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MIGRATION ANALYSIS AND REGIONAL POPULATION PROJECTIONS [1]

BY

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Abstract

The Central Bureau of Statistics in Norway has produced regional population projections for a long period, in which migration is projected by fixed rates of gross out-migration and fixed distribution of in-migrants among regions. During the last years we have completed a model called DREM (Demographic Regional Economic Model) with other migration assumptions, taking into account changes in regional labour markets. This paper is primarily concerned with the migration submodel of the DREM model. We first give a short presentation of the whole model. Furthermore we describe how the migration submodel is estimated. The paper also presents some results of the regression analysis. Finally some proposals for the further work with the migration submodel are discussed.

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1. THE DREM MODEL

The aim of the DREM model is twofold. On one hand it is a model projecting the balance between demand and supply of labour in the regional labour markets. Secondly, it is a model for population projections at the county level. As in many other countries, counties in Norway is an administrative level between the national level and the municipal level with important planning responsibilities. Altogether Norway is divided into nineteen counties. In the DREM migration submodel the capital and the surrounding county, Oslo and Akershus, are treated as one county, so that the model consists of eighteen counties.

An outline of the main elements in the DREM model is given in figure 1.1 (In Norwegian, the model is called DRØM). The labour market projections of DREM are designed to give regional breakdowns of results from projections made by use of national models. Estimates of labour demand resulting from computations with a national economic planning model are broken down by county by means of a regional input-output model called REGION. This is a separate model that has been operative for some years. There also exists a model of labour supply at the national level (MATAUK). Projections obtained from this model are broken down by county in a DREM submodel. Imbalances between demand and supply in the regional labour markets are projected by REGION and the DREM labour supply submodel.

The labour market balances are used to project net migration for each of the two age groups 16-24 years and 25-49 years. Gross out-migration, specified by one year age groups and sex, is calculated assuming fixed rates of out-migration. Gross in-migration to each region for each of the broader age groups is projected residually. It is distributed by sex and one-year age groups on the same proportions as in the base period. Gross in-migration of children is assumed to depend on in-migration of adults (25-49 years). The migration rates for persons 50 years and more, are the same as the ones used in the traditional population projections.

The net migration submodel in DREM is estimated for the period 1972-1986 by using regression methods.

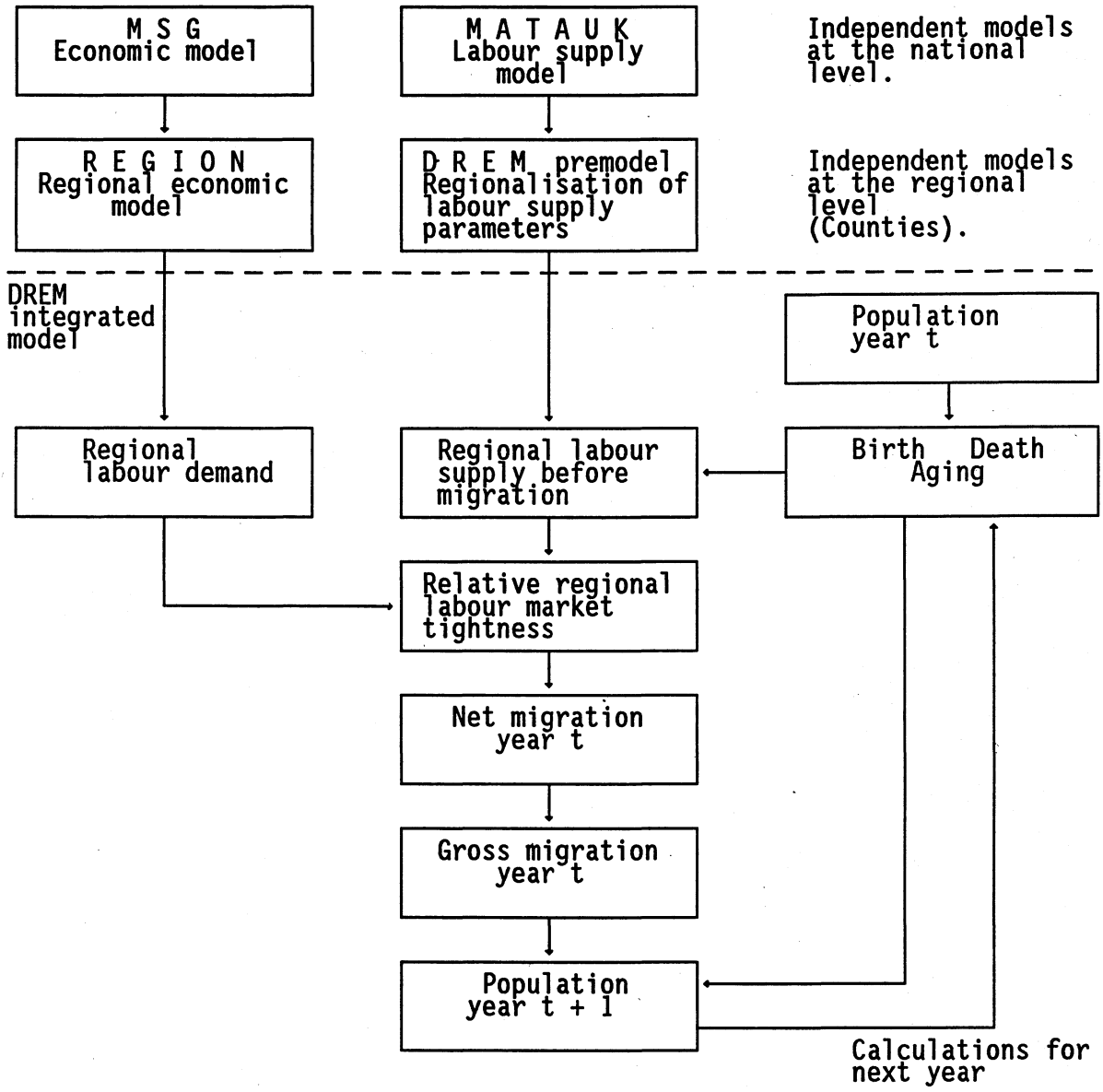

FIGURE 1.1 The DREM model

The model is estimated applying an iterative non-linear least squares routine to data of a combined time series-cross section type. In our migration analysis corresponding computations are also made for gross in- and gross out-migration.

In order to evaluate the explanatory power of the migration submodel, we have compared the results from this model with estimates derived from a simple model, where migration is determined by an autocorrelation process. A measure of the reduction in residual variance is taken as an indicator of the performance of the full model.

2. THE DREM MODEL IN A THEORETICAL PERSPECTIVE.

Several theories and models have been developed to explain the migration processes. They are all more or less selective in their way of handling explanatory variables, and none of them represent a comprehensive representation of the various factors influencing migration. Most attempts to model internal migration at an aggregate level have assumed the labour market to be a key factor. This may be for theoretical reasons, or due to problems connected with forecasting regional trends of other factors. The DREM model fall into the category of such "partial models" by focusing just the relationship between migration and labour market development. In addition, the DREM model depends in a considerable extent on fixed rates of gross out-migration.

However, studies at micro level, like the Norwegian Survey of Migration Motives 1972 (Central Bureau of Statistics (1977)), show the complexity of motivations behind migration flows. Factors like migration distance and direction, and personal characteristics of the migrants like age, education and family situation are all important. This complexity of migration motives makes it natural to question the utility of crude studies at an aggregate level in gaining insight in the migration processes. On the other hand answers to surveys of individual motives might have an "egocentric bias". The respondents often mention the last personal argument in a chain of causes, and take political or economical conditions that may affect migration decisions as granted. In many cases the macrostructures will be more or less "invisible", so that subjective reports of migration motives often may represent rationalisations inside a frame of a more complex reality. Anyhow, the surveys may indicate factors which are worth modeling at an aggregate level. The Norwegian Survey of Migration Motives 1972 pointed out the following major migration motives for migrations between municipalities: labour market conditions 35 percent, housing and environment 27 percent, family 12 percent and education 9 percent. Going up to the county level migration motives as labour market conditions and education increased in importance to respectively 38 percent and 11 percent, while housing and environment decreased to 21 percent. Migration motives related to housing tend to be more important for short distance moves, while motives related to labour market and education tend to be more important for moves over longer distances. Aggregating also the capital Oslo with the

surrounding county Akershus, as we do in the model, would further increase the importance of labour market motives.

An earlier empirical migration analysis of the DREM migration submodel also included proxies of regional housing market and educational possibilities. The results showed that house-building and educational possibilities seem to affect only in-migration, and that the explanatory power in regard to the net-migration rates was very low beyond the explanation power caused by the regional labour market change (Lian (1986)). For projection purposes we ought to have a priori assumptions on the grouping of counties based on knowledge about the different explanation variables. We have still no convincing way to project regional housing supply and regional educational supply.

In the international literature we find several attempts to model the relationship between labour market change and internal migration. The DREM migration submodel is basically a macromodel for migration, as net-migration is related to regional labour market change. This connects the model to migration theories grounded more on macro relations than on micro relations. Regional unbalances between demand and supply of labour are traditionally associated with the socalled equilibrium theories, which are grounded on the viewpoint of classical economic theory. These theories consider migration as a mechanism contributing to equilibrium between regions with high and low income level. The more affluent regions will gradually lower their income level as a result of high in-migration. However, these theories do not explain well migration that takes place in opposite direction of what is expected, and the situation in regions which seem to experience continually decline in the labour market.

As an alternative to the equilibrium theories there exist theories that assume a more cumulative development in the migration process. Myrdal and Hirschman maintain that spiral effects often arise, so that the difference between regions with positive and negative net-migration may increase. Longtime out-migration will have negative feedback on the labour market and the home environment and reduce the foundations for services. This pattern of development will give new incentives to migrate and the whole out-migration process will become cumulative (Lian (1986)).

From these migration theoretical points of view, the DREM migration submodel is mainly related to the assumptions of tendencies towards equilibrium. Unlike the traditional equilibrium theories, the model is more directly related to the demand and supply of labour, and not to the regional differences in income level. The migration pattern in DREM is modelled so that net out-migration from a region reduces the supply of labour, which means that an excess of supply over demand for labour will be reduced. From this follows in the next period a reduction in the projected net out-migration. In the same way the model will after some time reduce the net in-migration to regions with a surplus of demand for labour, as the supply of labour increases through the net in-migration. The models stronger relation to the equilibrium ideas, is also related to the models heavier weight on the demand side of the labour market, and that it in a less degree takes into account the feed-back effects of the supply side. The existing migration model has constant terms and lagged variables that to a certain degree give cumulative effects, but the labour market indicator might partially counteract this. We have, however, in the model REGION recently introduced feed-back effects from the population development in the projections of certain public service activities, which partially can give rise to more cumulative effects in the migration projections of the model.

The DREM migration submodel is indirectly connected to the socalled pull-push theories of migration (Lee (1969)), in the way it postulates decreasing net in-migration to regions with strong push factors in the labour market, and increasing net in-migration to regions with strong pull factors in the labour market. On the other hand the model is less convenient for migration analyses that aim to explain the migration-processes according to more individually based migration theories. Nevertheless, implisitly migration theories like the human-investment theories and career/lifecycle theories expect regions with the largest and most diversified labour market and with the best employment possibilities, to be net receivers of migrants.

Ideally, we should have constructed a migration model that included some micro and macro relations simultaneously. Trønnes (1983) and Lian (1986) in their migration analyses connect regional labour market changes to time variations in both net- and gross-migration rates. The results showed that

such models give better explanation of the time variations in the net-migration rates.

The empirical migration analysis presented in this paper is an attempt to update earlier migration analyses in the DREM model. Both the net- and gross-migration rates are related to data on labour market change. The regional labour market data are extended to the period 1972-1986, while the earlier migration analyses were based on the period 1967-1979. The regression analysis is now made more detailed by estimating specific parameters for each county. The hypothetical expectations are that counties with negative labour market change will get decreasing net in-migration rates, while counties with positive labour market change will get increasing net in-migration rates. With regard to gross-migration, we expect the rate of gross out-migration to decrease with increasing demand pressure on the regional labour market. For in-migration the expectations will be the opposite.

3. THE DATA AND THE LABOUR MARKET INDICATOR.

In our empirical migration analysis we need relevant data for the development of the migration between counties and for changes in the regional labour markets. The migration rates are derived from annual counts of the population register, which is of rather good quality. Persons living in different counties at the beginning and the end of a year are defined as migrants. In this way the migration is counted as the number of migrants and not as the number of migrations. A migration rate is calculated as the number of migrants pr. thousand inhabitants. As the number of inhabitants we have used the mean population in a year. We have used this type of rates both for net- and gross-migrations.

It has been much more difficult to find relevant data on the regional labour markets. The statistical base for regional labour market data is rather weak, and we have used different methodes to construct regional time series by combining various statistical sources. (See Stambøl (1989)).

It exists, as indicated in the previous section, an extensive international literature pointing out the relative tightness in regional labour markets

as important for both the extent and the directions of migrations. Brun (1982) has on the basis of such hypotheses, defined an indicator of the tightness in the labour market as the relation between demand and supply of labour. This measure is used as a regional labour market indicator. In order to rule out general variations in economic activity, it is calculated as the difference between the tightness in a regional and national labour market.

$$(1) \qquad X_{j,t} = \frac{D_{j,t}}{S_{j,t}} - \frac{\sum_j D_{j,t}}{\sum_j S_{j,t}}$$

where $X_{j,t}$ is the indicator for region j in year t. D and S is the demand and supply of labour. The demand of labour in a region is defined by: $D = ER + V$ where ER is the number of employed persons by county of residence and V is reported vacancies in the county. Correspondingly the supply of labour is given as follow: $S = ER + U$ where U is the number of unemployed in the county. Equation (1) is used as one alternative of expressing regional labour market status, and is in this paper named alternative A. This labour market indicator has been used in earlier migration analyses for the DREM model. It is, however, very sensitive to the registration of vacancies and unemployment. One problem is the data quality of each of these variables. The quality of the data may vary both over time and between regions. Another problem is the focus on this variables as labour market indicators. Fields (1976) suggests that the probability to get a job and keep it, should be the preferred indicator for the potensiality of migration rather than unemployment. He thinks that "the turnover" in the labour market gives a better explanation of the migration rates than unemployment. Moen (1980) strengthens this hypothesis by saying that there exists several types of unemployment that not necessarily result in migrations (e.g. social unemployment, seasonal unemployment etc.). In cases of structural unemployment caused by changes in industrial and occupational structure, the unemployed will not necessarily find convenient jobs, neither in the home region nor in another region.

We have constructed an alternative measure of regional labour market change counting number of employed according to county of employment (as opposed to county of residence). This second alternative is here named B. This

alternative is more in accordance with the model REGION, which projects regional labour demand according to the county of employment. This alternative also includes a one year lag on the supply side of labour, for better measuring the year-to-year changes of labour in the regional labour markets. How the labour market indicator B is formulated, is shown in equation (2).

$$(2) \qquad X_{j,t} = \frac{D_{j,t}}{S_{j,t-1}} - \frac{\sum_j D_{j,t}}{\sum_j S_{j,t-1}}$$

where the symbols D, S, j and t mean the same as in equation (1), but their definitions are different. The demand of labour in a county (D) is defined by: $D = EE + V$, where EE is the employed persons by county of employment and V is the same as in equation (1). The supply of labour (S) is defined by: $S = (ER + U)C$ where ER and U are the same as in equation (1) and C is a measure of net-commuting between counties (Calculated as employed persons by county of employment divided by employed persons by county of residence). In the calculation of the supply of labour we have then made the assumption that the unemployed will apply for jobs outside their counties according to each counties level of net-commuting. This adjustment at the regional labour market is still not included in the DREM projection model, which, however, might have to be adjusted in the light of the results of the present project.

The employment data used in the empirical analysis includes 12 groups of persons considering sex, age (16-24 years, 25-49 years and 50-74 years) and hours worked (full time/part time). In this paper we have payed attention to the two age groups 16-24 years (youth) and 25-49 years (adults). According to earlier migration analyses this is a natural age specification, since migration patterns of youth differs from other age groups. In addition migration motives also differ between youth and adults as a reflection of different life-cycle phases (Stambøl (1987)). The labour market figures are used to calculate aggregated complete labour market balances, sex specific labour market balances and age and sex specific labour market balances.

4. THE REGRESSION MODEL.

In previous migration analyses for the DREM project a regression model was developed to estimate the parameters of the explaining variables. In Lian and Sørensen (1984) it is shown how assumptions about unobserved variables may lead to a model with county specific constant terms and autocorrelated residuals. The assumptions of autocorrelated residuals give a model whith one year lag on both the migration rates and the regional labour market indicator. Including some minor adjustments we have used the same model formulation in our present migration analysis. To simplify the formal presentation, only the simplest version of the model is presented here:

$$(3) \quad Y_{j,t} = a_j + b_j X_{j,t} + u_{j,t}$$

j and t are indexes for county and year respectively

$Y_{j,t}$ = migration rate
$X_{j,t}$ = labour market indicator
a_j = county specific constant term
b_j = county specific parameter of the labour market indicator
$u_{j,t}$ = residuals

The correlations of the residuals may have a time and space dimension. We disregard the spatial autocorrelation and assume that the residuals follow a first order autoregressive process. Unlike the earlier migration analyses in DREM we operate with county specific parameters of both the labour market and the autocorrelation. We get:

$$(4) \quad u_{j,t} = k_j u_{j,t-1} + d_{j,t}$$

k_j = county specific autocorrelation coefficient
$d_{j,t}$ = independent normally distributed residuals with constant variance and expectation like zero

By multiplying equation (3) for time t-1 with k_j and subtracting the results from (3) we get:

$$(5) \quad Y_{j,t} = c_j + k_j Y_{j,t-1} + b_j X_{j,t} - b_j k_j X_{j,t-1} + d_{j,t}$$

c_j = county specific constant term

Model (5) is equivalent to (3) and (4). Regressions on (5) give consistent estimates of both the parameters and variance of the residuals in model (3). The present migration rates will then be "explained" through the present labour market indicator, and the labour market indicator and the migration rate lagged one year. We expect that the county specific constant term of the model captures the cross section differences in the average level of the counties' migration rates. To help evaluating the results, we use a special measure, expressing the reduction in residual variance achieved by going from a simple model, disregarding the explanatory variable to a full model (5) including the labour market indicator. The simple model is:

(6) $Y_{j,t} = d_j + v_{j,t}$

d_j = county specific constant term
$v_{j,t}$ = residuals

We also here assume that the residuals follow a first order autoregressive process, and in the same way as under (4) we get:

(7) $v_{j,t} = l_j v_{j,t-1} + e_{j,t}$

l_j = county specific autocorrelation coefficient
$e_{j,t}$ = independent normally distributed residuals with constant variance and expectations like zero

In the same way as under (5) we get:

(8) $Y_{j,t} = g_j + l_j Y_{j,t-1} + e_{j,t}$

g_j = county specific constant term

The regressions based on (8) give consistent estimates on both the parameters and the variance of residuals in model (6). The variance reduction achieved by turning from model (6) to model (3) should then give a measure

of the ability of the labour market indicator to account for the evolution over time in the migration rates. This variance reduction is expressed as follows:

$$(9)\quad R^2x = \frac{Var\,(v_{j,t}) - Var\,(u_{j,t})}{Var\,(v_{j,t})} = 1 - \frac{(1 - l^2)\,(1 - R^2f)}{(1 - k^2)\,(1 - R^2s)}$$

$$l^2 = \frac{1}{18}\sum_j l_j^2 \qquad k^2 = \frac{1}{18}\sum_j k_j^2$$

R^2f = explained variance in model (5) (full model)
R^2s = explained variance in model (8) (simple model)

All models were estimated applying an iterative least squares method. The model (5) is non-linear, owing to restrictions on the coefficients.

We draw attention to the fact that the measure for the explanatory power of the labour market change on the time variation of the migration rates, is an expression for the additional explanation by taking into account the regional labour market. The measure does not tell anything about the total explanation power of the labour market. This have connection with the correlation between the labour market indicator and other explanatory variables.

5. RESULTS

In this chapter we present some of the results from our migration analysis. First we have choosen some results which show the effects of the labour market conditions on the time variations of the migration rates. Secondly we show some results from an analysis measuring the relationship between the regional labour market conditions and the cross-section differences in the average level of the migration rates. All the results repported here are based on alternative A as labour market indicator (see chapter 3). We did not obtain complete regressions based on alternative B, because the estimation routine did not converge for some of the person groups involved.

Time series regressions.

The results of the time series regressions are shown for each sex and the age groups 16-24 years and 25-49 years. In table 5.1 is shown the models explanation and variance of both the net- and gross-migration rates. R^2x is the measure of variance reduction comparing the full model to the simple one. The total explanation in the simple model (R^2s) and the full model (R^2a) (R^2a=full model based on alternative A) is high due to a model formulation with county specific constant terms, capturing most of the differences in the average level of the migration rates between counties. In general, the migration rates vary more between counties than they do over time (See also Lian and Sørensen (1984)). The most surprising result is that the labour market conditions seem to have a stronger effect on time variations of the gross-migration rates than of the net-migration rates. Earlier migration analyses in DREM gave the opposite result. The effect is particularly strong on gross out-migration for both the youths and the adults. We also notice that the total explanation in both the simple and the full model is stronger on gross-migration than on net-migration in all the person groups. This means that the average level of year-to-year changes in the net-migration rates has been stronger than in the gross-

TABLE 5.1 Explanations in models with and without the regional labour market indicator. 1973-1986. Alternative A.

Age	16 - 24 years			25 - 49 years		
Model	R^2s	R^2a	R^2x	R^2s	R^2a	R^2x
Net-migr. Tot:	0.89	0.91	0.15	0.84	0.85	0.11
Male:	0.84	0.87	0.14	0.79	0.80	0.04
Female:	0.88	0.89	0.06	0.84	0.86	0.14
Out-migr. Tot:	0.94	0.94	0.19	0.95	0.96	0.16
Male:	0.89	0.90	0.16	0.93	0.94	0.17
Female:	0.94	0.95	0.12	0.95	0.96	0.17
In-migr. Tot:	0.93	0.93	0.07	0.87	0.88	0.09
Male:	0.91	0.92	0.06	0.86	0.87	0.10
Female:	0.91	0.92	0.09	0.85	0.86	0.08

migration rates. The earlier migration analyses in DREM gave small differences in power of explanation between the sexes. The results in table 5.1 show considerable differences between the sexes, in particular for the explanation of the net-migration rates.

In order to test the stability in the model estimates over time, we have performed regressions for both the periods 1973-79 and 1980-86 separately. The results for both sexes are shown in table 5.2. The model gives considerable differences in the explanation between the 1970s and the 1980s. Except for net-migrations in the oldest age group, the labour market explanations of the time variations of the migration rates decrease. In the oldest age group this coincides with increasing explanation in the simple model (R^2s), which means that the average level of year-to-year changes in the migration rates are smaller in the 1980s than in the 1970s. In the youngest age group there has been an increase in the year-to-year changes in the gross-migration rates. This should partially increase the potential of the labour markets explanation of the time variations of the gross-migration rates. When it does not, it is due to the changes in the autocor-

TABLE 5.2 Explanations in models with and without the regional labour market indicator. 1973-79 and 1980-86. Alternativ A.

Age	16 - 24 years			25 - 49 years		
Model	R^2s	R^2a	R^2x	R^2s	R^2a	R^2x
1973-1979: Net-migration	0.90	0.92	0.15	0.85	0.87	0.08
Out-migration	0.95	0.97	0.49	0.95	0.97	0.17
In-migration	0.94	0.95	0.25	0.87	[1] ---	[1] ---
1980-1986: Net-migration	0.93	0.94	0.07	0.88	0.90	0.14
Out-migration	0.91	0.93	0.23	0.96	0.96	0.01
In-migration	0.93	0.95	0.16	0.89	0.91	0.14

[1] Not included. The estimation routine did not converge.

relation. Anyhow, the results for each of the two sub-periods separately also show that the labour market explanation is strongest for out-migration, except for the oldest age group in the 1980s. In the former migration

analyses, one parameter common to all counties indicated a strongly significant influence of the labour market indicator. In our new analysis, several of the estimated county specific parameters are not significant.

Among other regression results, we will mention that, as far as the estimation routine did converge, the labour markets explanation of the time variations of the migration rates based on the labour market indicator alternative B, showed a somewhat stronger explanation of the net-migration rates and a somewhat weaker explanation of the gross-migration rates. Regressions performed on different segments of the labour market showed some differences in explanation power going from models including complete labour markets to models including sex and age specific labour markets. It seemed that for males the labour markets explanation power of the migration rates became somewhat reduced by turning to more disaggregated labour markets, while the situation for females seemed to be the opposite. The results might reflect the fact that males have access to a greater part of the labour market, while female employment opportunities seem to be concentrated to fewer occupations.

According to our hypothesis concerning the relationship between the regional labour market change and the net- and gross-migration rates (see chapter 3), the hypothesis concerning time variations in the migration rates can be tested using the estimated county specific parameters of the labour market indicator (see equation 3). The interpretation of the parameter estimates on the labour market indicator, is that a change in a thousandth lead to a change in the migration rates like parameter/1000. For youth the average tendency seems to follow the expected one, with negative parameters on out-migration and positive parameters on both the in- and net-migration. For adults the average tendency fits well to the in- and net-migration, but not to the out-migration. For youth, eleven out of eighteen counties follow the expected tendency for net-migration, while 12 and 9 counties follows the expected tendency for in-migration and out-migration respectively. For adults the number of counties following the expected tendency are 11 counties for net- and in-migration and only 7 counties for out-migration.

Cross-section analysis.

So far we have discussed the estimation results stressing the time variations of the migration rates. It is also of great interest to consider the cross-section variations of the migration rates in relation to the regional labour market changes. In the model the county specific constant terms are expected to capture the cross-section variations of the migration rates. In an ad-hoc analysis we have looked into the relationship between the regional labour market change and the cross-section variations of the gross-migration rates using relative measures for both data sets. The relative level of the gross-migration rates in each county is calculated in the same way as we calculated the regional labour market indicator (see chapter 3). The average level of the gross migration rates for the whole country is a weighted average over all the counties. When both the regional labour market indicator and the relative level of each counties gross-migration rates are measured per thousand, it is possible to plot the relative level of each counties labour market and gross-migration in the coordinat system shown in the Figures 5.1-5.8. The Figures shows average measures for the periods 1973-79 and 1980-86 respectively.

The Figures show 8 different possible combinations of the relative regional labour market indictors and the relative gross-migration. Counties with index values along the diagonal where the ratios between relative labour market conditions and relative gross in-migration is 1.0, have a level of gross in-migration rates that fits well to their labour market conditions (the Figures 5.1-5.4). Counties with index values in the sectors 2,3,4 and 5 will have a relative level of gross in-migration which is higher than the labour market conditions would suggest, while the situation is opposite in the counties with index values in the other sectors. Correspondingly, in the case of relative gross out-migration, counties with index values along the diagonal where the ratios is -1.0, have a level of gross out-migration that fits well to their labour market conditions (the Figures 5.5-5.8). Counties with index values in the sectors 1,2,3 and 8 all have a relative level of gross out-migration which is higher than the labour market conditions should indicate, while the situation is opposite in the counties with index values in the other sectors. Using pull-push theories, counties with index values in the sectors 7 and 8 in the case of gross out-migrations,

In the Figures 5.1-5.8 the counties are indicated as follows: Østfold=Ø, Oslo/Akershus=O/A, Hedmark=He, Oppland=O, Buskerud=B, Vestfold=V, Telemark=Te, Aust-Agder=AA, Vest-Agder=VA, Rogaland=R, Hordaland=Ho, Sogn og Fjordane=SF, Møre og Romsdal=MR, Sør-Trøndelag=ST, Nord-Trøndelag=NT, Nordland=N, Troms=Tr and Finnmark=F.

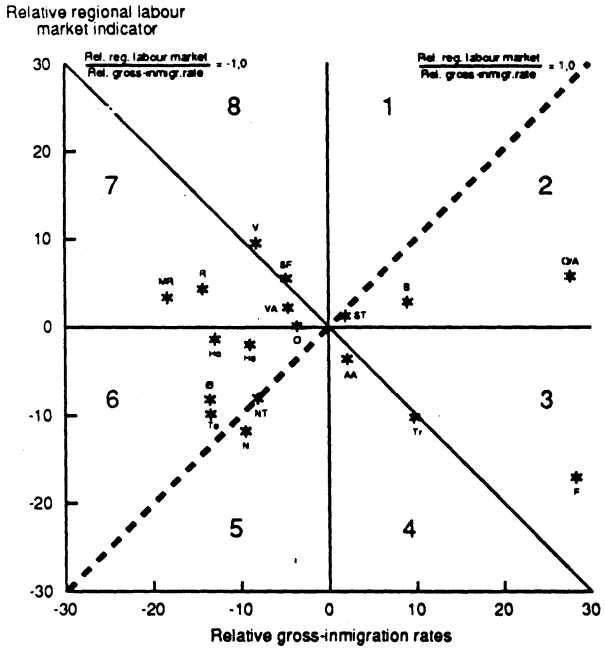

Figure 5.1. The relationship between relative regional labour market conditions and relative gross-inmigration rates. 1973-1979. Persons 16-24 years. Per thousand

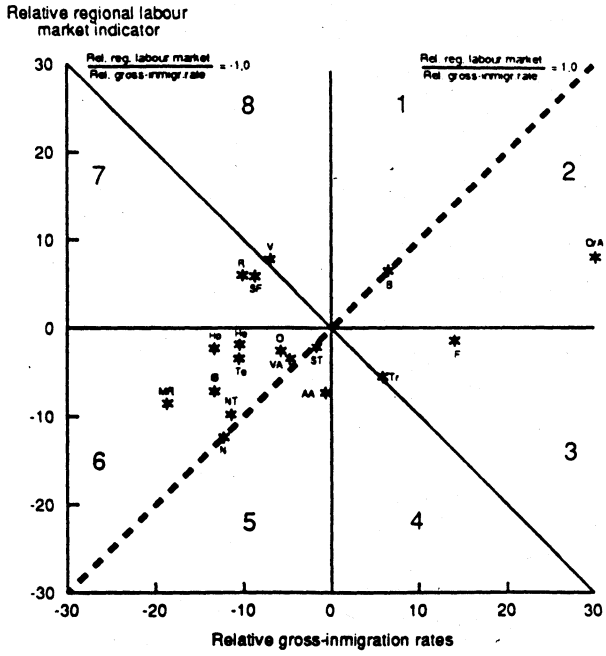

Figure 5.2. The relationship between relative regional labour market conditions and relative gross-inmigration rates. 1980-1986. Persons 16-24 years. Per thousand

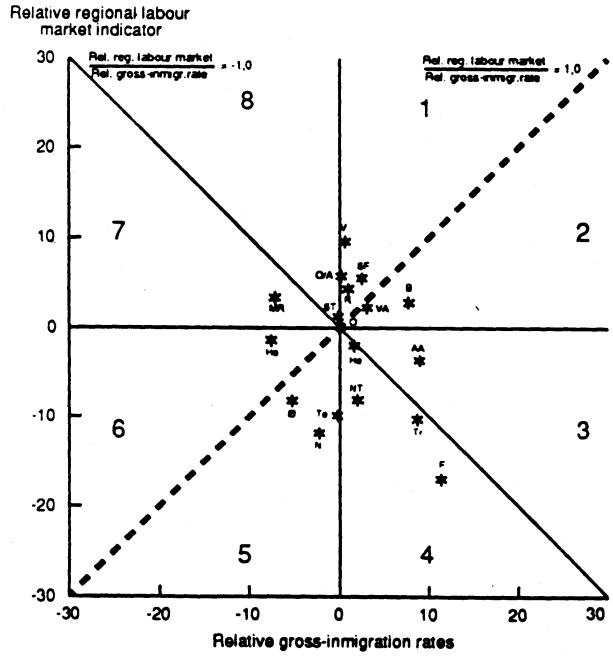

Figure 5.3. The relationship between relative regional labour market conditions and relative gross-inmigration rates. 1973-1979. Persons 25-49 years. Per thousand

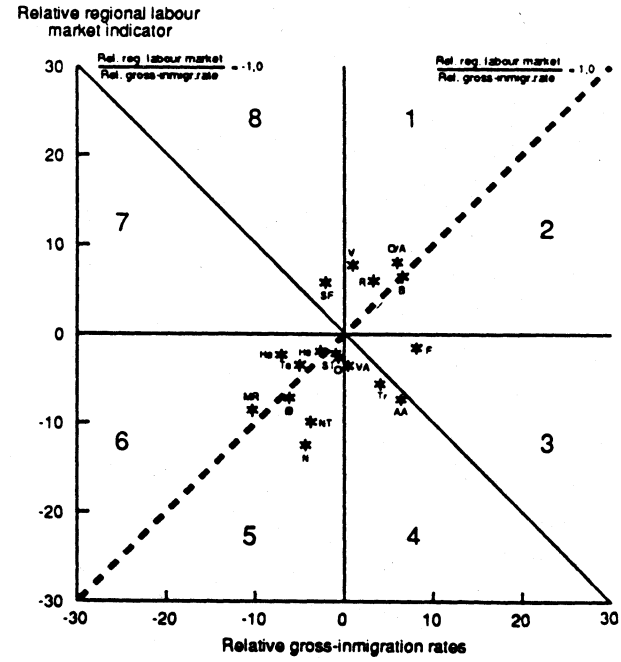

Figure 5.4. The relationship between relative regional labour market conditions and relative gross-inmigration rates. 1980-1986. Persons 25-49 years. Per thousand

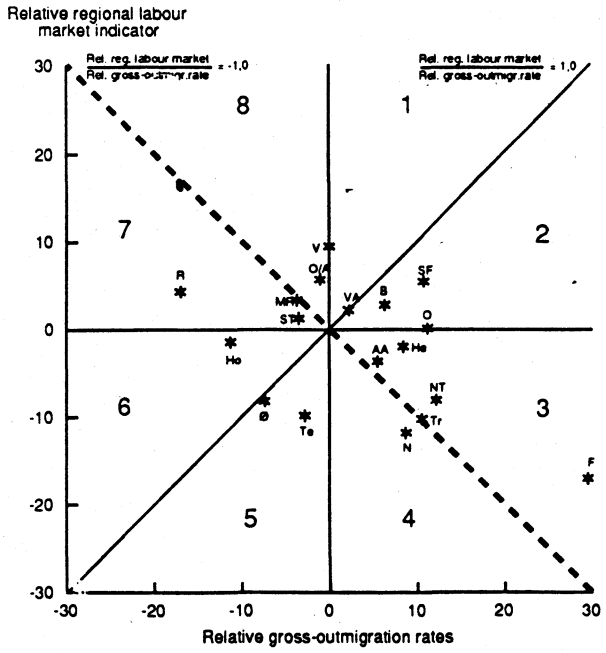

Figure 5.5. The relationship between relative regional labour market conditions and relative gross-outmigration rates. 1973-1979. Persons 16-24 years. Per thousand

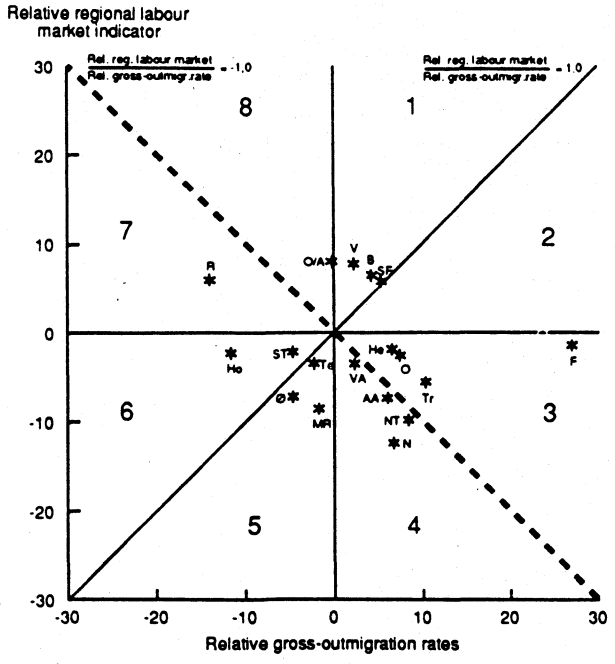

Figure 5.6. The relationship between relative regional labour market conditions and relative gross-outmigration rates. 1980-1986. Persons 16-24 years. Per thousand

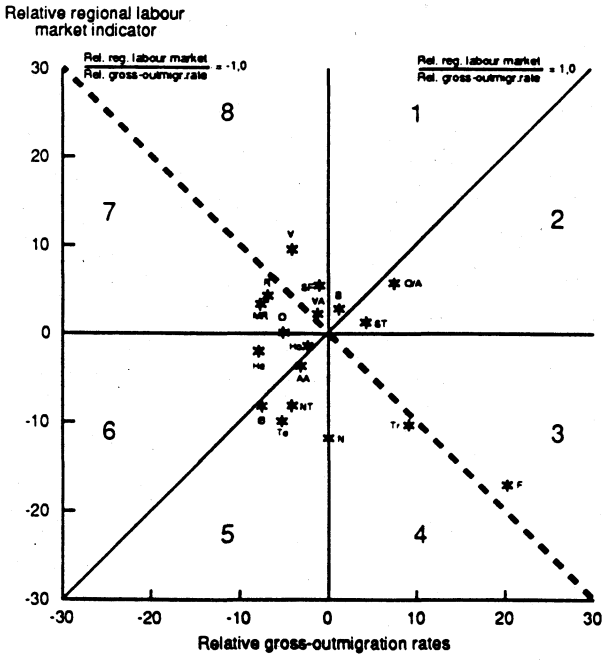

Figure 5.7. The relationship between relative regional labour market conditions and relative gross-outmigration rates. 1973-1979. Persons 25-49 years. Per thousand

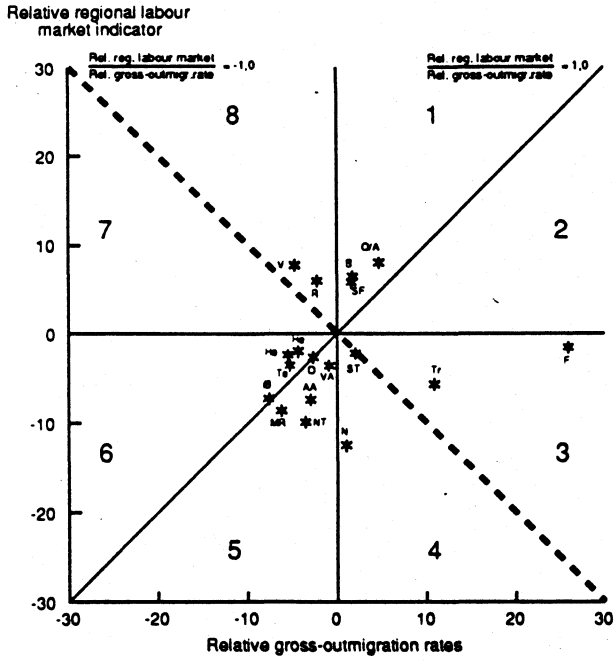

Figure 5.8. The relationship between relative regional labour market conditions and relative gross-outmigration rates. 1980-1986. Persons 25-49 years. Per thousand

and in sectors 1 and 2 in the case of gross in-migrations, could have strong pull explanations to the migration process with regard to the regional labour market conditions. Correspondingly the push explanations could be strong in counties with index values in the sectors 3 and 4 in the case of gross out-migrations and in sectors 5 and 6 in the case of gross in-mi-

grations. According to our hypothesis concerning the relationship between the regional labour market change and the gross-migration rates, we should expect to find the counties' index values either along the expected diagonals or in the sectors 1,2,5 and 6 in the case of gross in-migration and in the sectors 3,4,7 and 8 in the case of gross out-migration.

Our analysis are made separately for the 1970s and the 1980s, and are performed for the age groups 16-24 years and 25-49 years. Some of the results indicate a tendency that the counties' relative level of gross out-migration in relation to the labour market conditions, is lower in the 1980s than in the 1970s. Correspondingly the relative level of gross in-migration also seems to be somewhat lower in the 1980s than in the 1970s according to the regional labour market. An immediate interpretation of these results might be that both the push and pull factors have decreased their explanation power of the migration rates from the 1970s to the 1980s. It is, however, important to note that the employment is geographically more consentrated in the 1980s than in the 1970s. About half of the counties had a labour market indicator above the national average in the 1970s, while this share is reduced to about one quarter in the 1980s. This means that both the push and pull factors of the regional labour market seem to be stronger in the 1980s than in the 1970s. This indicates that the migration rates, particularly in the case of gross out-migration, has not changed as much as expected from the changes in the push and pull factors in the regional labour markets. In spite of a stronger tendency to migrate in direction of more centrally localised counties in the 1980s, this migration process seems to be somewhat weaker than we could expect from the regional labour market change.

The results for gross in-migration show that 9 counties follow the expected pattern for the youngest age group in the 1970s, while 11 counties follow the expected pattern for the oldest age group. This number increases to 13 counties for both age groups in the 1980s. Concerning gross out-migration 11 counties follow the expected pattern for the youngest age group in the 1970s, while the corresponding number is 9 for the oldest age group. This number decreases to 10 counties for the youngest age group and to only 6 counties for the oldest age group in the 1980s. These results show that the changes in the relative level of gross in-migration seem to be somewhat more in accordance with the regional labour market change, while changes in

the relative level of gross out-migration seem to diverge somewhat from the regional labour market change.

6. CONCLUDING REMARKS.

Migration is a major source of uncertainty in the projection of regional population development. The DREM model is ment to be a functional model, exploring some alternative assumptions about migration in addition to the fixed rates used in the traditional population projections. The explicit link between migration and labour market conditions in DREM opens up possibilities for more satisfactory specifications of migration alternatives. Many of our central users appreciate an attempt to see regional population and labour market in relation to national long term economic and demographic prospects. To some extent, we have achieved this by establishing links to the existing national planning models.

The results of our estimates of the migration model show, however, a weaker tendency for the regional labour market conditions to explain the time variations of the migration rates than we have found in earlier migration analyses. One of the reasons for this may be a decreasing tendency in the average level of year-to-year changes in the migration rates in the 1980s compared to the 1970s. This does not necessarily mean that the development of the migration rates fits better to the traditional population projection model, using fixed rates of migration over time. Smaller year-to-year changes in migration rates might well arise from a steady trend in the development, while greater year-to-year changes might well arise from a shift between increasing and decreasing migration rates.

Of great interest when the model is used in population projections, are the differences found between the labour markets power of explaining the net- and gross-migration rates and between the sexes. The DREM migration submodel emphasizes the relationship between regional labour market changes and net-migration. The results from our empirical migration analysis indicate that we also should consider implementing relations explaining gross-migration, especially gross out-migration. With the analysis based on gross migration rates, the empirical model should be reformulated, taking into account the stochastic nature of these rates. As earlier migration

analyses revealed small differences in the parameter estimates between sexes, the model was implemented assuming common parameters for both sexes. Our analysis presented in this paper indicates that the model ought to have sex specific parameters.

According to our hypothesis concerning the relationship between the labour market change and the directions of migrations, the results show to some extent a tendency to follow the expected one, both for the time variations and the cross-section variations of the migration rates. Yet this relationship seems to be relatively much stronger in some counties, and in average little more than half of the counties seem to follow the expected tendency.

In our model, no attempt is made to explain the differences between the counties in average migration rates over the time period. As shown these differences do seem to show some covariation with the labour market indicator. We should need to introduce into the model a better measure of the long-run prospects of labour market development, in order to explain more of the long-run differences of the migration rates between counties.

7. SOME FURTHER RESEARCH PROPOSALS.

In the last chapter we discuss some possible changes in the migration submodel which have not been examined in our empirical analysis so far. Up to now calculations of the relationship between migration rates and changes in the labour market have been made on the basis of a regional labour market indicator measured relatively to the labour market situation in the whole country. The model does not consider from where the in-migrants are coming and to where the out-migrants are going. A change in one counties' relative labour market conditions might affect the migration flows between some counties more than between others. An alternative hypothesis is that a change in the relative labour market conditions in one county will first of all affect the migration flows between this county and other counties with traditionally high interaction of migration. We might take up such an analysis, based on interaction-theories, comparing each counties' relative labour market indicator (measured in relation to the national average) to each of the other counties' relative labour market indicators separately. It would be necessary to calculate parameters for the probabilities for a

migrant moving from a particular county to a particular other county. The Norwegian migration data give the necessary detail for an approach like this.

Another problem related to the measure of the regional labour market changes, is its weak sensitivity to the level of changes in the labour market in the nation as a whole. The migration process might differ between years with increasing or decreasing employment at the national level. With decreasing national employment some counties may have positive indicators in their relative labour market change in spite of a general decreasing employment. Correspondingly, with increasing national employment, some counties will get negative labour market indicators even though their employment is increasing. Thus we should like to investigate how the regional migration processes occurs under different employment changes at the national level.

In defining our regional labour market indicators (see chapter 3) we would find it most appropriate for our model to use the alternative which is based on county of employment (Alternative B). As we have mentioned earlier, this alternative did not give parameter estimates for all the person groups involved, and for this reason we can not use it in a complete population projection. We should then need to project commuting. This points out the problems of a partial migration analysis in a more general labour market context. In principle, the analysis should be extended to cover other labour market adjustments simultaneously. Data on regional labour market adjustments in Norway are, however, weak.

Yet another problem is related to the aggregation level of the labour market indicator. Measuring the regional labour market balances through total demand and supply of labour, we have no information on the mis-matches between the regional industrial structures and the qualifications of the labour force. To measure the adjustment processes in the regional labour markets we should want data showing the industrial structure or even better the occupational structure at the demand side and the qualifications of the supply of labour. At the moment the regional economic model REGION projects the regional demand of labour for about 33 production sectors, but gives no further classifications showing the occupational structures. At the supply side we have no data projecting the qualifi-

cations of the regional supply of labour. Furthermore, we should need the migration rates at the same disaggregated level. At the moment we have no information connecting the migrants to their occupations or qualifications. Accordingly we have not found it possible to disaggregate the labour market indicator further than to sex and age specific labour markets (see chapter 3). Our data problems might, however, be more manageable, if we aggregate the counties into a smaller number of regions.

Immigration represents another problem in the DREM migration submodel. Today immigration is projected in the same way as in the traditional population projections, which means a exogenous number of net-immigration, while the projection of regional distributions of immigrants follows the same procedure as for the interregional migrants. One possible improvement is to see whether the net-immigration is related to the labour market changes at the national level. The character of the immigration has indeed changed from labour migration more in the direction of refugees and asylum-seekers, but anyway we still have a hypothesis that net-immigration may be sensitive to the situation at the national labour market. Secondly it might be of interest to project the internal distribution of immigrants separately, because the regional pattern of settlement among immigrants is quite different from that of internal migrants.

In our empirical analysis, we have so far used crude age intervals. As the migration rates varies markedly over age, unchanged individual behaviour gives rise to changing average rates if the age composition of the group changes. As the necessary demographic detail is available, we could take this effect into account in our analysis of gross-migration rates by usual demographic standardization techniques. This method might be of special importance if we choose to use a longer period than just one year lag on the migration rate and the regional labour market indicator. As the model operates now, the base year in the population projection will have a strong effect on the projected migration rate.

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