

Housing Choice and Search Behaviour in a Disequibrated Market
An Exploratory Analysis*

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Abstract

This paper studies some aspects of the disequilibrium situation in the Dutch housing market. In the first place an attempt will be made to quantify the disequilibrium on the rented part of this market by comparing the numbers of intended moves to various types of dwellings with the numbers of realized moves to such dwellings in preceding years. The ratio of these two variables will be called the realisation rate.

In the second place we analyse the duration of search by assuming a constant hazard rate and employing information about the incompleted spells of search. Sensitivity analysis reveals that the hazard rate is relatively large for households that have been searching for a short period only, while it is relatively small for households that have been searching for a long time.

In the third place it is shown that the estimations of the hazard rates can be used to derive predictions of the numbers of moves.

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1 Introduction

The Dutch housing market is highly influenced by government measures introduced to guide the market. In order to analyse this market it is therefore necessary to take into account the influence of these government measures. One of the most important of these is the fixation of a large part of the rents by the government. These are not determined by supply and demand at the level of market equilibrium, but are fixed at a lower level in order to keep the housing costs of households with a low income at a reasonable level. As a consequence of this measure excess demand has become the normal situation for this part of the market. Private entrepreneurs judge the profitability of housing construction to be insufficient and have withdrawn from the market. In order to relieve the problems associated with this, the government has undertaken large investments in the construction of housing, mainly by means of subsidizing plans developed by municipalities and non-profit institutions which are founded with the purpose of constructing houses. Nevertheless, the supply of cheap, qualitatively good housing, subsidized by the government, has lagged severely behind demand.

In this paper some aspects of the permanent situation of excess demand in the rented segment of the market will be analysed. In the first place attention will be paid to the possibilities that searching households have to realize their desire to make a move within a reasonable period of time. For this purpose we will compare the actual number of moves in the recent past with the number of desired moves. In the second place we will analyse the composition of the population of searching households in terms of the realized period of search. This will allow us to make an estimate of the rate at which such households leave this population. We will model this process initially by means of a constant leaving rate, but will also investigate the validity of this assumption by introducing a distinction between short-term and long-term searchers. Our estimates of the leaving rates enable us to predict the flows of leavers and to compare these with the actual figures.

The purpose of our analysis is to get a better insight in the search behaviour on the disequibrated Dutch housing market where large discrepancies between desires to make a move and possibilities to realize

such desires can occur.

In earlier studies of the Dutch housing market only marginal attention has been paid to the things that happen on the road between the original desire to make a move and the ultimate realisation of it. In simulation studies researchers have tried to smooth out the excess demands in an apparently reasonable way, which is, however, not always explained clearly (see Rima and Van Wissen [1987], Hooimeijer en Linde [1988]). Scholten [1988] contains a log-linear analysis of the differences between the distributions of the desired and the realized moves whose behavioural interpretation is less clear. These studies all make use of the Dutch Housing Needs Survey (abbreviated in Dutch as WBO), but none of them employs the information about the realized duration of search contained in this data base in order to estimate the flows of leavers. Since such an analysis seems not to have been carried out elsewhere either, the present paper gives a first attempt to use the available information about duration of search in order to arrive at a better understanding of the actual search and allocation process on the Dutch housing market.

The organization of the paper is as follows. Section 2 contains information about the data and the way we have used them. In section 3 we study the excess demands by means of a comparison of actual and intended moves. In section 4 we describe the method that has been used to estimate the leaving rates. The results of this estimation are discussed in section 5. In section 6 the differences between short-term and long term searchers are studied. Section 7 is devoted to a comparison of actual and predicted flows of moving households. Section 8 concludes.

2 The Data

It has already been mentioned above that use will be made of the Dutch Housing Needs Survey (WoningBehoeftte Onderzoek, WBO) of 1981, a 1 % sample of the Dutch household population. Attention will be restricted to the rented segment of the market where the disequilibria are concentrated. A household has been considered as searching when it indicated to be willing to make a move to another dwelling within a period of a year. Such households usually indicated also some characteristics of the desired new dwelling, viz. whether it should be a single family dwelling or an

Table 1 Classification of Rented Dwellings

number	s.f.d./apartment	nr of rooms	monthly rent*
1	single family dwelling	1-3	< 250
2	„	1-3	250-450
3	„	1-3	≥ 450
4	„	4	< 250
5	„	4	250-450
6	„	4	≥ 450
7	„	≥ 5	< 450
8	„	≥ 5	≥ 450
9	apartment	1,2	< 250
10	„	1,2	≥ 250
11	„	3	< 250
12	„	3	250-450
13	„	3	≥ 450
14	„	≥ 4	< 250
15	„	≥ 4	250-450
16	„	≥ 4	≥ 450





* units are Dutch guilders

apartment, the desired number of rooms and the rent it was willing to pay for such a dwelling. This elaboration of the desire to make a move allows us to make a classification of the dwelling types. The classification that has been used is identical to the one employed in Rouwendal [1988] en is shown in table 1.

Only households that occupied a rented dwelling and were searching for another rented dwelling have been incorporated in the analysis. This has been done on the presumption that the subpopulation of households with an owner-occupied dwelling searching for a rented dwelling is of a different kind. The collapse of the market for owner-occupied dwellings in 1979-80 makes this assumption even more reasonable.

Since our interest was in the first place in mobility between the different types of dwellings and not in migration we restricted our analysis to households that were searching within the same housing market

Legend

-  1 North and Southwest
-  2 Centre and East
-  3 Rimcity
-  4 South

The black lines denote the boundaries of the Housing Market Areas.



Figure 1. The division in housing market areas and regions

area in which they lived. We used the division of the Netherlands in housing market areas that has been constructed at the Dutch Ministry of Housing (see DGVH [1982, part 2]). Since these areas were too small to be used as independent units of analysis, they have been grouped into four larger spatial entities. These larger areas, from now on called regions, have also been used by Scholten [1988, chapter 4], who derived them on the basis of a clusteranalysis of housing mobility. The regions are shown in figure 1 and can be described as north and southwest (region 1), centre and east (region 2), the Dutch Rimcity (region 3) and south (region 4). It should be noted that the figures to be presented about moves of households all concern moves with origin and destination in the same housing market area, although the figures have been aggregated to regions.

In order to get an impression about the severity of the excess demand on the various (sub)segments of the market for rented dwellings we will compare the numbers of intended moves with the average number of realized moves in the preceding 4 years. A problem with this way of proceeding is

that some households may have made two or more moves during these years, while only the last one is reported. The consequence will be an underestimation of the number of realized moves. Since the number of households that make two or more moves within a period of four years is (presumably) small, this difficulty has been ignored.

For the determination of the probabilities of leaving the population of searchers we used the information about the realized duration of search. The available classification of this period is more detailed for a short period of search than for longer ones. It has been assumed throughout that the in-flow of searching households is uniform over time or at least that variation in this variable can be neglected. But we cannot exclude the possibility of a seasonal pattern in this inflow. It is known that more moves are made during spring and autumn than in the winter and the summer. This will influence the out-flow probabilities. However, since we do not know at which time of the year the respondents have been interviewed and even then would not have an easy correction method available, we have proceeded on the assumption that seasonal patterns in the outflow are also of negligible importance.

3 Excess Demands

In order to get an impression of the volume of the excess-demands, the average numbers of realized moves in the years 1978-1981 and the desired moves within a year by respondents have been compared in table 2. All moves have their origin and destination within the same housing market area, although they are aggregated to the four larger regions.

It should be remarked immediately that a comparison of the intended moves in 1981 with the realized moves in the preceding years is only useful when the situation on the housing market does not change (much) over time. This has been assumed throughout. Some justification for this assumption can be found in the fact that the total number of realized moves in the years 1977- 1980 does show little variation and certainly not a clear trend.

The general impression of large excess demands appears from the fact that only in a small number of cases the yearly average number of realized moves in the recent past is larger than the corresponding number of desired moves at the time of collecting the sample. These cases concern dwelling types 4, small single family dwellings with a low rent, (1 time) and 14, large apartments with a low rent, (3 times) and all refer to relatively small

Table 2 Intended and realized moves*

nr	region 1		region 2		region 3		region 4	
	real.	int.	real.	int.	real.	int.	real.	int.
1	21.50	69.0	104.75	265.0	76.00	182.0	35.50	101.0
2	7.50	40.0	26.75	176.0	8.00	130.0	11.25	71.0
3	4.25	11.0	17.00	66.0	9.00	50.0	2.25	36.0
4	16.50	14.0	40.75	60.0	14.25	39.0	17.25	25.0
5	30.00	65.0	77.25	303.0	18.25	204.0	35.00	97.0
6	10.25	19.0	56.00	138.0	23.75	116.0	27.00	61.0
7	29.25	45.0	61.50	120.0	21.00	117.0	31.75	45.0
8	14.00	16.0	46.00	84.0	28.00	81.0	18.75	29.0
9	4.25	10.0	16.50	29.0	72.50	87.0	7.00	13.0
10	10.50	13.0	38.25	86.0	57.75	128.0	17.00	28.0
11	9.25	14.0	33.75	59.0	69.00	135.0	7.50	12.0
12	8.75	30.0	27.00	153.0	60.25	290.0	17.50	57.0
13	2.50	8.0	14.75	40.0	33.25	85.0	5.25	24.0
14	11.25	4.0	26.00	19.0	41.00	71.0	9.25	7.0
15	12.50	23.0	69.25	80.0	84.75	225.0	27.00	30.0
16	3.50	4.0	26.50	53.0	51.50	102.0	10.50	17.0

* Source : WBO 1981. The number of realisations (abbreviated as real.) is the average yearly number of moves with origin and destination in the same housing market area in the period 1977-1980; the number of intended moves (abbreviated as int.) is the number of households that indicated to be willing to move to a dwelling of the relevant type in the same housing market area within a year.

numbers of moves. The fact that the number of realizations during the period of a year exceeds the volume of the searching population indicates that the complete period of search is less than a year for most of these searchers.

In the large majority of cases, however, the number of realized moves is much smaller than the number of intended moves. This indicates an average waiting time of more than one year. The largest discrepancies between

Table 3 Realisation ratios

type	region 1	region 2	region 3	region 4
1	0.312	0.395	0.418	0.351
2	0.188	0.152	0.062	0.158
3	0.386	0.258	0.185	0.063
4	1.179	0.679	0.365	0.690
5	0.462	0.255	0.089	0.361
6	0.539	0.406	0.205	0.443
7	0.650	0.513	0.179	0.706
8	0.875	0.548	0.346	0.647
9	0.425	0.569	0.833	0.538
10	0.808	0.445	0.451	0.607
11	0.661	0.572	0.511	0.625
12	0.292	0.176	0.208	0.307
13	0.313	0.369	0.391	0.219
14	2.813	1.368	0.577	1.321
15	0.543	0.866	0.377	0.900
16	0.875	0.500	0.505	0.618
av. *	0.509	0.394	0.327	0.428

* The numbers of households intending to move have been used as weights.

intentions and realisations concern the regions 2 and 3, i.e. the central part of the country, where housing market problems are concentrated. It also appears that apartments are much more desired in the the urbanized Rimcity than elsewhere.

On the basis of the maintained assumption that the situation in the rented part of the the Dutch housing market has changed little in the period 1978-1981, and the additional assumptions that all searching households either move to a dwelling of their (indicated) first choice or keep searching for such a dwelling, and that the process of inflow and outflow develops smoothly over time, the ratio of the numbers of intended and realized moves can be interpreted as an indicator of the excess demand

in the submarket concerned. This indicator will be called the realisation ratio. These ratios are listed in table 3.

In the final row of table 3 the average realisation rates of searching households in the four regions are listed. It appears from these figures that excess demands are severe throughout the country, but especially in its central part. In the peripheral regions 1 (north and southwest) and 4 (south) the average realization probability is highest, 51 and 43 % respectively. In the centre and east (region 2) it equals 39 %, while in the Rimcity only 33 % of the searching households can be expected to realise their intended move within a year. It appears that a searching household will, on average, have to wait more than two years before a move can be realized, and in the Rimcity even some three years. These figures seem to be extremely high and suggest that a number of searching households will disappointedly stop searching even though no move has been realised or turn to a second best choice. We will come back to this issue in a later section.

4 The Method

The realization rates that have been computed in the preceding paragraph indicate that it is difficult to complete the process of housing market search within a limited period of time (say a year), when one is looking for a rented dwelling. This suggests that a possibly significant number of searchers will disappointedly stop searching after some period or direct its attention towards a lower preferred but easier to realize type of dwelling. Such behaviour would of course contradict one of the two assumptions on which our computations of the realization probabilities were based. It is possible to get some information about the extent of such behaviour through an analysis of the realized search periods of households that intend to move to another rented dwelling but have not yet moved. In the present section we will discuss the method that will be used in this paper in order to estimate the rates of leaving the populations of searching households. This method can be regarded as an alternative to the one employed in the preceding section and the comparison of both estimates may be expected to yield information about the extent to which these assumptions are violated.

As has been done in the preceding section, it will be assumed here that

the situation in the rented segment of the housing market has changed little in the years immediately preceding 1981. For the present purposes this means that we assume that the rate of inflow of searching households is (approximately) constant. This implies that the distribution of the realized periods of search of households intending to move to a given type of dwelling is completely determined by the rate of leaving this population. We have information about this distribution and will employ it in order to arrive at some estimate of this outflow. In the next paragraphs we will discuss the method that has been used for this purpose.

The WBO-data contain information about the elapsed duration of search of households intending to move, which will be denoted as u . The households in the sample are still searching and the period of search that will ultimately be completed by them, to be denoted as v , will therefore be at least as large as the one realized at the moment of participation in the Housing Needs Survey.

The boundaries of the classes of the realized period of search that are distinguished in the survey are 1 month, 3 months, 6 months, 1 year, and 2 years. The process of leaving the population of searching households is modelled as being continuous over time, with all households searching for the same type of dwelling having an equal, constant rate q of leaving. In the terminology of duration analysis, q is defined as a constant hazard rate.

Given this assumption, the distribution function of the completed durations of search, $G(v)$, equals :

$$G(v) = 1 - e^{-q \cdot v} \quad (1)$$

The probability that the completed duration of search will exceed t is therefore determined as follows :

$$\begin{aligned} \text{Prob}(v \geq t) &= 1 - G(t) \\ &= e^{-q \cdot t} \end{aligned} \quad (2)$$

We have assumed that entrance in the population of searchers takes place at a constant rate. The probability that we will observe, in our cross-sectional sample, an elapsed, incompleted duration of search that exceeds t will therefore be equal to the probability that the completed duration of search exceeds t in a sample in which we follow a number of households that started searching together (at time 0) over time. In symbols, this implies :

$$\begin{aligned} \text{Prob}(u \geq t) &= \text{Prob}(v \geq t) \\ &= e^{-q \cdot t} \end{aligned} \quad (3)$$

In our sample we can only observe the interval in which the elapsed, incompleted duration u lies. It follows from (3) that the probability that an arbitrarily selected searcher in our sample has realized an incompleted duration of search which lies between t_{i-1} and t_i equals :

$$\text{Prob}(t_{i-1} < u < t_i) = e^{-q \cdot t_{i-1}} - e^{-q \cdot t_i}, \quad (4)$$

$i=1, \dots, 6.$

We define $t_0=0$, $t_1=1/12$, $t_2=1/4$, $t_3=1/2$, $t_4=1$, $t_5=2$, $t_6=\infty$.

The likelihood of observing a given combination of realized periods of search in our sample can now be determined as :

$$L = \prod_{i=1}^6 (e^{-q \cdot t_{i-1}} - e^{-q \cdot t_i})^{n_i}, \quad (5)$$

where n_i denotes the observed number of searchers with an elapsed duration of search u that lies between t_{i-1} and t_i .

Maximization of the likelihood-function (5) gives rise to the estimates of the rates of leaving, q , that have been listed in table 4.

5 Comparison of the Leaving Rates and the Realisation Ratios

One would expect a relationship between the leaving rates that have been determined in this section and the realization ratios that have been computed in the preceding one. As a matter of fact, it is easy to show that

Table 4 Rates of leaving the populations of searchers*

dwelling type	region 1	region 2	region 3	region 4
1	0.88**	0.40**	0.41**	0.63**
2	0.58**	0.47**	0.41**	0.58**
3	0.22	0.63**	0.36**	0.38**
4	0.53*	0.33**	0.46**	0.30*
5	0.67**	0.41**	0.43**	0.51**
6	0.90**	0.59**	0.46**	0.53**
7	0.56**	0.37**	0.35**	0.36**
8	1.29**	0.48**	0.47**	0.60**
9	0.94*	0.48**	0.65**	0.62**
10	1.16**	0.55**	0.40**	0.58**
11	0.50*	0.44**	0.44**	0.73**
12	0.63**	0.56**	0.40**	0.52**
13	1.00	0.48**	0.48**	0.40**
14	0.57	0.41**	0.28**	0.43
15	0.56**	0.44**	0.41**	0.44**
16	0.46	0.61**	0.48**	0.48**

* The rates of leaving have been estimated by means of maximum-likelihood. Two asterisks behind an estimate denote significance at a 1 % level, one asterisk significance at a 5 % level.

both figures must be equal if our model provided an exact description of reality and all households that stop searching move to the dwelling type they indicated as their first choice (i.e. they will never move to a different type of dwelling or stop searching without realizing a move).

Table 5 Comparison of the realisation ratios and the leaving rates

region	weighted averages		stand. deviations		correlation coefficient
	real.ratios	leaving rates	real.ratios	leaving rates	
1	0.509	0.695	0.601	0.275	-0.093
2	0.394	0.475	0.287	0.085	-0.393
3	0.327	0.426	0.194	0.077	0.472
4	0.428	0.508	0.299	0.112	-0.130

*The numbers of searchers have been used as weights.

To see this it suffices to observe that the number of households leaving the population of searchers during one period (year) equals $q \cdot B$. The ratio of the number of leavers and the total population of searchers will therefore be equal to the intensity of leaving q .

Actually, both figures are not equal. The weighted average of the leaving rates is for all regions higher than that of the realisation rates. This seems to imply that a significant number of households leave the population of searchers without realizing a move. For region 1 (north and southwest) the average leaving rate is appr. 35 % higher than the average realisation ratio, for region 3 (Rimcity) this figure is 30 %. In the two remaining regions, 2 (centre and east) and 4 (south) the average leaving rate exceeds the average realisation ratio by 20%. The relevant figures are shown in table 5.

It is also shown in that table that the variance in the leaving rates is much smaller than that in the realisation ratios. This suggests that more people stop searching without realising the move they intended to make when the probability of realising such a moves is small. These households may either disappointedly stop searching without realizing a move or switch to a second best alternative which is easier to realize.

Finally, the correlation coefficients, which are listed in the last column of table 5 show that there is no relation between both figures. Only in region 3 there exists a weak positive correlation between the realization ratio and the leaving rate.

In summary, it must be said that the relation between leaving the population, as measured by means of the leaving rate, and moving behaviour,

as measured by means of the realisation ratio, is much weaker than should be expected on the basis of our - admittedly simple - model. Many searching households seem to stop searching without realizing the move they intended to make. Disappointed stopping and switching to second-best choices seem to be widespread phenomena.

However, there are also some alternative possible explanations of the discrepancies between the realisation ratios and the leaving rates. First of all, it may be the case that respondents to the Housing Needs Survey do not give reliable information about their intentions. Acceptance of this hypothesis would make all analysis of the data worthless. Since other analysis has shown that the intended moves to specific types of dwellings can be related in a systematic way to incomes and household composition (see Rouwendal [1989]) this possibility can be abandoned.

Another possibility could be that the situation on the Dutch housing market is not stationary. In the late seventies there was a major boom on the market for owner occupied dwellings, which ended in a relatively sudden collapse in 1979/80, while prices kept decreasing throughout 1981. The uncertainty about future developments of the market might have caused smaller numbers of households intending to move to an owner-occupied dwelling, which would imply a relatively large interest in rented dwellings in that year. The realization ratios would then have been unusually low in 1981, giving an exaggerated expression of the excess-demands.

A third, somewhat related explanation is that the process of leaving the population of searching households is not stationary. It may happen that all households have to wait some time in a queue before another dwelling is offered to them, which would suggest that q is close to zero for households with a short realized period of search and higher for those who have already been searching for a longer period. Since the distribution of vacant rented dwellings at the municipal level usually takes place by institutions that adopt some kind of queuing, such a pattern seems reasonable. The fact that households who disappointedly stop searching will probably only do so after having realized a period of unsuccessful search of some length makes this possibility appear even more worthwhile to verify. This will be the subject of the next section.

6 Differences between short-run and long-run searchers

In this section we will analyze differences in leaving rates between

short-term and long-term searchers. For this purpose we will split our population of searching households into two subpopulations. The first of these contains all households with a realized duration of search of at most one year, the other consists of households with a realized duration of search of more than one year. For both populations the leaving rates are estimated again.

In order to determine the leaving rates of the short-term searchers we used only the data concerning the households with a realized duration of search of at most one year. The probability that an arbitrary searching household within this population has a realized duration of search that lies between t_{i-1} and t_i equals :

$$\begin{aligned} \text{Prob}(t_{i-1} < u < t_i \mid u \leq 1) &= \text{Prob}(t_{i-1} < u < t_i) / \text{Prob}(u \leq 1) \\ &= (e^{-q \cdot t_{i-1}} - e^{-q \cdot t_i}) / \text{Prob}(u \leq 1), \quad (6) \\ &\quad i=1, \dots, 4. \end{aligned}$$

$\text{Prob}(u \leq 1)$ is the probability that an arbitrary household in the complete sample has a realized duration of search which is at most equal to 1 year. For $P(1)$ we have simply substituted the fraction of searchers in our sample with a realized duration of search of at most one year. We thus proceed as if no observations of realized durations of search that exceed one year were available. This implies that we act as if the data were censored by the fixed incomplete duration of search of one year.

An analytical expression of $\text{Prob}(u \leq 1)$ can only be derived if one also specifies the model for incomplete durations that exceed 1. Although this would be possible, we will not undertake it here. For the purposes of the present exploratory analysis we are only interested in the validity of the assumption that the hazard rate is constant over time. We will therefore use the same estimation method as has been used for the complete sample.

The likelihood-function takes the form :

$$L = \prod_{i=1}^4 (e^{-q \cdot t_{i-1}} - e^{-q \cdot t_i})^{n_i}, \quad (7)$$

which is analogous to (5) (the constant $\text{Prob}(u \leq 1)$ can be omitted).

It is not difficult to see that an analogous procedure can be used to estimate the leaving rates of the long term searchers.

Table 6 Leaving Rates of Short and Long-Term Searchers*

dwelling type	region 1		region 2		region 3		region 4	
	short	long	short	long	short	long	short	long
1	1.74**	0.34*	1.71**	0.20**	2.55**	0.17*	1.95**	0.29*
2	1.95**	0.27**	1.73**	0.23**	2.42**	0.17**	2.09**	0.24**
3	2.09	-	2.09**	0.26**	2.47**	0.13*	2.35**	0.13*
4	3.41	0.27	2.06**	0.17**	2.14*	0.22*	1.59	0.15
5	2.22**	0.29**	1.97**	0.17**	1.80**	0.24**	2.31**	0.27**
6	2.29**	0.22	2.31**	0.25**	2.26**	0.16**	2.82**	0.27**
7	2.24**	0.19	2.11**	0.18**	2.13**	0.15**	2.65**	0.20**
8	1.99*	0.69	2.80**	0.20**	2.04**	0.19**	3.92**	0.18*
9	2.21	0.29	4.25*	0.12	2.44**	0.18**	2.04*	0.29
10	2.23**	0.47	1.90**	0.20**	2.51**	0.17**	2.83*	0.22*
11	1.89	0.29	2.78**	0.20**	2.44**	0.16**	1.60*	0.41
12	1.70**	0.31*	2.03**	0.26**	2.25**	0.15**	2.09**	0.26**
13	2.06	-	1.95*	0.29**	2.37**	0.24**	2.21	0.26*
14	-	0.29	3.30*	0.13	1.98**	0.15**	1.38	0.18
15	2.55**	0.06	2.11**	0.21**	2.11**	0.17**	2.19**	0.10
16	-	-	1.85**	0.21**	2.58**	0.23**	2.75	0.29*

* One asterisk denotes significance at a 5 % level, two asterisks significance at a 1 % level.

The results of this estimation are listed in table 6 and summarized in table 7. In some cases the data did not allow estimation of the leaving rates for the subpopulations. The leaving rates for the households who have realized a (relatively) short period of search are in general much higher than those for the population as a whole. The leaving rates of the

Table 7 Summary of the Results for Short and Long-Term Searchers*

region	weighted average		standard-deviation		correlation coefficient	
	s	l	s	l	s	l
1	2.11	0.26	0.82	0.18	-0.50	0.16
2	2.12	0.21	0.65	0.05	0.49	-0.59
3	2.25	0.18	0.22	0.03	0.31	0.06
4	2.38	0.24	0.60	0.07	-0.17	-0.24

* s : short-term searchers, l : long-term searchers.

long-term searchers are much lower than those of the population as a whole.

The rates of the short-term searchers also show much more variation (as measured by the standard deviation) than their analogues for the total population. The correlation with the realisation rates has not much improved in both cases.

It appears from table 7 that there are huge differences between the leaving rates of short-term and long term searchers. The leaving rates of the former group are much higher than those of the latter. This is contrary to our expectation, based on the a priori knowledge of the functioning of the rationing system of the Dutch housing market, on the expectation that disappointment-effects will only become apparent after some period of realized search and on the presumption that the collapse of the market for owner-occupied dwellings has increased the demand for rented dwellings. Our results seem to indicate that other effects, which work in the opposite direction, are much more important.

There are various possible explanations of the difference between the groups. It may be the case that the leaving rate q is a decreasing function of time for all searching households. The above results can then occur even if the population of searchers is homogeneous. For a priori reasons, mentioned above, this seems to be unlikely. It may also be the case that the population is in fact heterogeneous, with different leaving rates for the various subpopulations. Since households with a higher leaving rate disappear more rapidly from the population of searchers, the effect will be a decrease of the average leaving rate. The second possibility is the likelier one, but further research is necessary to confirm or reject this

Table 8 The predicted flows of movers*

dwelling type	region 1		region 2		region 3		region 4	
	c	s/l	c	s/l	c	s/l	c	s/l
1	40.4	43.9	87.4	103.2	61.2	76.5	47.2	54.4
2	17.6	20.2	66.0	76.9	43.7	54.1	31.2	36.5
3	2.2	3.2	30.8	36.0	15.1	19.7	11.4	14.8
4	5.8	6.7	16.9	20.4	14.4	17.0	6.5	7.9
5	31.7	36.5	101.9	125.0	71.3	82.6	38.8	45.7
6	11.3	12.6	61.5	72.6	42.8	53.0	25.1	29.9
7	19.3	23.0	37.1	45.8	34.6	43.4	13.6	16.6
8	11.6	12.1	32.0	40.1	30.4	36.8	13.1	16.1
9	6.1	6.8	11.1	14.4	41.6	49.4	6.0	6.9
10	8.9	9.5	36.4	42.7	42.2	52.9	12.3	14.8
11	5.5	6.3	21.0	26.0	48.1	59.4	6.2	6.8
12	14.0	15.6	65.6	76.7	95.6	119.4	23.1	27.0
13	5.1	5.6	15.2	17.5	32.4	38.6	7.9	9.2
14	1.7	2.0	6.4	8.2	17.3	21.6	2.4	2.8
15	9.9	12.4	28.5	34.5	75.7	92.7	10.7	13.6
16	1.5	2.0	24.2	28.1	38.9	46.9	6.5	7.6

* *The figures in columns under a c are the predictions based on constant leaving rates, the figures in columns under a s/l on different leaving rates for short and long-term searchers.*

conjecture. We will confine ourselves here to the conclusion that modelling the process of housing market search by means of a stationary leaving rate is clearly rejected by the data.

7 Actual and predicted flows of movers

As a final exercise we will, on the basis of our estimates of the leaving rates, make predictions about the flows of movers in the Dutch housing market and compare these with the average flows in the years immediately preceding 1981. Since the correlations between the leaving rates and the realization rates were not impressive - to say the least - one should not expect too much from the results of this exercise.

Tabel 9 Actual and predicted moves

region	average number of moves			correlation coefficient	
	actual	predicted c	s/l	c	s/l
1	12.2	12.0	13.7	0.52	0.55
2	42.6	40.1	48.0	0.42	0.43
3	41.8	44.1	54.0	0.27	0.28
4	17.5	16.4	19.4	0.44	0.45

When the process of leaving the population of searchers is uniform, predictions of the flows of leavers can easily be made. Since we have assumed throughout this article that the situation on the housing market is stationary, total outflow should equal the total inflow. The total inflow per unit of time (year) equals b , which can be determined as $q \cdot B$, the product of the leaving rate and the total population of searchers :

$$x = q \cdot B. \quad (8)$$

When the population is split up in short-term and long-term searchers the outflow becomes equal to :

$$x = q_s \cdot B_s + q_l \cdot B_l, \quad (9)$$

where q_s denotes the leaving rate for short-term searchers and q_l that for long-term searchers. B_s denotes the size of the population of short-term searchers, B_l that of long-term searchers.

The predicted flows of movers have been computed by means of formulas (8) and (9) and are listed in table 8. The correlation coefficients between the two series are high : 0.99 for all four regions. The distinction between short-term and long-term searchers in general gives rise to a somewhat higher prediction of the outflow, but does not have significant consequences for the variation in the predicted outflows.

The figures listed in table 8 can be compared with the average numbers of realized moves listed in table 2. The results of this comparison are summarized in table 9. The averages of the predicted and actual flows are

Table 10 Results of regression analysis*

region	constant	predicted outflow	realization probability - reg.av.	R^2
1	2.86	0.69**	17.3**	0.79
2	2.13	0.84**	80.8**	0.77
3	6.68	0.65**	101.8**	0.88
4	3.44	0.72**	27.8**	0.79

* One asterisk denotes significance at a 5 % level, two asterisks significance at a 1 % level.

of the same order of magnitude for all four regions. The distinction between short and long-term searchers gives rise to somewhat higher predictions.

It should be remarked that the predicted flows are based on the population of searching households that have indicated their realized period. This implies that the predicted flows are biased downwards and the figures of table 9 do not indicate that the number of households who stop searching without realizing a move is negligible. Since some 30 % of the searching households did not indicate their realized period of search, this figure may be regarded as an indication of the fraction of disappointed searchers.

Although the correlation between the actual and predicted moves is still rather low, the negative signs which occurred for the leaving rates have now disappeared.

The standard deviations of the predicted flows (not listed) are for all regions larger than those of the realized flows. This indicates that the realized moves are more equalized over the various dwelling types than the flows of leavers. It may be conjectured that this has something to do with second best choices, which increase the flows towards dwelling types for which excess demands are less severe.

This hypothesis has been tested by means of some regressions. The actual numbers of moves have been used as the independent variable, which had to be explained by the predicted number of moves and the deviation of the

realization ratio from its regional average. The latter variable indicated the relative strength of the excess demand. A relatively high realization rate should be expected to give rise to a larger number of actual moves than a relatively low realization rate, because of second-best choices.

The results of the analysis are listed in table 10 and confirm our expectations. We used the predictions that made use of the distinction between short and long-term searchers, but use of the other series would have given rise to comparable results. The sensitivity for differences in the realization ratios seems is largest in the region 2 (centre and east) and - especially - in region 3 (Rimcity), where excess demands are most severe.

It may be concluded that the estimated flows of leavers can be related in a meaningful way to the actual moves. In view of the disappointingly low correlations between the realization rates and the leaving rates this conclusion is somewhat surprising and at the same time encouraging.

8 Conclusion

The results of our exploratory analysis can be summarized as follows :

1 The situation of disequilibrium on the Dutch housing market is reflected in large discrepancies between the numbers of realized and intended moves. These discrepancies are concentrated in the central regions 2 and 3.

2 The process of leaving the population of searching households is not stationary. The leaving rates of short-term searchers are much higher than those of long-term searchers.

3 There is almost no correlation between the realization rates and the leaving rates.

4 Notwithstanding this, one can make a meaningful prediction of the actual number of moves on the basis of the leaving rates and the deviations of the realization rates from their regional average.

The results that have been presented in this paper are exploratory. The process of leaving the population of searching households has been modelled in a way that may be described as primitive. Use of more advanced models of duration analysis (see e.g. Nickell [1979] for an analysis of incomplete unemployment spells or Kiefer [1988] for a survey) seems to be fully justified on the basis of the results reported above. More attention will

then have to be paid to disappointment-effects which make searchers accept second-best choices or stop searching without realising a move. Furthermore the heterogeneity of the population has to be taken into account in order to see if an explanation can be found for the huge differences in the leaving rates between short-term and long-term searchers.

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