41st European Regional Science Association Congress
Zagreb, August 29 – September 1, 2001

DOES THE COMPOSITIONAL EFFECT EXPLAIN THE ASSOCIATION BETWEEN RATES OF IN-MIGRATION AND OUT-MIGRATION?

Hannu Tervo

School of Business and Economics, University of Jyväskylä, P.O. Box 35, FIN-40351 Jyväskylä, Finland. E-mail: htervo@tase.jyu.fi

ABSTRACT. In this paper the association between rates of migration is analysed with data from Finland from the years 1975 - 1999. The main focus is on the compositional hypothesis according to which regions that experience much in-migration possess a relatively large number of persons who are much more likely to move again, thus increasing out-migration. The results show that out-migration rate is positively related to in-migration rate, but negatively related to net migration rate. Push factors work in Finland, but even so, out-migration is positively associated with in-migration. The results produced with the help of combined micro - macro data support only partly the compositional hypothesis. Other explanations are also needed to account for the positive association between rates of in- and out-migration.

JEL-classification: R23, J61

1. INTRODUCTION

Traditional economic theory assumes that migration is motivated by poor economic conditions and that

migrants are attracted to regions with good economic conditions. A simple push-pull hypothesis predicts that out-migration is inversely proportional to in-migration and that the correlation between rates of in-migration and out-migration is negative. If this is the case, interregional migration also has an obvious role in the equilibrium process of labour markets.

But the empirical findings obtained from many countries is that the relationship between in- and out-migration across locations is strongly positive (Lowry, 1966; Cordey-Hayes and Gleave, 1975; Mueser and White, 1989). This is against the push-pull hypothesis as well as common sense expectations. The observation of the positive relationship goes as far back as the 1800s when E.G. Ravenstein presented his laws of migration, of which the fourth says that □each main current of migration produces a compensating counter-current□ (Ravenstein, 1885, p. 199). The high correlation between in- and out-migration holds both when aggregate migration flows and migration rates are compared. Regions with a high gross out-migration per capita tend to have a high gross in-migration per capita, and vice versa. Net migration is usually a small fraction of gross migration. This positive relationship casts doubt on the effectiveness of migration as an equilibrating force, though net migration generally operates in an equilibrating direction.

Another curious finding, observed especially with the U.S. data, is a positive or zero correlation between rates of out-migration and net migration (Lowry, 1966; Cordey-Hayes and Gleave, 1975). Regions with a high gross out-migration per capita tend to have a net in-migration. In this case, net out-migration is more probably associated with very low levels of gross in-migration per capita than with a high gross out-migration per capita. Thus, the rate of out-migration is positively correlated with both inward and net migration. Hoover and Giarratani (1985, p. 284-5) have termed this the *Lowry hypothesis*.[1] This result means that the out-migration rate is independent of the economic characteristics of a region. Per capita rates of out-migration tend to be similar for all regions irrespective of their economic character, and they are only dependent on the population characteristics within a region. The result is consistent with another common result, obtained again especially in the U.S., that regional unemployment has an insignificant role in explaining out-migration (Greenwood, 1975; Herzog et al., 1993).[2]

In this paper, we first analyse the relationships between rates of migration in Finland. The analysis shows that rate of out-migration is positively related to in-migration rate, but negatively related to net migration rate. The first result is in accordance with the common result, but the second is not. The latter result indicates that out-migration is related to the economic characteristics of a region in Finland, and therefore the correlation between

[1] Lowry (1966) himself found his result surprising and unsatisfactory, but even so the observation was termed the Lowry hypothesis (Plane, Rogerson and Rosen, 1984).

[2] There is still one hypothesis, the *Beale hypothesis* (Hoover and Giarratani, 1985) which combines the two hypotheses, suggesting that the Lowry effect dominates in relatively prosperous and growing regions, where the net is positive; whereas in depressed regions, where the net is negative, the □common-sense effect" is predominant (Beale, 1969).

rates of out- and net migration is negative. The push factors work in Finland. This result is in concordance with the results obtained from studies based on micro data which show that, unlike in many other countries, regional unemployment in Finland is a significant determinant of out-migration (Ritsilä and Tervo, 1998; Tervo, 2000; Häkkinen, 2000).

Even if the first result of the positive relationship between in- and out-migration is common, it is nevertheless interesting. This is especially because the Lowry hypothesis is realised only partly in the Finnish case, since out-migration rate is not positively correlated with net migration rate.[3] Why is the relationship between in- and out-migration rates positive? A number of explanations have been suggested to explain this phenomenon (Mueller and White 1989), but the compositional effect is the oldest and perhaps the most widely cited explanation. According to this hypothesis, regions that experience much in-migration possess a relatively large number of persons who are much more likely to move again, thus increasing out-migration (Morrison, 1971).

We approach the observed positive association between in- and out-migration in Finland by analysing the role of the compositional hypothesis. In this analysis, micro-based data from the period 1987-1996 is utilized. Mueser and White (1989) write that attempts to confirm directly the compositional hypothesis by tying the results of analyses using micro data to aggregate measures have not been successful (p. 122). Our idea is to identify those people who have migrated and to analyse the relationship between rates of in- and out-migration when previous in-migration has been taken into consideration. In the analysis, we combine the use of micro data with the use of macro (regional) data. To our knowledge, this approach is novel in the analysis of the compositional hypothesis. Generally, the results suggest that the hypothesis is not without explanatory power, but it is not wholly able to account for the positive association between rates of in-migration and out-migration. Obviously the phenomenon is a complex process arising from many factors. Thus, there is still room for other explanations.

The rest of the paper is structured as follows. In section 2, we shortly review various hypotheses on the positive association between rates of in-migration and out-migration. Section 3 presents the development of migration flows and rates in Finland in 1975 - 1999 and shows the correlations between these rates. In section 4, we introduce the micro data and present the results related to the analysis of the compositional hypothesis. Section 5 concludes the paper.

2. POSSIBLE EXPLANATIONS BEHIND THE CORRELATION BETWEEN IN- AND OUT-MIGRATION

The compositional hypothesis is often used to explain the observed positive association between rates of in-migration and out-migration. According to this hypothesis, a region that attracts migrants grows to have a

[3] Gedik (1992) also found that the Lowry hypothesis was not valid for the Turkish case. Contrary to our results, however, Gedik s analysis showed that in-migration and out-migration are not related in Turkey.

population which is more migration prone, thus also increasing out-migration from the region. Studies based on micro data have shown that previous migration experience greatly enhances the probability of moving, by facilitating subsequent migration decisions and encouraging migrants to move on or back (DaVanzo, 1983; Tervo, 2000). Migrants may learn to respond efficiently to labour market signals. Migration may thus be a learned strategy (Bailey, 1993). Repeat migrants may also be individuals for whom mobility costs are low, or whose expectations were disappointed. Or they may be students who move back to their home district or to another new region which offers vacancies. Many moves of very short duration occur because of migrants misperceptions of alternative opportunities and are quickly corrected through return or repeat migration (Long, 1988). In addition, cumulative inertia (Gleave and Cordey-Hayes, 1977) also implies that higher in-migration tends to increase out-migration, since individuals develop attachments to a location only over time. More recent migrants to an area have a greater probability of moving than those who have established a strong network of social and economic ties through a considerable period of residence in the same area.

To be accurate with the time lag, if a region has a large amount of in-migration during a particular period, then this region will have a population with a large proportion of recent migrants, and its rate of out-migration in the period following is likely to be higher (Vanderkamp, 1989). If the study period is long, then there will be simultaneity in the explanation of inflows and outflows of migrants. The correlation between rates of in- and out-migration in the *same* period may, however, arise also from the fact that in-migration between periods is highly correlated. Regions which attract people continue to be the same from year to year, and vice versa. Therefore, there is also a positive correlation between rates of in- and out-migration, even if the study period is short.

In addition to the compositional effect, several additional explanations for the positive association between in- and out-migration rates have been advanced. Return migration is one such explanation: each migration stream tends to induce a counterstream of return migrants, since many migrants are particularly likely to move back (Vanderkamp, 1971; Long, 1988; DaVanzo, 1983; Kauhanen and Tervo, 2002). As Mueser and White (1989) noted, this process implies that the direction of causation is from out-migration to in-migration, while the compositional effect implies the reverse.

Gleave and Cordey-Hayes (1977) and Tabuchi (1985) have presented the idea of a vacancy chain. The departure of residents leaves vacated positions such as jobs and houses for new-comers, thus increasing in-migration. Gleave and Cordey-Hayes (1977) also suggested that the economic activities that make an area attractive also tend to increase turnover and thus out-migration. If jobs are easily available, this attracts in-migrants, but may also make workers leave jobs easily, thus adding to out-migration rates.

Plane, Rogerson and Rosen (1984) and Mueser and White (1989) provide technical explanations for the positive correlation by examining the relationship between in- and out-migration in models that allow population to interact with probabilistic decision processes. Mueser and White (1989) argue that the relations between measures of aggregate migration are strongly influenced by the dynamic character of the migration

process and the fact that migration is a principal determinant in the distribution of population. They term this process □dynamic adjustment□ according to which population tends to redistribute itself in such a way as to equalise rates of in- and out-migration. Schachter and Althaus (1989) explain a positive association between in- and out-migration in a model that assumes heterogeneous preferences in conjunction with equilibrating population movements. Based on a model with identical, utility-maximising agents, Mueser (1997) shows that changes in relative location attractiveness can cause many migrants to move against the dominant stream, thus inducing two-way migration.

3. INTERREGIONAL MIGRATION IN FINLAND IN 1975 - 1999

After a period of deep depression, interregional migration accelerated in Finland in the mid 1990s. The development also stimulated migration research, but this research is dominated by the analysis of net migration (e.g. Laakso, 1997; Vartiainen, 1998; Pekkala and Ritsilä, 2000) and analyses based on micro data (e.g. Ritsilä and Tervo, 1998; Tervo, 2000a and 2000b; Häkkinen, 2000). The analysis related to gross migration is very limited, and therefore, we do not know the behaviour and relationships of different rates of migration in Finland.[4]

Data and regional unit

In the following analysis, we use macro-level data on the components of migration of the 85 Finnish subregions (□seutukunta□) from the period 1975 - 1999. The data is derived from Statistics Finland. Finnish subregions (NUTS 4-level regions) represent the actual commuting areas (local labour markets) fairly well, although in the case of bigger centres, local labour markets may be wider than subregions, and in the case of rural subregions, they may be smaller. The statistics on internal migration in Finland are based on migration between municipalities (NUTS 5-level regions), their number being 455. Due to the small size of the municipalities, many moves from one municipality to another are residential changes taking place inside the same commuting area. In the majority of instances, moves from one subregion to another are labour market motivated or are induced by educational opportunities, although they may also be motivated by housing conditions. Therefore, the regional unit used in this study, subregion, is better than municipality, the regional unit used in ordinary statistics. In the following text, when using the term □region□, we mean these subregions.

Development of migration rates

Figure 1 shows how interregional migration developed in Finland in 1975 - 1999. The data does not cover the first half of the 1970s, at which time interregional migration was on a very high level. This was still the situation in 1975 after which migratory flows became smaller. Due to a recession, the number of migrants fell under 100

[4] See, however, an early contribution by Purola (1964).

000 persons in 1978, after which it rose again and remained between 108 000 and 123 000 in the 1980s. Because of a deep recession in the beginning of the 1990s, the number of migrants again fell under 100 000. Upward trends started in 1994 after which the number of migrants increased from year to year, reaching the amount of 157 000 in 1999.

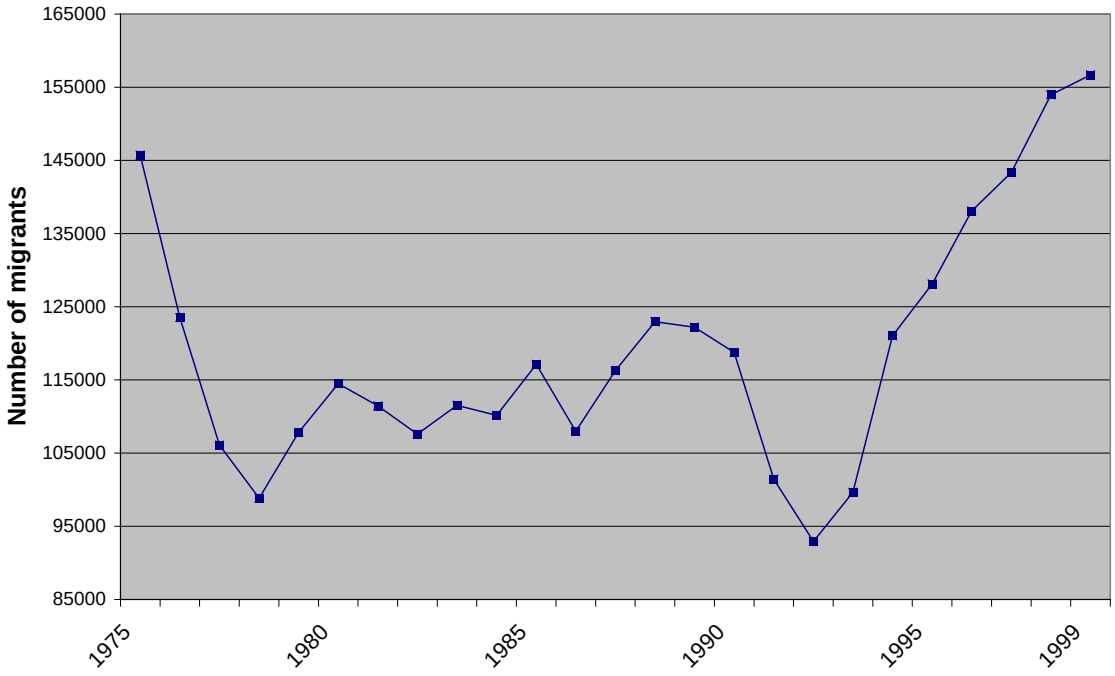

FIGURE 1: Development of interregional migration (between 85 subregions) in Finland, 1975 - 1999

Figure 2 shows the means of the migration components and their development in the study period. Due to the concentration process of population, bigger regions have large net inward flows of migrants, while most of the smaller regions have net outflows. Due to their large number, smaller regions dominate regional means and therefore net migration becomes negative.[5] In the boom years of the 1990s, net migration rates reach their highest negative means. Conversely, the means are quite close to zero in the years of 1989 and 1990, just before the severe recession.

[5] If the means are weighted by population, the net migration rate naturally becomes zero (because we only analyse internal migration).

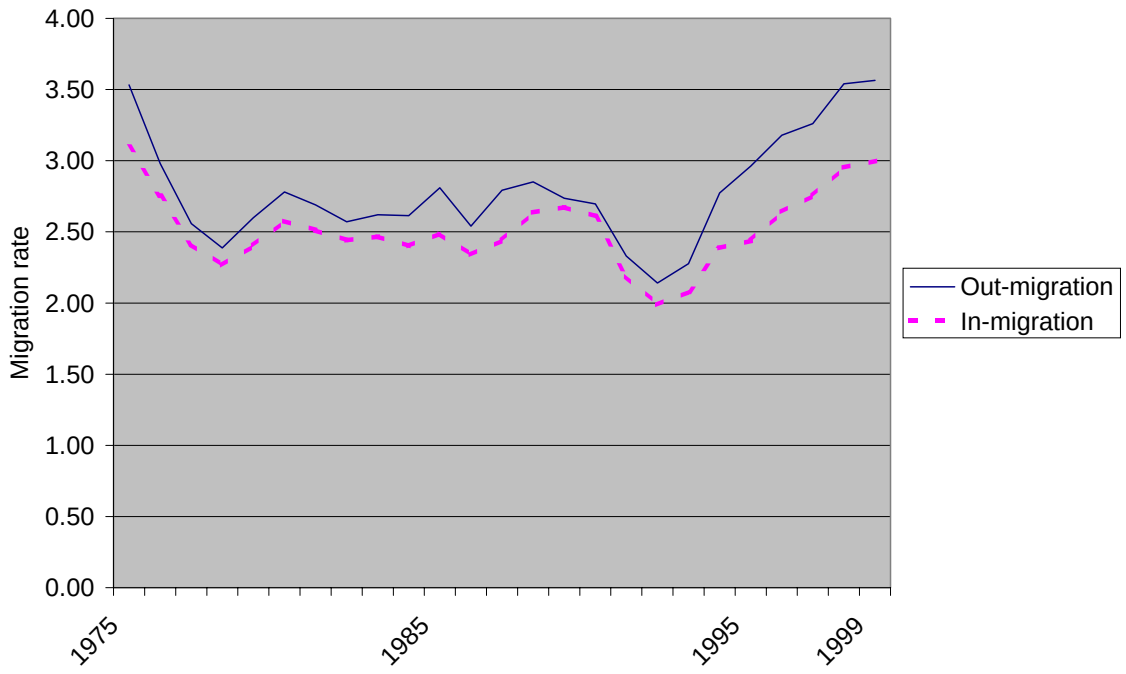

FIGURE 2: Means of regional migration rates in Finland, 1975 - 1999

Migration flows have continuously been directed from peripheral regions of Northern and Eastern Finland towards regional centres in the South. The number of regions receiving net in-migration, however, continued to diminish. In the period 1994 - 1999, only six growth centre regions received a net in-migration of over 0.5% per annum and only fourteen regions out of 85 received any positive net in-migration at all. In the period of recession, 1991 - 1993, the number of winning regions was 25, and in the latter half of the 1980s, it was as high as 33. Accordingly, the development in net migration rates tells of strong concentration in Finland, which has naturally given rise to concern among many politicians and regional authorities.

Correlations between rates of migration

Figure 3 shows the correlations between the three components of migration and their development in the period 1975 - 1999. Interestingly, the correlation between rates of out-migration and in-migration is positive throughout the whole study period. The correlation between rates of in-migration and net migration is also positive, but the correlation between rates of out- and net migration is negative. For example, in 1999 these correlations were 0.56, 0.51 and -0.43, respectively. They are all statistically significant. The latter two results are in accordance with common-sense expectations, although the result of the positive correlation between out- and net migration is different from many results obtained in other countries. The result of positive correlation between in- and out-migration is what has been found in many countries, but because correlation between out- and net migration is negative, the result is only partly in accordance with the Lowry hypothesis.

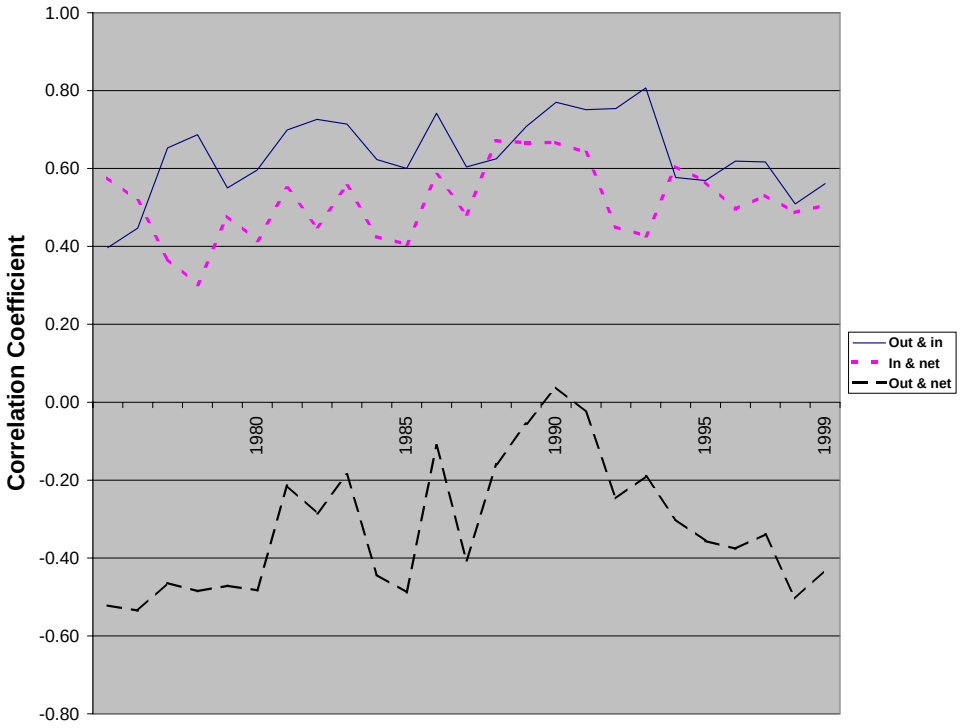

FIGURE 3: Correlations between rates of migration in Finland, 1975 - 1999

The correlations are fairly stable during the study period, as the figure indicates. The correlation between out- and in-migration rates diminished little during the 1990s. It received its highest value, 0.81, in 1993 and its lowest value, 0.40, in 1975. The negative correlation between rates of out- and net- migration is not significant in the period 1988 - 1993. There are also occasionally some other years when this correlation does not reach significance. Its highest negative value, -0.54, is from 1976. The correlation between in- and net migration rates has been the most stable during the whole period: the highest value, 0.67, is from 1988 and the lowest value, 0.30, from 1978.

The period 1994 - 1999

To analyse more thoroughly the positive correlation between rates of in-migration and out-migration, we concentrate on the period after the severe recessipon, 1994 - 1999. When taking the means of annual migration rates from these years, we find that the correlation between rates of in-migration and out-migration (variables IM9499 and OM9499) is as high as 0.62 in this period. If we classify the regions into two groups, city-regions (n = 35) and other regions (n = 50), we find that the correlation is even slightly higher in each group, 0.73 and 0.72, respectively. In the group of negative net migration, the correlation is 0.74 (n = 71), and in the group of

positive net migration, it is as high as 0.94 (n = 14).

The scatter-plot in Fig. 4 illustrates the nature of dependence between rates of in-migration and out-migration. If we imagine a 45^{o} line indicating migration balance, we can verify that the number of growing regions which have net in-migration is small, while the number of declining regions with net out-migration is great. The regression line illustrates how in- and out-migration are related. Typically, a region with a small in-migration rate also has a small out-migration rate, if bigger than the in-migration rate, while a region with a high in-migration rate has a high out-migration rate, if smaller than the in-migration rate. As the correlation is not perfect, we can also find exceptions in this.

For further analyses, we divided both rates of migration into four equal groups and cross-tabulated these quartile-variables (Table 1). In these new variables, e.g., the lowest category includes 25% of the regions with the lowest migration rates, and the highest category 25% of the regions with the highest rates. It should be noted that the criteria differ with rates of in-migration and out-migration, since the distributions of these variables also differ. Therefore, regions in the diagonal have greater out-migration than in-migration.

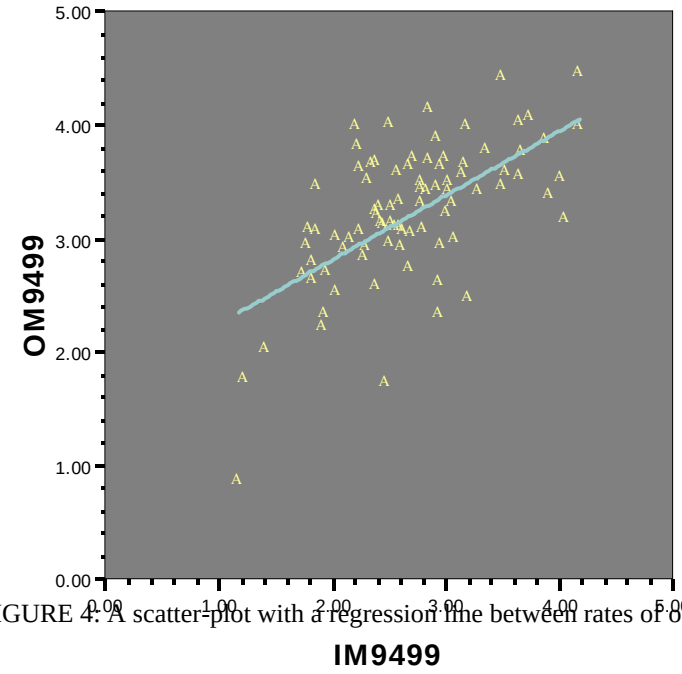

FIGURE 4. A scatter-plot with a regression line between rates of out-migration and in-migration, 1994 - 1999

In the case of independence, the diagonal includes 20% of the cases. In our case, it includes 45%, 38 cases out of 85. This shows how rates of in-migration and out-migration are dependent on each other. The eleven regions in the *(1,1)* cell have the lowest rates both in in-migration and out-migration. They include, e.g., the regions of Pori and Imatra, both of which are declining industrial areas. At the other end, ten regions are placed in the *(4,4)* cell in which both rates are the highest ones. This cell includes, e.g., the regions of Kuopio and Rovaniemi, both of which are provincial centres, thus attracting people, but are, however, not doing so well.

The cases in the extreme cells in which one of the migration rates is the lowest and the other one the highest are interesting, since they best represent those regions which are in accordance with the □push-pull□ hypothesis. The number of regions in the extreme cells is only three - two in the *(4,1)* cell and one in the *(1,4)* cell - which demonstrates that out-migration is very seldom entirely inversely proportional to in-migration. A region with a very high in-migration rate and a very low out-migration rate is Tampere, one of the biggest and fastest growing city regions in Southern Finland, while two regions with opposite migration rates are from the peripheral Northern Finland (Lapland), viz. Tornionlaakso and Koillis-Lappi. The capital region, Helsinki, is placed in the *(1,2)* cell which indicates that its in-migration rate is not very high, even though net migration is clearly positive.[6]

TABLE 1: A cross-tabulation of in- and out-migration rates

Quartiles of out-migration rates	Quartiles of in-migration rates				
	1	2	3	4	Total
1	11	5	4	1	21
2	6	9	4	2	21
3	2	4	8	8	22
4	2	3	6	10	21
Total	21	21	22	21	85

4. EMPIRICAL EVIDENCE RELATED TO THE COMPOSITIONAL EFFECT

Next we analyse the fairly high positive correlation between rates of in-migration and out-migration by examining the role of the compositional hypothesis, according to which regions that experience much in-migration possess a relatively large number of persons who are □migration prone□ and who are thus likely to move again (Greenwood, 1975; Mueser and White, 1989). We evaluate the hypothesis empirically by utilising both micro and macro data. By using individual level data, we identify those who have migrated either in the preceding period or in the period under scrutiny. With this information, we aggregate the individual level file to create a regional level file and to analyse the relationship between rates of in- and out-migration when previous in-migration has been taken into consideration. In practise, we have several alternatives to accomplish this analysis.

[6] In absolute terms, net migration is the greatest in the Helsinki region. This is more due to its low out-migration rate than to its high in-migration rate.

Sample data

We have a micro-based data set from the years 1987 - 1996 at our disposal. This data is a 1% random sample drawn from the Finnish longitudinal census and it has 49 334 observations (in 1996). The data includes, among other variables, an annual variable indicating the region in which an individual resides. By comparing subsequent years, we can identify those persons who have moved from one region to another during a year.

We formed two migration variables of which the first one, MH, describes migration history and tells us whether an individual has moved from one region to another in any of the years during 1987 - 1995, and the second one, M96, whether an individual moved in 1996. The micro data was aggregated to create a macro (regional) data set containing variables which include the number of migrants in the period 1987 – 1995, in 1996, and the total number of cases. Based on our 1% sample, we were then able to calculate the estimated rates of in- and out-migration by region (sOM, sIM), which we could compare with the actual migration rates based on the population data (OM, IM).

Unfortunately, the comparison reveals that the sample-based data is not quite correspondent with the population data. This is obviously due to the small sample size (1%) and, perhaps more importantly, due to the fact that interregional migration is a rare event, for which reason random variation may play a big role. The actual migration rate is 2.70% in 1996, but the sample data gives a downwards biased estimate, 2.41%. The error in the aggregate is not great, but in the case of small regions, when there are only very few migrants in the sample data, the estimates may vary a lot. At maximum, the estimated out-migration rate differs 3.1%-units from the actual rate. The corresponding deviation related to the in-migration rate is slightly smaller, 2.7%-units.

When estimating the correlation between rates of in-migration and out-migration in the sample data and comparing this with the corresponding correlation in the population data, we can observe a difference in the results:

$r_{OM, IM} = 0.62$ (correlation in the population)

$r_{sOM, sIM} = 0.34$ (correlation in the 1% sample)

The correlation is still positive and significant in the sample, but smaller than in the population. These differences in the sample compared with the population show that we have to be cautious when analysing the phenomenon of positive association between in- and out-migration with the help of the sample data constructed.

The effect of migration experience

The sample data shows that the percentage of those individuals who moved in the period 1987 - 1995 (variable

MHS) is 12.4%. Accordingly, every eighth individual changed her/his domicile (region) at least once during the period. Of those who moved in the period 1987 - 1995, 72% moved once, 23% twice, 4% three times and nearly 2% more than three times. Interestingly, the percentage of migrant stock varies by region, the range being as wide as 3.8% - 26.8%. The distribution of the variable is, however, skewed as the histogram shows (Figure 5). Actually, only five regions have a value over 20%. The 10^{th} percentile is 8.1% and the 90^{th} percentile is 17.2%.

In 1996, the percentage of those people who moved is 2.4%. Interestingly, this percentage varies a lot depending on an individual's migration experience. The percentage is 1.6% among those who do not have a migration history, i.e. who did not move in the period 1987 -1995 (MH=0), but as high as 7.9% among those who have a migration history (MH = 1). This difference reinforces the presumption that migration experience has a remarkable effect on the propensity to move.

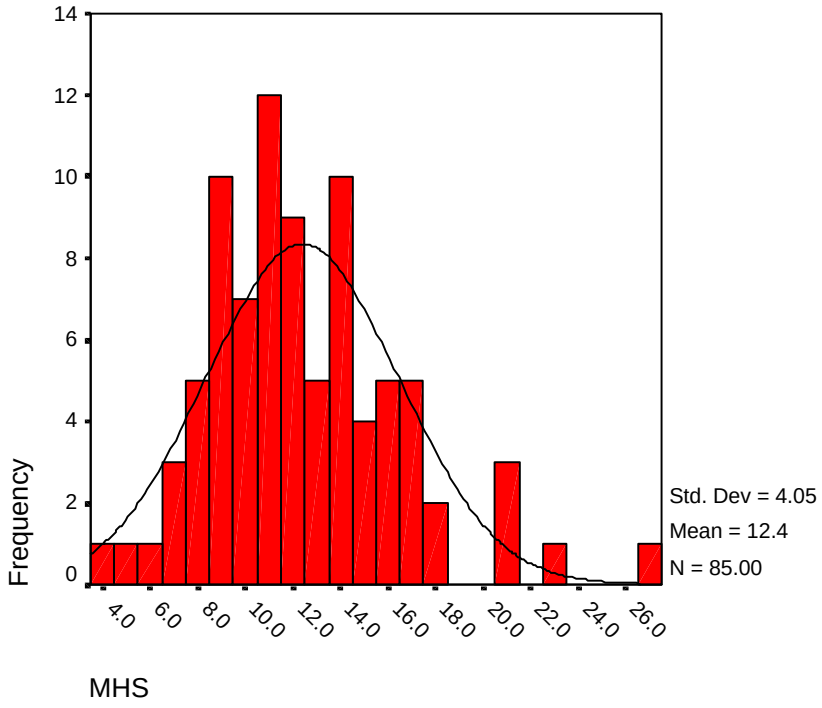

FIGURE 5: A histogram of the variable MHS showing the percentage of those individuals who moved in 1987 - 1995 (85 regions)

Distinct groups

One possibility to analyse the compositional effect by using data on the migrant stock is to separate in the sample data those who do not have a migration history from those who have and analyse the correlations between rates of out-migration and in-migration in these two groups separately. If a region attracts migrants,

the share of those who have a high propensity to move increases and, thus, out-migration also increases in the region. But if we analyse only those who have not migrated, there should be no association between rates of in-migration and out-migration, because out-migration is not affected by the migrant stock. In-migration may still vary in accordance with the pull of a region.

The migration rates are termed sOM^{mh0} and sIM^{mh0} in the group with no migration history and sOM^{mh1} and sIM^{mh1} in the group with migration history. The results are as follows:

$$r_{sOM^{mh0}, sIM^{mh0}} = 0.31$$

(Result 1)

$$r_{sOM^{mh1}, sIM^{mh1}} = 0.28$$

We would have hypothesized that the correlation is zero among those who have no migration experience if the compositional effect had worked. The correlation is, however, about the same as in the whole group ($r = 0.34$) and among those who have migrated before. Thus, these results do not provide evidence in favour of the compositional hypothesis.

The problem is a possible unreliability of the sample data. Because the correlation between rates of in-migration and out-migration is smaller in the sample than in the population, the classification into two groups according to migration history may not reveal the compositional effect either. To overcome this, we combine the sample and population data. For this purpose, the population-migration rates are multiplied by ratios based on the sample which describes the relationship of the migration rates of those who have/do not have a migration history as compared with the aggregate migration rates[7]:

$$OM^{mh0} = (sOM^{mh0} / sOM) * OM$$

$$OM^{mh1} = (sOM^{mh1} / sOM) * OM$$

$$IM^{mh0} = (sIM^{mh0} / sIM) * IM$$

$$IM^{mh1} = (sIM^{mh1} / sIM) * IM$$

When using these combined migration rates the correlations turn out to be:

[7] This is the same as the number of out-/in-migrants in the population multiplied by the share of migrants with (no) migration history in the sample and then divided by the population which has been multiplied by the share of individuals with (no) migration history in the sample.

$$r_{OM^{mh0}, IM^{mh0}} = 0.20$$

(Result 2)

$$r_{OM^{mh1}, IM^{mh1}} = 0.08$$

The correlations are still positive, but small and not statistically significant (p = 0.49 and 0.07, respectively). The result of a (nearly) zero correlation in the group which does not have a migration history would support the compositional hypothesis. But the correlation in the group with a migration history also turns out to be zero. This is not what was expected. Thus, these results also remain partly vague.

Controlling for migration experience

Another possibility in the analysis is to control for the effect of migration experience when estimating the correlation between rates of migration. In the first method, we calculated adjusted out-migration rates for 1996 (sOM^{adj}) in which the effect of migration history is regionally standardised. For this purpose, we assumed that the share of those individuals who moved in 1987 - 1995 (MHS) is the same for each region as it is in the country as a whole (=12.4%). This will have an effect on out-migration rates, since the average migration propensity of those with migration history is greater than of those with no-migration history (0.079 vs. 0.016). Under these assumptions, a standardized out-migration rate can be formed as follows:

$$sOM^{adj} = sOM - (MHS - 0.124) * 0.079$$

We then estimated the correlation between the adjusted out-migration rate and the in-migration rate and compared it with the normal correlation between rates of out- and in-migration. These correlations are:

$$r_{sOM^{adj}, sIM} = 0.26$$

(Result 3)

$$r_{sOM, sIM} = 0.34$$

As expected, the in-migration rate correlates more weakly with the adjusted out-migration rate than with the normal out-migration rate. The difference is not, however, big and not statistically significant. This would suggest that the compositional effect is not very big, if it has an effect at all.

If we assume that both the estimated share of the migrant stock and the propensity to move related to it also hold in the population, we can form a similar adjusted out-migration rate for the population (OM^{adj}) as for the sample data:

$$OM^{adj} = OM - (MHS - 0.124) * 0.079$$

In the population, the in-migration rate clearly correlates more weakly with the adjusted out-migration rate than

with the normal out-migration rate:

$$r_{OM^{adj}, IM} = 0.25$$

(Result 4)

$$r_{OM, IM} = 0.62$$

Although the correlation estimated with the adjusted out-migration rate is about the same as in the sample data, the difference between the correlation estimated with the non-adjusted rate is big. The difference is also statistically significant. This result would give stronger evidence in favour of the compositional hypothesis than the corresponding result estimated in the sample data.

A related method to control for the effect of migration experience is to use partial correlations in which the degree of association between rates of out-migration and in-migration is estimated while keeping the effect of migration history constant. In the sample data, this correlation is as follows:

$$r_{sOM, sIM \cdot MHS} = 0.23$$ (Result 5)

The correlation is positive and statistically significant ($p = 0.032$), but only slightly smaller than the normal correlation, + 0.34. If we estimate the partial correlation in the population data between the migration rates while eliminating the effect of migration history, the result is about the same:

$$r_{OM, IM \cdot MHS} = 0.34$$ (Result 6)

The partial correlation is a bit bigger than above, but as compared with the normal correlation coefficient in the population data, + 0.62, the partial correlation coefficient clearly gets a smaller value.

There is still another possibility to assess the effect of migration history in the population data. In the preceding analysis, we used the sample-based variable MHS also in the analysis of the population data. Alternatively, we may use data on previous in-migration from the years 1987 - 1995 to assess the effect of migration stock on out-migration. For this purpose, we formed the variable IM8895 which is the average of the in-migration rates for the years 1988 - 1995. When we keep the effect of this variable constant and estimate the partial correlation we get the following result:

$$r_{OM, IM \cdot IM8895} = 0.02$$ (Result 7)

The zero correlation strongly supports the compositional hypothesis.

We could continue the partial correlation analysis and take into account also other possible control variables such as population, unemployment level, income level, level of education, employment growth, industrial

structure etc.[8] Standard econometric theory says that if important variables are omitted from a model in regression analysis, the estimated values of all other regression coefficients will normally be biased and the significance tests invalid. The same also holds with partial correlation analysis: if important variables are not used as control variables, the estimated partial correlation coefficient (which is comparable with the regression coefficient) may be biased. For this reason, we also estimated various second- and higher-order correlation coefficients. The results are not shown here in detail, but they indicate that all important higher-order partial correlations between rates of in-migration and out-migration are significantly positive. For example, when we control for unemployment level (UNEMP), level of education (EDU), share of agricultural employment (AGR), population (POP), dwelling prices (DWE), income level (INC) and growth in employment (EMPL), in addition to migration stock (IM8895), the estimated partial correlation coefficient between rates of migration OM and IM is again clearly positive:

$$r_{OM, IM \cdot IM8895, UNEMP, EDU, POP, DWE, INC, EMPL} = 0.42 \qquad \text{(Result 8)}$$

Thus, we may suspect that the reason for the fall of the estimated correlation between OM and IM from 0.62 (zero-order correlation) to 0.02 (first-order partial correlation, with IM8895 as the control variable) is due to a specification error. Another possibility we may suspect is the problem of multicollinearity, which may increase the standard errors of the estimated coefficients. Migrant stock correlates strongly with rate of in-migration ($r_{IM, IM8895} = 0.88$), for which reason the first-order partial correlation may become distorted.

Summary of results

We found some evidence in favour of the compositional hypothesis, but the evidence is not solid throughout and, at any rate, it seems that the compositional effect by itself cannot explain the positive association between rates of in-migration and out-migration.

To summarise the results, we found that:

1. The estimated correlation between rates of in- and out-migration does not disappear, even if its estimated value gets smaller, in the group with no-migration history. The result is stronger in the population than in the sample. (Results 1 and 2)

2. In-migration rate correlates more weakly with adjusted out-migration rate in which the effect of

[8] We could, of course, switch from correlation analysis to regression analysis, but since our aim is not to model out-migration, but merely to analyse the positive correlation between rates of in- and out-migration, we will not do this.

migration history is regionally standardised, and thus eliminated, than with plain out-migration rate. The difference is small in the sample and bigger in the population. The correlation, nonetheless, still remains positive. (Results 3 and 4)

3. The estimated partial correlations in which the effect of migration history is kept constant show positive if smaller dependence between in- and out-migration. (Results 5 and 6)

4. In the population, the partial correlation in which the average previous in-migration is used as the adjusting control variable shows zero-relation, but additional control variables bring back a positive correlation between in- and out-migration. Again, this correlation is smaller than the plain correlation. (Results 7 and 8)

5. CONCLUSION

Our results showed that the Lowry hypothesis is realized only partly in Finland: out-migration rate is positively related to in-migration rate, but negatively related to net migration rate. This has been the situation prevailing throughout the period 1975 - 1999. Push factors work in Finland, but even so out-migration is positively associated with in-migration. The positive relationship between rates of in-migration and out-migration has been a puzzling finding obtained in many countries. Our findings support only partly one of the main hypotheses presented to explain the positive relationship, viz. the compositional hypothesis. Indeed, the results produced with the help of combined micro - macro data suggest that previous migration experience greatly enhances the probability of moving and, therefore, regions that attract migrants grow to have populations which tend to be more migration prone, thus also increasing out-migration from the regions. This does not, however, seem to wholly account for the positive association between rates of in- and out-migration. Other explanations are still needed. □Technical□ explanations (Plane, Rogerson and Rosen, 1984; Mueser and White, 1989; Schachter and Althaus, 1989) may be important. Additional empirical research is, however, needed to assess, e.g., the role of the □vacancy chain□ -hypothesis or the role of return migration.

ACKNOWLEDGMENTS

This paper is part of a research project funded by the Academy of Finland (project no 41157). The author also wants to thank the Yrjö Jahnsson Foundation for financial support.

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