

MIGRATION, CHANGE OF WORKPLACE AND COMMUTING, AN INTEGRATED APPROACH

by

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1. INTRODUCTION

To establish the background to the research reported in this paper, one must look back to 1972, when the final report of the Integrated Traffic and Transport Study (NEI, 1972) was published. This Dutch version of the "classical" large-scale transport studies typical of the "fifties" and "sixties", showed how the traffic and transport system would develop if government policy remained entirely oriented towards satisfying the demand for transport by the continued construction of roads and other infrastructure. Increased prosperity and motorisation had, especially in the years between 1950 and 1970, entailed strong suburbanisation and thus a dramatic rise in the demand for transportation. Extrapolation of that development yielded a picture of the future that to many was abhorrent. No wonder then that policy makers began to show a growing interest in the explanation of location behaviour, and in particular in the effect of changes in the traffic and transport system on the spread of activities.

Initially, attention was focused on the application of land-use or activity-allocation models. These were found to be of only limited use, however, mostly because no consistent theory was yet available due to insufficient knowledge of the complicated processes of individual location behaviour.

After some time the focus of research shifted. The Project Bureau for Integrated Transport Studies commissioned a project to develop a research method by which the relation between residential and workplace choices could be analysed (NEI, 1977). Attention was directed first and foremost to the home and job search behaviour of a sample of heads of households. First, an adequate description of the major changes of behaviour had to be drawn up; to that end the Netherlands Economic Institute made use of the biannual Labour Force Survey Sample of the Netherlands Central Bureau of Statistics. This description of spatial behaviour was followed by a model experiment (the so-called double allocation model), in which the simultaneous distribution of mobile workers among new and vacated housing and work locations was estimated for some 20 regions in the western part of the Netherlands. Neither the descriptive analysis nor the use of the double allocation model gave much insight into the underlying individual decision processes. Yet such an insight is needed to illuminate the effects that specific stimuli would have on certain groups of workers. That is why in 1980 an extensive survey was held to provide the data needed for the explanatory analysis, which in turn was to provide a basis for policy evaluation.

In the present contribution to the World Conference on Transport Research 1983 we shall deal successively with the research approach, some results of the investigation based on data from the Labour Force Survey

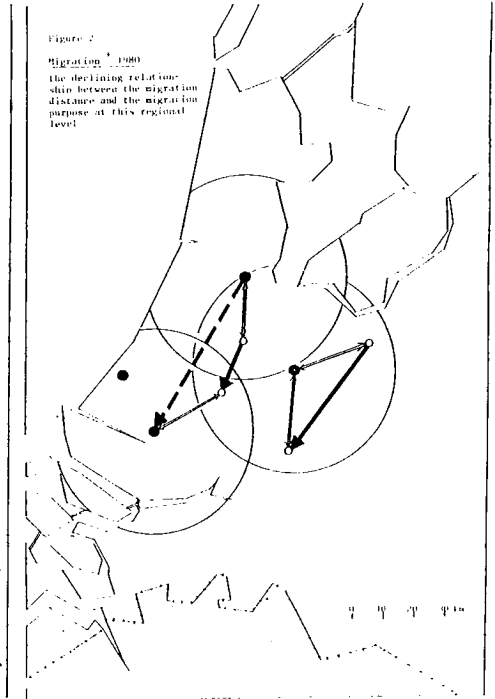
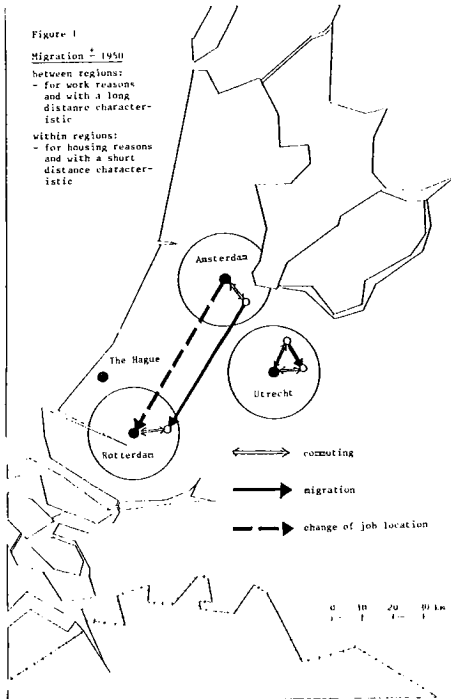
Sample, the nature and use of the double allocation model, and some results obtained by analysing the data of a survey held in Amsterdam and its surrounding regions in 1980.

2. THE RESEARCH METHOD: AN INTEGRATED APPROACH

Various types of research approaches are available with which one can try to increase the insight into spatial phenomena: migration studies, traffic studies, regional labour-market models, etc. Their common drawback is their partial approach. The traditional migration literature makes a distinction between "work" migration (moving for labour-market reasons) and "residential" migration (moving with a view to improving one's direct housing conditions). Migration models are used in both cases, with so-called attraction variables and migration distances as explanatory variables. Work migration tends to take place between labour-market areas, residential migration within a labour-market region. Hence, the average migration distance tends to be longer in work-migration studies than in studies of residential migration. Given the structure of the urbanised western part of the Netherlands, often both labour- and housing-market reasons are involved when people decide to move house. An example may be elucidating. A glance at figures 1 and 2 teaches us that the distinction between residential migration and work migration in the urbanised western part of the Netherlands (the Randstad), which may have made sense while the commuting range was limited, has become less useful now that markets are strongly overlapping. Nowadays, residential migration often covers larger distances than work migration, which creates difficulties in the specification of attraction factors and model structures.

Past traffic studies permit the coupling of the number of homes with the number of employment opportunities of the chosen traffic areas, but the distribution models are absolutely static. Therefore, these models cannot help us to describe the effect of a house-moving or work-change on commuting traffic.

In the research projects reviewed in this paper, precisely the connection between a change in living and working address and workers' daily travel behaviour is the object of research. The underlying thought is that in deciding to change their work address, people often explicitly consider the implications for home-to-work travel, and that the same holds for decisions to move house. For a good understanding of such processes, the partial approaches need to be completed by an approach with the explicit object of showing the relationship between behaviour on the labour market and on the housing market. Only thus can one identify the role which distance and accessibility play in the whole process. Let us consider, for instance, the group of people working at long distances from their homes. How is this group composed? Are they mostly newcomers on the labour and housing markets who can only find houses available far from their jobs? Or do they tend to be people with comfortable incomes who have exchanged unpleasant living conditions near their work for more pleasant circumstances further away? Or again, is most of the long-distance commuting perhaps temporary, the commuter intending sooner or later to adjust his workplace to his present residence, or the other way about?

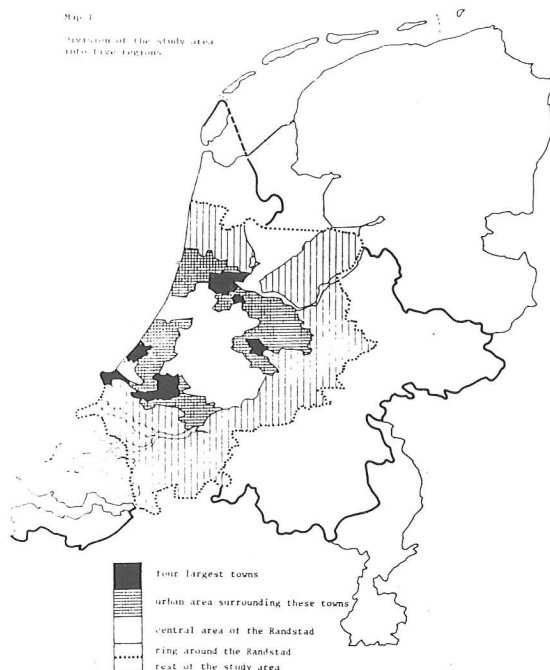


An accurate description based on consistent data about the residential and work addresses and home-to-work trips of persons starting or ceasing to work or changing their home or work addresses, could lay the foundation for an explanatory analysis. As the insight into relocation phenomena increases, a better picture can be drawn of the possible effects of policy measures, which moreover can be better adjusted to spatial behaviour with respect to relocation and commuting.

3. SOME RESEARCH RESULTS

3.1. Description and analysis of commuting and relocation flows

Use has been made of some of the basic material from the Labour Force Survey Sample of 1975 and 1977, based on surveys held by the Netherlands Central Bureau of Statistics among 2-3 per cent of all households. The Labour Force Survey Sample contains information about the location of home and workplace of respondents not only at the survey date, but also one year before. The area covered by the research project is represented in map 1.



In view of the low sample density and to reduce as much as possible the influence of sample errors, the spatial analysis had to be based on sub-areas with sufficient observations. Five subareas were distinguished:

- (1) the four largest towns (Amsterdam, Rotterdam, The Hague, Utrecht);
- (2) the urban area surrounding these towns (the "remaining parts of the Randstad");
- (3) the central area of the Randstad;
- (4) the surrounding regions (the "ring around the Randstad"), and
- (5) the rest of the study area.

In that regional division, interregional commuting appears to have increased in the period 1975-1977 by 56,900 moves from 501,500 to 558,400, an increase of 11 per cent in two years. The share of interregional commuters in the (somewhat increased) total of all active persons also grew: from 15.1 per cent in 1975 to 16.5 per cent in 1977. The increase in the incoming commuter flows into the large towns is striking.

The integrated approach proposed here can be clarified by showing the (re)location phenomena behind the changes in commuter flows. Let us for example look at the growth of commuter traffic from the Randstad's central area to the four largest towns. In table 1 the increase by 16,500 commuter moves has been split into relocation causes on the one hand and on the other entrance into and exit from the labour market (starters and stoppers).

Table 1. Decomposition of the commuter flow from the central area of the Randstad to the four largest towns.

1.1	commuter flows spring 1975 and spring 1977			
	1975	117,500		
	1977	134,000		
	Balance	+16,500		
1.2	Contribution to the net balance of persons who were working at both points of time but changed their residence and/or workplace (relocators), and persons who started or ceased working (starters and stoppers)			
	relocators	+ 9,500		
	starters/stoppers	+ 7,000		
1.3	Net relocation effect, divided into interregional house moves, job change, or combination of the two			
		Ingoing	Outgoing	
			Balance	
	Migration without work change	+15,400	- 6,300	+ 9,100
	Work change without migration	+ 8,900	- 8,600	+ 300
	Work change and migration	+ 500	- 400	+ 100
	Total	+24,800	-15,300	+ 9,500
1.4	Net effect of starting and stopping, distinguished by total number of starters and stoppers			
	starters	+11,100		
	stoppers	- 4,100		
	balance	+ 7,000		

3.2. A double allocation model

For an extensive description of the structure of the model applied, the estimation methods followed and the assumptions adopted, reference is made to the report concerned (NEI, 1981a). In this contribution to the World Conference on Transport Research 1983 a few points will be touched upon which are important for an understanding of the model and an appreciation of its possible uses.

(a) The model is distinguished from other spatial interaction models in that changes both in residential region and in work region are considered in their mutual association (hence the name "double allocation model"); in that respect it enriches traditional migration- and traffic-distribution models. The model computes how a previously determined group of "relocators" re-distributes itself across the study area, and at the same time how large each sub-group of "relocators" is. These sub-groups are:

- workers changing only their residential region;
- workers changing only their work region;
- workers who change both their residential and their work region.

(b) The double allocation model can be characterised as a spatial interaction model in which the parameters have been estimated by means of entropy maximation. The model falls apart in two sub-models, a mover-stayer model and a distribution model.

(c) The essentially double relocation of living and working is explained by groups of explanatory variables: scale and attraction of the residential and work activities by region, house- and work-change distances and distances in commuter traffic. For each variable the parameters have been estimated with the help of the data material from the Labour Force Sample Survey 1975 and 1977. The results are most satisfactory. The parameters prove significant and the test of the computed and actually measured values of the explanatory variables yields acceptable differences.

(d) The model computes the relocations occurring in the course of a year. If, starting from, for example, the situation in 1980, one wants to compute the situation in 1985 as well as the changes that have occurred in the meantime, the model has to be run five times, the end situation of each period of one year constituting an input for the next period of a year. The method relies on the fact that the estimated parameters refer to a period of one year (1974-1975 and 1976-1977 combined).

(e) As appears from the above points, the model describes the relocations of the workers who in a given year change their residence or their workplace, and the way in which residential and workplace choices were mutually adjusted in response to the commuting distances.

Other matters besides relocation should be considered in the computations, namely, the numbers of starters and stoppers, migration to and from the area outside the study area, commuting by starters and stoppers, the number of workers by residential unit, etc. Most of these quantities exogenous to the model have been derived from the Labour Force Sample Survey 1975 and 1977; for the time being we will assume them constant for the forecast period. The number of relocators (residential and work mobility) has not been assumed constant, however, but calculated in each instance as a function of the growth of the housing stock and the economic cycle, in accordance with the developments observed in the Labour Force Survey Sample.

3.2.1. Application of the model

We should keep firmly in mind to what purpose the double allocation model has been developed. One should neither expect accurate forecasts nor use the outcomes in a purely quantitative way. The purpose of the double allocation model is, given certain (alternative) assumptions as to the explanatory variables and given the parameters (reflecting relocation behaviour in the period 1974-1977), to indicate tendencies in migration, job-change, and commuting among the regions distinguished. There is little sense in drawing conclusions from year-to-year figures. Rather the picture at the end of the forecast period should be studied together with the cumulative changes in the course of that period. The model results are useful to judge spatial

policy alternatives, because they show the direction of change that these policy alternatives would encourage and in what respect they differ from each other. For example, on behalf of the National Physical Planning Agency in the Netherlands, variants have been computed with respect to the future spread of housing and employment in the western part of the Netherlands. Maps 2, 3 and 4 show the increase, calculated with the help of the model, of the principal interregional commuter flows in the year 1985, and the corresponding residential and workplace changes in the period 1980-1985.

3.3. The underlying decision process

In 1980, an extensive survey was held in Amsterdam and its surroundings (the northern part of the Randstad) to find out in what circumstances decisions made with respect to residential location and transportation are associated with decisions about places of work, and by whom these decisions are made. The first concern was the relation between residential and/or workplace changes, changes in accessibility between the two addresses, and changes in the means of transportation employed in home-to-work traffic.

It is assumed that change of home and workplace are of mutual influence and in most cases the change of workplace incites the house move. Such a working hypothesis implies that no account is taken of the probably very small number of cases in which the opposite is true, or in which a simultaneous influence could be assumed. The reason behind the change in both job and home location lies in the often increased commuting distances between the old home and the new job location. Three cases can be distinguished:

(1) The commuting distance resulting from the work change is short (say, less than 10 km). We may assume that in the majority of cases such a distance is no stimulus to move house.

(2) The new commuting distance is very long, say more than 100 km. In most cases a move will be thought necessary.

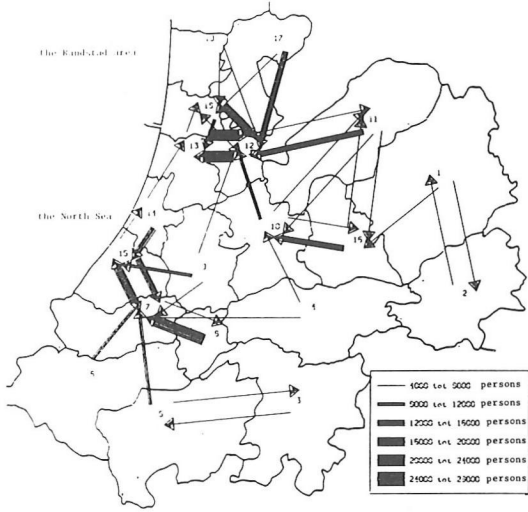
(3) The job change results in a commuting distance between the two extremes. The reactions cannot be predicted. In some cases there will be a house move, in others not. This is a situation which is often encountered in the Randstad.

The object of our research is to obtain more clarity about the reactions that may occur in this middle category. In case 3 there may be a causal relationship between the two moves, but not necessarily. Even if both job and home location are changed in the same three month period we still cannot assume that the moves are causally related; the house move may be the result of another stimulus.

The following hypotheses have been formulated for checking against the data:

(a) If a planned work change results in a greater distance between the old residential location and the new work location, then the chance increases that the decision to change jobs stimulates a house move.

The most important migration streams between regions, calculated for 1985

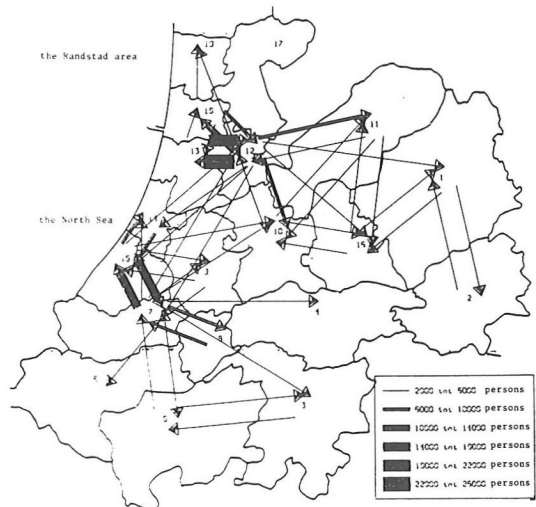
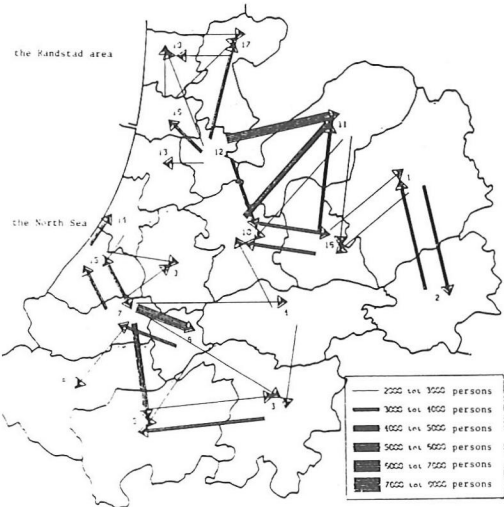


Map 3

The most important migration streams between regions, calculated over the period 1980-1985

Map 4

Changes bij individuals of the location of employment, calculated over the period 1980-1985



(b) If the decision to move house is indeed, on account of the commuting distance, connected with the decision to change jobs, the period between job change and house move is likely to be shorter as the distance between the old residential location and the new work place is longer.

With the help of data from a study of house and work changes in the northern part of the Randstad these hypotheses have been tested. The survey material contains longitudinal data with respect to residential and workplace changes of 4,000 persons during 21 quarters of a year. The testing procedure is based on the examination of the last work change and the last house move made by each respondent before the survey date. The analysis deals with quarter yearly intervals. Frequency distributions have been drawn up for the last house move and the last job change, for each quarter. Conclusions are that:

the association between workplace change and house move appears to be stronger, the longer the commuting distance required if the residential location is not adjusted.

the time of adjustment is shorter as the commuting distance is longer.

4. CONCLUSIONS

This research approach, which focuses on the relationship between changes in residence and job location and changes in the daily-travel behaviour of workers, has provided useful analysis results. In this contribution to the World Conference on Transport Research 1983 results of three research projects have been presented. The data from the Labour Force Survey Sample made it possible to allocate the changes in interregional commuter flows to, on the one hand, relocation causes, and on the other to the entrances into and exits from the labour market. The double allocation model permits an insight into the effects of the future spread of housing and employment on interregional commuter, migration and job-change flows. The extensive survey held in the northern part of the Randstad has increased our understanding of the underlying decision processes. In this paper we have given attention, by way of example, to the time between changes in residence and job location. The longitudinal data on residence and workplace and the mode used in home-to-work journey prove to be a very valuable source of information for the analysis of spatial processes. Longitudinal analysis has provided an enrichment in our understanding, greater than would have been possible with cross-section analysis.

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