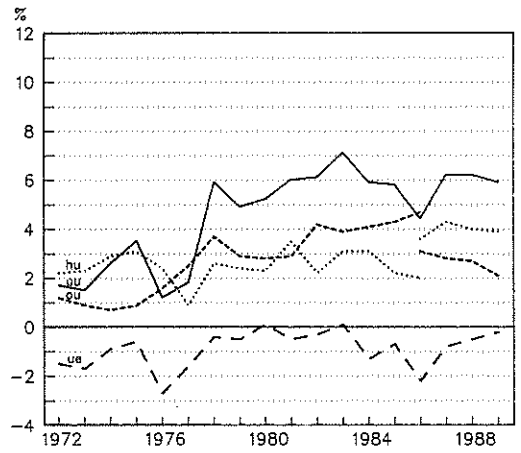

Figure 4. Regional underutilisation and its components in area III, 1972–89.

trend, while in area III — where regional assistance has been lowest — underutilisation has distinctly increased. As a result, while the aggregate underutilisation rate of area III was clearly lower compared with area II in the 1970s, this difference has reduced in the 1980s. The difference was even negative in 1983 and 1986.

A widely discussed question in regional labour market analysis is whether regional unemployment rates tend to converge or diverge in times of recession, or whether there are differences in the timing of business cycles at the regional labour market level. Past studies have variously made use of two alternative measures of the cyclical sensitivity of regional unemployment which give quite contradictory impressions: during recessions when aggregate unemployment increases absolute differences in unemployment rates between regions and over time seem to grow, while proportionate variations rather tend to decrease (cf. Gordon, 1985a). The same observation is obtained with the data used here: during the study period (which saw an increase in the national unemployment rate) the trend of the coefficient of variation of the aggregate underutilisation rates shows a statistically significant decrease[4], while absolute differences in underutilisation between regions rather seem to have grown or, at all events, remained stable. The correlation between the underutilisation rate and the national unemployment rate is also positive in all areas.[5]

Between the years 1972–1989 the data appears to indicate both smaller proportionate and larger absolute fluctuations in area I. A rough indication of this is obtained from the values of the coefficient of variation and range: the coefficient of variation of the aggregate underutilisation rate is 0.13 in area I, 0.23 in area II and 0.43 in area III, while the range is 5.6, 5.0 and 4.9, respectively. Clearly, in area I the value of the coefficient of variation is smallest, while the range is greatest.

An examination of the three components reveals that the two unemployment components ou and hu clearly have greater weight in the aggregate underutilisation rate compared with the underemployment component ue (Figures 2, 3 and 4). Furthermore, the ue component has negative values, especially in areas II and III. This result is in accordance with the earlier result of the analysis by provinces (Tervo, 1990).[6]

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[4] *The parameter estimate of the trend variable t (t = 1,2,..., 18) was −0.02 (t-ratio −4.12) in the estimation based on the coefficient of variation between all the four regions. The results do not change essentially even though Uusimaa is left out (the estimated coefficient is the same and the t-ratio −3.97).*

[5] *The correlation rates were 0.78 in area I, 0.32 in area II and 0.56 in area III.*

[6] *One explanation for these negative values is that the tight labour market situation in the reference region draws additional workers into part-time work which in turn reduces the average working times in the region.*

An eye-catching finding concerning all the areas is, on the one hand, the growth of significance of the open unemployment component and, on the other, the decline in the hidden unemployment component. Temporarily, in the mid-1980s, open unemployment was even more common than hidden unemployment. After the change of definition of unemployment to exclude persons on unemployment pensions the hidden unemployment component has again exceeded the open unemployment component.[7]

The decrease in the hu component reflects the rapid increase in the female labour force participation rate. This rate has been at a comparatively high level in Finland. The increase in female employment has caused a decline in the hu component expressly in the less developed areas where the female participation rate has traditionally been lower compared with the reference region. As a result, regional differences in the overall participation rate are now more due to the shares of retired and disabled persons than to the shares of persons keeping house.[8]

4. *An econometric analysis of the aggregate underutilisation rate*

Further investigation will concentrate solely on aggregate underutilisation. The aim of this exercise is to account for the annual variation in the aggregate measure in each of the three areas. However, the possibilities of this analysis are limited by the short span of the time-series available. When using such short-span time-series and crude data, it is useful to concentrate on a few economic relationships only. Therefore the aim is not to account for the prevailing differences between the areas but, rather, to model the development over the relatively short study period in each area. Thus, the aim is to model the main features of the Data Generation Process using a simplified representation based on the observable factors and related to existing theory.

4.1 Hypotheses and variables

The dependent variable of the analysis is the aggregate underutilisation rate in each of the three areas ($\mathbf{uu}_{\mathrm{I}}$, $\mathbf{uu}_{\mathrm{II}}$ and $\mathbf{uu}_{\mathrm{III}}$). This variable makes explicit allowance for certain structural differences, viz. for differences in the population (age) structure and for differences in the industrial structure. Certainly, other structural factors also underlie underutilisation, but data limitations prevent us from taking these into consideration.

Let us turn to the explanatory variables. Firstly, interregional migration is assumed to play an essential role in regional underutilisation. However, the equilibrating mechanism of interregional migration is incomplete due to different impediments to migration so that labour responds neither perfectly nor instantaneously to regional differences.[9] Gordon (1985b) and Cheshire (1981) have argued that in periods of economic growth and high levels of activity, migration is an effective equilibriator of regional unemployment disparities but that the efficiency of this adjustment process is much more limited in periods of recession when workers are less willing and able to move to areas of relative advantage (cf. also Pissarides and McMaster, 1989). Eriks-

[7] *The change of definition was carried out in 1987 (see note 4 to the Table in Appendix). Because the shares of those persons on unemployment pensions varies regionally, the change of definition also affects the components of the aggregate regional underutilisation rate. The breaks in the curves in 1986 in Figures 2, 3 and 4 are due to this change of definition (figures based on both classifications were available from 1986). In all, this is a good example of how the number of openly unemployed can be statistically lowered.*

[8] *An important question is whether regional differences in the shares of retired and disabled persons reflect voluntary early withdrawal from the labour force or enforced withdrawal from employment due to threat of unemployment or actual spells of unemployment. The second alternative seems more probable since it is hard to imagine why voluntary early withdrawal should take place in high-unemployment areas when it does not happen to a similar extent in low-unemployment areas.*

[9] *Pissarides and McMaster (1990) found that interregional migration in Great Britain responds to changes in regional relative wages and to differences in employment opportunities from which follows that eventually migration brings the system back into equilibrium. However, this adjustment was found to be very slow — even in the absence of exogenous shocks it takes more than twenty years. Eriksson (1989) analysed the situation of Finland. His results also implied that the market mechanism works but slowly.*

son's (1989) results concerning the situation of Finland implied that migration rates respond to unemployment ratios but not to differences. This result is consistent with the view that migration decreases with rising overall unemployment.

In general, if the factors affecting migration have changed, changes in regional underutilisation will also follow: if either material obstacles (like the costs of moving or the availability and price of housing) or social and psychological barriers to the interregional mobility of labour increase, regional underutilisation will tend to grow, and vice versa. The impediments to migration like these are, however, hard to measure.

Two types of variables has been used. The variable **MIGPPOP**, which is gross migration between the municipalities of Finland (internal migration) per 1000 mean population describes the level of migration activity. To a certain degree, it shows the general willingness to migrate and, thus, indirectly the development and variation of the barriers to migration. On the contrary, the variables $\mathbf{PNM_I}$ and $\mathbf{PNM_{II}}$ simply measure the amount of proportionate net migration losses in areas I and II, respectively. In these variables net migration losses of each year have been divided by the population figures of that year.

Secondly, it is hypothesised that market conditions will affect regional underutilisation. According to the 'aggregate demand hypothesis' presented by Tiller and Bednarzik (1983), the differential impact of a national business cycle occurs largely because area economies differ in the size of their export sector, income and price elasticity of export demand, marginal and average propensities to import and marginal cost functions. A related hypothesis concerns a hierarchical effect according to which the level of unemployment and the timing of changes is related to the position of the regions concerned in the spatial hierarchy and the level at which these regions are integrated into the national economy (Fischer and Nijkamp, 1987). This assumes that changes in the demand for labour are transmitted through the system with lags during which upturns in the economy will occur first in higher order places and later in lower order places.

Accordingly, even though cyclical underutilisation is at a minimum during economic booms, regional underutilisation can not then remain at a minimum. It is assumed, on the contrary, that it will increase, since in the leading region of the economy resources are then being used the most efficiently, for which reason regional differences will grow. Reciprocally, regional underutilisation is supposed to fall during economic recessions.[10]

On the other hand, market conditions will presumably have a delayed effect on the non-leading regions so that changes in economic activity will affect underutilisation with lags in these regions. According to this hypothesis, the economic situation will not influence underutilisation in the long run, i.e. the parameter value of the variable measuring economic activity should be zero in a static long-run solution to the dynamic model.

Economic activity is measured with the variable **GDPG**, which describes the growth of production. It is measured as the annual growth in real gross domestic product in purchasers' values. One problem is an interdependence between the economic situation and labour mobility. However, it is hard to introduce any hypothesis which is stated in terms of linear combinations of coefficients of the economic activity and migration variables.

Thirdly, regional differences in wage rates and, more generally, in income rates are expected to be associated with the magnitude of regional non-utilisation, at least indirectly through migration: if there exist large income differences between areas, migration will tend to increase and, accordingly, regional underutilisation decrease. Two types of variables are used. $\mathbf{INCR_I}$, $\mathbf{INCR_{II}}$ and $\mathbf{INCR_{III}}$ describe the ratio between average income in the reference region and in areas I, II and III, respectively. Average income is measured as income in state taxation per the number of income recipients. The second variable is **INCCF**, which is the coefficient of variation of the average incomes of the provinces. The data is based on Statistics of Income and Poverty which does not allow account to be

[10] *However, according to the counterarguments related to the situation of Finland, where the spatial division of labour is affected by the strong forest sector, the differential impacts of business cycles are not inevitably hierarchical. Which effect dominates in practice is an empirical question.*

taken of structural differences by age or industry.[11]

Finally, it is expected that regional underutilisation is affected by various policies. One of the basic economic goals of regional policy has been to bring into effective use resources otherwise unused. In Finland regional economic policy has been designed to influence the geographical distribution and generation of economic activity, mainly by encouraging expansion in problem regions through financial inducements to the private sector and a differentially high rate of public expenditure to improve the infrastructure. Besides regional economic policy labour market policies have aimed at reducing high regional unemployment rates. Furthermore, many other policies have regional effects.

The analysis of the policy effects on the regional utilisation of resources is hard to carry out. For example, regional economic policy has been pursued actively throughout the whole study period with no great differences in policy strength. One, and perhaps the only, possibility is to observe the trend of regional underutilisation when the effects of the explicitly defined factors underlying underutilisation are taken into account simultaneously. If this is a falling trend, particularly in those areas where regional assistance has been highest, we have the possibility that regional policies have reduced regional underutilisation. However, this observation cannot prove the efficiency of these policies, since other factors not taken into account here may also have affected the trend. Another drawback is associated with the effects of intervening factors. Presumably the creation of new jobs in the assisted areas reduces net outward migration and, accordingly, regional underutilisation will not inevitably fall (cf. Moore and Rhodes, 1977). Despite these potential flaws, a trend variable **TIME**, measured in time periods from 1972 onwards, is used in attempting to model regional underutilisation.

4.2 Estimation results

Various model specifications were estimated. Log-linear specifications and annual data over the period 1972–89 were used. The limited sample available was an impediment to a thorough-going analysis including, for example, the analysis of dynamic responses. The main results of the OLS estimations are shown in Tables 1, 2 and 3, which include six different estimated models for each area. A variety of diagnostics is reported. These test the normality of the disturbance term, first and second order residual serial correlation, heteroscedasticity, functional form and parameter constancy. The residuals appear to be well behaved in most estimations, and therefore most of the specifications can be regarded as good descriptions of the data.[12]

Some equations were also re-estimated by recursive least squares for a thorough investigation of parameter constancy. The graphs of the »break-point» Chow tests (not shown here) indicated some inadequacies in areas I and II: both equations break down in 1982 and 1986. Dummies for these two exceptional years were tried. As these dummies were not statistically significant, and especially as it was hard to discover any good theoretical explanation for them, their use was abandoned. The non-constancy seems to be associated with the variables **TIME** and **MIGPPOP**, as recursive estimates of the coefficients indicated (not shown here). On the contrary, the coefficients of the variables **GDPG** and $\mathbf{GDPG}_{-1}$ are stable. The Chow test showed no breaks in the area III estimations.

The explanatory ability as well as the overall significance of the regressions varies somewhat. In general, the equations of area III are determined best, while in area II the goodness of fit is lowest. It must be noted, however, that even in the best case the explanatory

[11] *Another possibility would have been to utilise the wage data of Industrial Statistics which would have allowed account to be taken of structural differences by industry. However, this data concerns only manufacturing industries.*

[12] *However, there are certain drawbacks. Most of the estimated equations of area I would seem to suffer from second order residual serial correlation. This might be an indication of the misspecification of the model. However, trials with lagged variables and certain other variables were unable to remove the problem. The problem of non-normalised residuals was encountered in some estimations of area II, which may violate the hypothesis testing procedure of the parameter estimates. However, estimated residuals may also be affected by misspecification of the model, in which case they do not inevitably reflect the true distribution of the random term. The ARCH and RESET tests are usually passed, with the exception of certain area III specifications.*

Table 1. Estimation results for area I.

Variables	Equation number					
	1	2	3	4	5	6
TIME	−.002	−.002	–	−.005	−.013	−.015
	(−.31)	(−.35)		(−.93)	(−1.35)	(−1.24)
ln(**MIGPPOP**)	−.767	−.696	−.698	−.933	−.538	−.378
	(−2.73)	(−2.36)	(−4.03)	(−4.14)	(−1.74)	(−.91)
ln(**PNM$_i$**)	–	−.048	–	–	–	–
		(−.89)				
ln(**GDPG**)	.046	.063	.045	.037	.063	.052
	(2.26)	(2.25)	(2.32)	(2.04)	(2.79)	(2.53)
ln(**GDPG$_{-1}$**)	−.025	−.020	−.029	–	−.050	−.051
	(−.99)	(−.77)	(−1.36)		(−1.69)	(−1.57)
ln(**INCR$_i$**)	–	–	–	–	−3.449	–
					(−1.48)	
ln(**INCCF**)	–	–	–	–	–	−1.389
						(−1.25)
INTERCEPT	5.66	5.45	5.24	6.52	6.90	2.43
	(3.86)	(3.63)	(8.09)	(5.52)	(4.22)	(.82)
Model performance						
S.E.	.085	.086	.083	.085	.082	.084
R^2	.670	.690	.667	.645	.721	.708
F-statistic	6.59	5.35	9.35	8.49	6.20	5.82
	F(4,13)	F(5,12)	F(3,14)	F(3,14)	F(5,12)	F(5,12)
Diagnostics						
LM(1) (serial correlation)	1.57	2.68	1.38	2.20	2.45	1.45
	F(1,12)	F(1,11)	F(1,13)	F(1,13)	F(1,11)	F(1,11)
LM(2) (serial correlation)	5.50	7.90	3.26	7.48	15.08	4.03
	F(2,11)	F(2,10)	F(2,12)	F(2,12)	F(2,10)	F(2,10)
Chi(2) (normality)	.50	.04	.71	.38	.68	1.21
ARCH (heteroscedasticity)	.51	.81	.53	.33	.57	.00
	F(1,11)	F(1,10)	F(1,12)	F(1,12)	F(1,10)	F(1,10)
RESET (functional form)	1.55	1.21	1.74	1.30	1.30	1.54
	F(1,12)	F(1,11)	F(1,13)	F(1,13)	F(1,11)	F(1,11)
CHOW (parameter constancy)	.82	1.55	.81	.62	.62	.55
	F(3,10)	F(3,9)	F(3,11)	F(3,11)	F(3,9)	F(3,9)

Notes: Dependent variable: ln(uu$_i$). OLS estimates 1972−89. t-values are in parentheses.

power is not particularly high, even if not extraordinarily low. Hence the development of regional underutilisation cannot be fully accounted for by the variables used: either all the important factors affecting regional underutilisation are not included in the analysis or the operationalisation of the factors into variables is not successful.

Let us turn to an examination of the parameter estimates of the variables. The two variables describing the effects of the economic situation (**GDPG** and lagged **GDPG$_{-1}$**) behave according to the hypotheses presented: during economic upturns regional underutilisation increases and only later, because of a delayed effect in the non-leading regions, will the change in market conditions reduce regional underutilisation. The parameter estimates of the lagged variable are, however, statistically insignificant in some specifications.

According to the hypothesis presented, the **GDPG** variable should have no effect on regional underutilisation in the long run, since it describes only the timing of fluctuations in the different areas. The long-run solutions of

Table 2. Estimation results for area II.

Variables	Equation number					
	1	2	3	4	5	6
TIME	.035	.032	–	.014	.026	.016
	(2.70)	(2.41)		(.94)	(1.37)	(.60)
ln(**MIGPPOP**)	1.059	1.182	−.162	−.102	1.689	1.635
	(1.80)	(2.01)	(−.36)	(−.17)	(1.59)	(1.82)
ln(**PNM_{II}**)	–	−.045	–	–	–	–
		(−1.19)				
ln(**GDPG**)	.099	.086	.110	.037	.102	.108
	(2.35)	(1.99)	(2.17)	(.74)	(2.36)	(2.46)
ln(**$GDPG_{-1}$**)	−.174	−.145	−.104	–	−.217	−.213
	(−3.31)	(−2.52)	(−1.88)		(−2.72)	(−3.05)
ln(**$INCR_{II}$**)	–	–	–	–	−6.248	–
					(−.72)	
ln(**INCCF**)	–	–	–	–	–	−2.054
						(−.86)
INTERCEPT	−4.94	−5.13	2.45	1.07	−4.23	−9.72
	(−1.61)	(−1.59)	(1.44)	(.33)	(−1.29)	(−1.52)
Model performance						
S.E.	.179	.176	.215	.234	.182	.181
R^2	.560	.607	.313	.191	.578	.586
F-statistic	4.14	3.70	2.13	1.10	3.29	3.39
	F(4,13)	F(5,12)	F(3,14)	F(3,14)	F(5,12)	F(5,12)
Diagnostics						
LM(1) (serial correlation)	.24	.21	.07	.12	.76	.77
	F(1,12)	F(1,11)	F(1,13)	F(1,13)	F(1,11)	F(1,11)
LM(2) (serial correlation)	.34	1.00	.99	.99	.52	.52
	F(2,11)	F(2,10)	F(2,12)	F(2,12)	F(2,10)	F(2,10)
Chi(2) (normality)	6.46	3.72	.77	2.22	6.02	6.57
ARCH (heteroscedasticity)	.17	.09	.00	.71	.12	.11
	F(1,11)	F(1,10)	F(1,12)	F(1,12)	F(1,10)	F(1,10)
RESET (functional form)	.58	.13	.00	.12	.86	.61
	F(1,12)	F(1,11)	F(1,13)	F(1,13)	F(1,11)	F(1,11)
CHOW (parameter constancy)	.14	.41	1.95	1.11	.70	1.08
	F(3,10)	F(3,9)	F(3,11)	F(3,11)	F(3,9)	F(3,9)

Notes: Dependent variable: ln(uu_{II}). OLS estimates 1972−89. t-values are in parentheses.

the estimated models support this hypothesis in most cases. In equation 1, for example, the static long-run parameters of the **GDPG** variable for the three areas are .021, −.075 and .185 with standard errors of .024, −.051 and .095, respectively. Accordingly, none of these parameter values deviate significantly from zero.[13]

Equations 5 and 6 include the variables measuring income differences between the areas. The signs on the coefficients of these variables are consistent with expectations. However, only in area III is the result statistically significant.

The migration variable does not behave well in all estimations. Its coefficients bear the right sign and are significant in most of the estimated equations of area I. In area III the signs are also as expected, but the variable fails to achieve significance. In area II estimations the results are puzzling. Here, the parameter

[13] *The parameter value of area III approaches close to statistical significance in this specification, but for example, in equation 6 the value of the long-run parameter estimate is only .022 with a standard error of .082.*

Table 3. Estimation results for area III.

Variables	Equation number				
	1	3	4	5	6
TIME	.049	–	.047	.079	−.039
	(2.00)		(2.29)	(3.53)	(−.94)
ln(**MIGPPOP**)	−1.572	−3.262	−1.677	−.440	1.017
	(−1.43)	(−4.22)	(−1.98)	(−.46)	(.72)
ln(**GDPG**)	.200	.215	.195	.342	.239
	(2.53)	(2.47)	(2.85)	(2.24)	(3.46)
ln(**GDPG**$_{-1}$)	−.016	.082	–	−.257	−.190
	(−.16)	(.87)		(−2.22)	(−1.72)
ln(**INCR**$_{III}$)	–	–	–	−41.84	–
				(−2.85)	
ln(**INCCF**)	–	–	–	–	−9.231
					(−2.45)
INTERCEPT	3.19	13.40	3.73	6.64	−18.31
	(.56)	(4.64)	(.84)	(1.39)	(−1.82)
Model performance					
S.E.	.334	.368	.322	.268	.284
R^2	.748	.670	.747	.850	.832
F-statistic	9.63	9.48	13.79	13.56	11.86
	F(4,13)	F(3,14)	F(3,14)	F(5,12)	F(5,12)
Diagnostics					
LM(1) (serial correlation)	.32	.03	.19	1.42	1.71
	F(1,12)	F(1,13)	F(1,13)	F(1,11)	F(1,11)
LM(2) (serial correlation)	1.50	3.53	1.60	.65	1.80
	F(2,11)	F(2,12)	F(2,12)	F(2,10)	F(2,10)
Chi(2) (normality)	.57	.75	.59	.27	.55
ARCH (heteroscedasticity)	.97	12.52	1.15	.23	.04
	F(1,11)	F(1,12)	F(1,12)	F(1,10)	F(1,10)
RESET (functional form)	2.57	.25	2.73	16.34	14.93
	F(1,12)	F(1,13)	F(1,13)	F(1,11)	F(1,11)
CHOW (parameter constancy)	.37	.30	.22	1.08	.12
	F(3,10)	F(3,11)	F(3,11)	F(3,9)	F(3,9)

Notes: Dependent variable: ln(uu_{III}). OLS estimates 1972−89. t-values are in parentheses.

estimate of **MIGPPOP** is often of the wrong sign, though insignificant. However, the sign on the coefficient of the other migration variable, **PNM**$_{II}$, is consistent with expectations. One explanation for these unclear results is associated with the problems related to the formation of the variable **MIGPPOP**: since it comprises the entire intercommunal migration, it also involves the migration between neighbouring communes which, however, is largely unaffected by the labour market conditions.[14]

[14] *Because of the possibility of multicollinearity, some trials were made with ridge regression, but the results did not essentially change. Another potential drawback is associated with the possibility of simultaneous equation bias: besides interregional migration affecting regional underutilisation it is conceivable that the amount of underutilised resources will also influence migration. The same possibility has also a bearing upon the income variables used. To eliminate the possible simultaneous equation bias, trials with two and three stage least squares estimation methods were carried out. To solve the identification problem, additional exogenous variables describing unemployment and income differences were used in the migration equation. However, the estimated coefficients of the underutilisation equation did not deviate notably from the parameter estimates of the OLS estimations. Thus the simultaneous equation bias does not seem to have great significance here.*

The trend variable, **TIME**, is signed positively in areas II and III and negatively in area I with varying statistical significance according to model. However, in most cases the former results are significant, while the latter are not. These results do not provide support for the hypothesis concerning the effects of regional policies: in area I, where regional assistance has been highest, the trend variable is not significant, even though of the right sign, and in area II, where regional assistance has been of medium strength, the trend variable is even positively signed.

As a final analytical step, seemingly unrelated regression was used to obtain estimates of the equation 2. The use of seemingly unrelated regressions can be regarded as one method for pooling time-series and cross-sectional data. Its use utilises information on the cross-equation covariances to improve efficiency in estimation. The distinguishing features of seemingly unrelated regressions are contemporaneous correlation in the disturbances and the assumption that each area has a different coefficient vector. In this estimation, however, the coefficients of **MIGPPOP** were restricted to be equal in each area. Two motives were behind this decision. On the one hand, it was assumed that barriers to migration should have a similar effect in each area. On the other hand, the problem of the wrong sign in area II estimations could be avoided by this means.

Table 4. Estimation results for pooled data.

Variables	Area I	Area II	Area III
TIME	.001	.005	.066
	(.10)	(.49)	(4.53)
ln(**MIGPPOP**)	−.594	−.594	−.594
	(−2.41)	(−2.41)	(−2.41)
ln(**PNM**)	−.014	−.015	−
	(−.31)	(−.42)	
ln(**GDPG**)	.051	.093	.201
	(2.17)	(2.11)	(2.86)
ln(**GDPG**$_{-1}$)	(−1.43)	(−1.39)	(−.95)
INTERCEPT	4.83	3.65	−1.80
	(3.82)	(2.51)	(−1.07)
S.E.	.072	.191	.292
R^2	.672	.305	.732
D-W	2.18	1.95	1.26
System R^2 .873			

Notes: Dependent variable: ln(**uu**). SUR estimates 1972–89. The coefficients of **MIGPPOP** are restricted to be equal in each area. t-values are in parentheses.

The estimates obtained by use of seemingly unrelated regression are given in Table 4. In broad outline, the results are rather similar to the area-specific OLS-estimations. The sign on the coefficient of **MIGPPOP** is now negative as expected.

5. *Concluding remarks*

This paper has analysed the regional underutilisation of labour resources in Finland over the period 1972–89. The results indicate an increase in regional nonutilisation particularly in area III, which contains the most developed parts of Finland (excluding the reference region, Uusimaa). On the other hand, there was no visible trend in the least developed area I. In general, absolute differences in regional underutilisation seem to have increased, while proportionate variations have rather decreased. A notable finding was also the decline in hidden unemployment at the expense of open unemployment. However, compared with the open unemployment component, the hidden unemployment component still carries more weight in the aggregate underutilisation rate. The significance of underemployment, the third component of aggregate underutilisation, is clearly smaller than the two other components.

In general, the estimation results did not provide a decisive answer to the determinants of regional underutilisation. One reason for this is the brief span of the time-series constructed. However, some interesting results were obtained. It was confirmed that economic activity affects regional underutilisation in the short run: regional differences grow during upturns and diminish during downturns. The estimated long-run effects also seemed to be zero, as was expected. Some support was also obtained for the hypothesis that underutilisation grows if barriers to migration increase.

The results regarding the role of regional policies were somewhat ambiguous. In the econometric exercise the results indicated no effect on these policies. However, other results showed that the difference in regional underutilisation between the non- (or only weakly) assisted area III and the assisted areas II and I decreased during the study period when regional policy was actively pursued. This

might be interpreted as indirect evidence for regional policy. Furthermore, since the main mechanism of adaptation to differential growth or the decline of regions within the national economy is flows of migration between regions, it is likely that an effective regional policy has the effect of reducing the level of net outward migration from a region before any substantial reduction in regional underutilisation is apparent.

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Appendix

The data are based on regional statistics of Finnish Labour Force Surveys.[15] During the study period (1972–89), some changes have taken place in the data collection system, which may make analysis of the results from different years more difficult. In 1976 the Labour Force Survey was revised in regard to the methods used and data included: changes were made in respect of the size, stratification and rotation of samples, the timing of the reference week and in the questionnaire itself (the revised survey included some new concepts and there were also some minor changes in the definitions used). The mail data collection system was replaced by interviews at the beginning of 1983. The following table shows the main results.

[15] *1972–76: Statistical Reports series TY. 1977–89: Official Statistics of Finland series XL.*

Table 5. Aggregate regional underutilisation and its components[1] in areas I, II and III, 1972–89.

Year	Aggregate underutilisation (uu)			Open unemployment (ou)			Hidden unemployment (hu)			Underemployment (ue)		
	I	II	III	I	II	III	I	II	III	I	II	III
1972[2]	11.6	5.6	1.7	4.1	2.0	1.2	8.3	5.7	2.2	−0.7	−2.1	−1.5
1973[2]	12.4	4.5	1.5	3.5	1.8	0.9	10.6	5.2	2.3	−1.7	−2.5	−1.7
1974[2]	11.6	6.0	2.6	2.8	1.1	0.7	9.6	6.3	2.9	−0.8	−1.3	−0.9
1975[2]	12.1	6.6	3.5	3.0	1.3	0.9	10.2	5.8	3.1	−1.0	−0.4	−0.6
1976	12.1	4.5	1.2	3.9	2.5	1.6	10.0	6.1	2.4	−1.7	−4.0	−2.7
1977	13.6	6.1	1.8	6.0	3.3	2.5	9.6	6.0	0.9	−1.9	−3.2	−1.6
1978	17.2	8.9	5.9	7.8	3.9	3.7	8.3	7.1	2.6	1.1	−2.0	−0.4
1979	15.6	6.7	4.9	6.4	2.8	2.9	7.9	5.2	2.4	1.4	−1.4	−0.5
1980	14.9	5.7	5.2	5.7	2.6	2.8	8.2	4.7	2.3	1.0	−1.7	0.1
1981	14.6	6.0	6.0	6.6	3.1	2.9	8.1	4.6	3.5	−0.1	−1.8	−0.5
1982[3]	16.5	8.4	6.1	6.7	3.7	4.2	9.1	5.6	2.2	0.7	−0.9	−0.3
1983	13.5	5.6	7.1	6.8	3.4	3.9	4.9	2.2	3.1	1.6	0.0	0.1
1984	15.4	6.4	5.9	7.5	4.2	4.1	6.0	1.8	3.1	2.0	0.5	−1.3
1985	16.8	7.3	5.8	7.5	4.6	4.3	6.8	1.9	2.2	2.8	0.8	−0.7
1986[4]	12.9	3.9	4.4	8.4	4.3	4.7	4.1	2.8	2.0	0.2	−3.2	−2.2
				(6.9	3.1	3.1)	(6.0	3.7	3.6)			
1987	14.6	7.6	6.2	6.0	2.9	2.8	7.3	5.0	4.3	1.3	−0.5	−0.8
1988	15.1	8.5	6.2	5.4	2.9	2.7	7.8	5.6	4.0	1.8	0.0	−0.5
1989	12.4	8.5	5.9	4.1	2.8	2.1	7.9	5.5	3.9	0.5	0.2	−0.2

All terms are expressed in percentages (they have been multiplied by 100).

[1] For the computation of the reference values (cf. Equations 5 and 7) age j has been divided into twelve classes (15–19, ..., 70–74) and industry l into seven main industries. However, in 1972–75 the age classification was different so that the classes were larger for the older age-groups. Other classifications based on sex (i) and occupation (k) (cf. Tervo, 1990) have not been used owing to a lack of data.

[2] Instead of hours worked, the data over the period 1972–75 is based on days worked. This exerts an effect on the underemployment component and, further, on the aggregate underutilisation rate. However, the differences have no great significance in practice.

[3] There were some deficiencies in to data relating to 1982. Therefore the underemployment component is partly based on assessments.

[4] Until the end of 1986 persons on unemployment pensions were also counted as unemployment. As from 1987 they are only counted as unemployment if seeking employment. This change of definition of unemployment has its effects on both the open and hidden unemployment component, but it does not influence the aggregate underutilisation rate. The figures in parentheses in 1986 describe the situation in which the new classification has been applied.