The propensity and the postponement of firm relocations.

Testing approaches for housing choice models*

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Abstract

Forecasting demand for industrial land and commercial property depends on a valid estimation how many firms move to various locations for various reasons. Estimations based on stated choices and revealed choices often differ in size and composition. Spatial and economic planning benefit if we reduce this gap by means of a better understanding why some firms move, others postpone and others chose for in situ improvements.

In regional science there is little knowledge about these processes behind firm movements, apart from location factors as such. In contrast, residential geography and applied demography have a long tradition in behavioural approach to model housing choice. Therefore, in this paper we test to what extent concepts of this approach can be used to improve our knowledge on firm movements. In particular we focus on the propensity and the postponement to move by analyzing a longitudinal dataset. Also we analyse preferences, choices between preferences and substitution between preferences.

* This paper reflects the initial stages of a research on land use by firms. If you want to quote this paper please contact the authors.
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1. Introduction

This paper combines perspectives of economic-geography, residential geography and applied demography. In residential geography and demography we are interested in understanding why people move, how they define preference-function and choice function (maximum, optimum), how they search and finally what they choose. We compare preferences and choice as a function of the motive for moving, the personal capital (income, time, etcetera) and external conditions (availability of supply, accessibility by means of rules etcetera). We are eager to apply some of the approaches and methods, in especially the disaggregated statistical models based in individual preference and choice data, into the domain of economic geography. This idea is not new, but the number of studies in economic geography is limited (Gordijn & Van Wissen 1992, Schutjens et al. 2006). This paper reflects the initial stages of a research on land use and relocations by firms to bring these ideas further by the use of unique longitudinal data.

In the Netherlands on average 18,000 firms and government organizations move each year. This is approximately 4 percent of the firm population (Van Oort et al 2007). Compared to the annual rate of household moves it is only 50%. This 4% demands land and commercial properties – land and floor space – either new or in the present stock. Ritsema van Eck et al. (2009) conclude that between 2000 and 2006 the spatial growth of employment land has been larger than the growth of land for housing. Especially retail centers in the periphery (urban fringe) and office locations nearby stations and the urban fringe have grown rapidly. Approximately 40% of the spatial growth 2000-2006 in the Randstad urban areas can be accounted for industrial estates. Despite the limited number of moves, the space required for these moves is relatively large.

Van Oort et al. (2007) conclude that presently system of matching demand and supply of employment land and governance structures work inefficiently in the Netherlands. The present competition between municipalities to attract firms may result in inefficient land use, long term vacancies and high interest payments for municipalities (they are the main suppliers of employment land). Since most firm relocate within the own municipality (75 percent) municipalities are not eager to stop attracting firms as game theory illustrates (prisoners’ dilemma). Problems have to be solved at a functional spatial scale: the regional level.
Solving this problem is only possible if we have sound forecasts. Forecasting demand, supply and the efficiency of the industrial land and commercial property market partially depends on a valid estimation of moving behaviour (relocation) of firms. Why? Although this market differs from the housing market (Van Wissen 1999), supply is defined by new stock and vacancies in the stock. In housing market models we use vacancy chains. A move to a new land or a property creates a vacancy: old land or property irrespective who owns it. It is available for another firm, which in turn may create a vacancy as well. The chain stops if a starter or migrant enters the market or when a vacancy remains vacant. Hence, total supply consists of new supply (primary) and supply in the stock (secondary). Optimizing the chain by means of ‘strategic’ primary supply makes sense as Van Oort et al. (2007) argue.

However, optimizing the chain is complex. Long term vacancies arise if the willingness to move drops, for instance in an economic crises, the quality is relative low compared to upward offers in the chain due by excessive volumes of new supply or if vacancies are just outdated. Bad performance of the chain can have various origins that demand different approaches. It may be worthwhile to convert a small size ‘industrial park’ in favor of housing. Firms vacancy chain optimizing may differ from then housing market since converting housing land use into other land use is less likely (Ritsema van Eck et al. 2009).

A first step in optimizing the chain we firstly must concentrate on how valid a chain approach is. We will explain and show that we need to know the search and substitution behavior of decision makers in firms (Louwers 1996, Goetgeluk 1997, Daalhuizen 2004). This contribution is the first part of a longer project in which we will gain insight on the probability to move as a function of explanatory characteristics, such as the motive for moving, the sector, the size and so forth, based on this dataset. Proxies for supply are context variables. Luckily we have longitudinal data to analyze the chain. Our analyses will be based on survey data from the former Chamber of Commerce of the region Rivierenland. In 1997-1998, 2000, 2004 and 2007 this chamber held four almost identical surveys among all firms in its region. Before we model we need a first descriptive insight in the data itself.

In this paper we concentrate on the propensity and the postponement of firm relocations. We show the rate of success, which is the probability to move in a certain time-period. We illustrate discrepancies between stated preferences (intentions) and overt behavior (revealed preferences, actual choice) of the searchers. The longitudinal data also reveals the probability to move of firms that intended to stay. In housing literature this is called a ‘windfall move.’ Getting insight in the windfall moves is important since despite the low probability to move the volume of this segment is large. This means that the annual volume of relocated moves
consists of successful searchers and successful windfall movers. Hence, it is necessary to compare the choices of both groups. If they resemble each other, we can estimate the preference structure of windfall movers based on the past and present land and commercial property situation conditional a set of explanatory factor such a sector, added value, personal and indexes like terrain, floor space and so on (see Louw 2009).

This paper is organized as follows. In section 2 we explain the approach in household demographics. In section 3 we deal with the data & methods. Section 4 describes some of the results. Section 5 is conclusive and looks ahead at the coming analyses.

2. Improving the chain

2.1 Static aggregated approaches

If the annual percentage of relocation is 4 percent it must be the result of moves to new supply and moves to vacancies in the stock. These last arise if a firm moves to new supply and leaves land or floor space vacant. In modeling vacancy chains we decompose the total vacancies in primary (new) and secondary supply. The comparison shows the multiplier-effect of primary supply. For planning purposes insight in multiplier is useful since it allow planners to optimize the chain by means of ‘strategic’ primary supply (Gordijn & Van Wissen 1992).

In housing market models static aggregate Markov Chain are used to estimate the vacancy chain at regional levels (Hooimeijer & Linde 1988). Based on data of actual moves of households a matrix P (contingency table) reveals the direct relationship between the dwelling types of destination (row) and origin (column) for movers and the destination for starters and in-migrants. For movers matrix P reveals the probability (row) to enter dwelling type x from all other dwelling types x, y, z. For starters and in-migrants this direct relationship does not exist. Starters have no legacy in the region of destination. In-migrant are starters and movers who origin in other regions. Since starters and in-migrants stop the chain, we split matrix P into matrix Q (movers) and matrix R. Only matrix Q is necessary to estimate the vacancy chain since it takes account of starters and in-migrants. If we offer new supply ‘a’, vector of the same dwelling types as in matrix Q, supply in step 1 supply is the sum of ‘a’ plus the vacancies of Q. In step 2, vacancies Q are accepted and new vacancies emerge. This process continues until no new vacancies emerge. In short: total supply consists of a plus the summed chain effect of Q as the formula shows. It can be shown that we can rewrite this by means into the multiplier model (I=identity matrix).
Markov models assume that the probabilities are homogenous. This implies that we need to define the land and commercial property segments in advance. These segments must make sense in reality. We have to assume that these probabilities are stationary over time. This is problematic assumption since market conditions can change suddenly. On the housing market these probabilities seem less volatile than on the market for land and commercial properties (Louw, et al. 2005). This implies that Markov models can only be used if we test especially the stationarity.

This test demands another approach. Instead of a static aggregated model, we need disaggregated concepts in which individual preference and choice behaviour are at stake. In other words: we compare the intention to move – or not to move - and the preferences for land and commercial property with the actual choice. The choice refers to moving or not moving and the rate in which households have accepted less quality and/or higher prices than the originally preferred. This last aspect is substitution. In housing market models we have switched to disaggregated statistical models. In housing studies this micro-macro perspective improved our knowledge on how the system develops. Although in planning the emphasis is on the macro-level understanding, processes on that level demand for insight on a micro-level (Lindenberg 1990).

In spatio-economic planning the emphasis is still on macro models. Dutch Macro-models like for instance the ‘Firmlocation Monitor’ (BLM, Bedrijfslocatie Monitor, Traa et al. 2007) or ‘Analysis Model Spatial Economy and Labor Markets’ (AREA, Analyse Model Ruimtelijke Economie en Arbeidsmarkten, Louter 2009). An explanatory agent behaviour component is lacking. It may be true that the complex planning tools based on micro-behaviour may perform as well as macro-models, but at least an effort is worthwhile.

### 2.2 Static disaggregated approaches

We start with housing modeling. We apply a commonly used housing model conceptualization (Hooimeijer & Linde 1988, Goetgeluk et al. 1995, Goetgeluk 1997, Oskamp 1997). The conceptualization starts with the definition of housing. According to Hooimeijer (2007) a house is a multidimensional object. It’s a care center (safety: eating, sleeping and so on); an activity center (expression: work, family life, friends, leisure); a geographic node in a ‘care network’ (neighbors, friends, family); a geographic node in an
activity network (work, schools and so on) and a means of investment. A house must be an expression of value for money at a specific time and at a specific geographical location (Mulder 1993). Value for money implies that the quality of the house - expressed as people’s valuation of its attributes (care center/node, activity center/node), which must match people’s (social) value structures and activity patterns, which are related to the various careers (study, work, family, housing) at a specific time in space - must be affordable in the short and long-run.

People permanently define preference structures that are related to the various stages in their lives. The number of housing choices, whether to stay or move, is limited since it involves a high level of risk and is costly (transaction costs). It is risky since the choice will have effects on the course of their lives, as path dependency studies show. Individual housing choice not only depends on housing market supply, but also affects this supply. A characteristic of the housing market is that supply is generated for the most part by people moving house. This can also be referred to as ‘filtering supply’. This is the same as the vacancy chain although we reject the Markov models as a valid estimator. The extent to which supply is made available and is reoccupied by various categories of households also depends on government policy, regulation and institutions (governance).

At the individual or household level, supply must be linked to the preferences of the household. The housing consumer will learn how the housing market enables or constrains the housing search. These opportunities and constraints can occur at both the micro and the macro level. The degree of the constraint depends on the urgency of the move. It is safe to say that after a period of search, people will often exhibit actual behavior (revealed preferences) that differs from their original plans (stated preferences). Priemus proposed: ‘A dwelling can be considered to be a continuous attempt to match the actual housing situation with the aspiration image – which is determined by the comparison of present practical possibilities – and the continuous attempt to harmonize the aspiration image with the subjective ideal image, which is the result of the consideration of the present theoretical possibilities’ (1969, p 14).

This definition implies that housing preferences develop throughout people’s lives, people act goal-oriented i.e. anticipate changing circumstances and finally the choice context is situational which means that dwellings need to be available and accessible at a certain time and location.

These three aspects of consumer behavior in the housing market are represented in the following diagram (Goetgeluk, 1997). The conceptualization is worked out into a three-stage search model that is often used in housing market search research (Gordon & Vickerman,

• The first stage is to enter the search. Moving is never an end in itself, but a means to achieve other goals. Events in personal of household’s careers trigger a move. Events are related to several careers people have, such as the household, study, work career.

• The second stage is the arrival of opportunities. This is exogenous to the household and does not only refer to the number of vacancies in various sub markets, but also to the accessibility of these opportunities. Opportunities that are beyond commuting distance from the place of work will be irrelevant to the household in search.

• The third stage is the acceptance of an opportunity. It is in this stage that the household is forced to make tradeoffs. The decision to accept an opportunity is not just conditional on being in search and on the arrival of an opportunity. It is also a function of the reason for searching and the rate of arrivals. If the reason for searching is the desire for a better dwelling, any opportunity valued less than the present housing situation will usually be rejected. People will either decide to postpone the move or withdraw from search. Whether search continues will depend on the arrival rate. If this rate is very low (segments with a low turnover), it will decrease the chances of continuing search. However if the reason for searching arises from other sources then housing improvement, people might very well accept an opportunity that is worse than their present housing. If the urgency of the search is too high to postpone the move, opportunities with a high arrival rate (segments with a high turnover) will be accepted. This might involve accepting one room less, paying a higher price, moving into rental instead of owner-occupied accommodation, etcetera.

Summarizing, the actual choice is the combination of preferences, opportunities, and constraints. Housing preferences and choice can only be understood if a move is regarded as a way to combine goals in time and space. The motive for moving is therefore an integral part of the search and substitution behavior of households. Further, an approach is needed that bridge the gap between intended choice behavior and the actual choices households make. For policy-makers such would result in better Decision Support Models. They predict the (unintended) outcomes (opportunities), due to changes in the constraints (housing permit legislation, building schemes), better if search (preferences) and substitution (choice)
behavior on the housing market is understood. This will lead to better predictions of the simulation models of the regional housing market.

It is not surprising that some researchers active in demography, economic geography, spatial economics and micro-economics are trying to establish the demography of firms (Van Wissen 1999, Schutjens et al. 2006). Some even propose simulation models that resemble to some extent the housing simulation models. These models focus on key features like, birth, death, growth and migration while taking account of course of the type of economic activity, firm size (Gordijn & Van Wissen 1992, Van Wissen 1999, Van Steen 2005). However, Van Wissen (1999) rightfully argues that transferring housing simulation models to firm demographics will not work easily. One of the problems that Van Wissen (1999, 2005) mentions is the lack of suitable data that offers us the opportunity to measure intentions, preferences, behavior and trade-offs firms make. And data are only valid and reliable if we ask the right question in advance. The questions in this paper are straightforward:

- how can the total mobility split up into active searchers and windfall movers,
- to what extent do movers substitute their preferences if supply lacks,
- to what extent does the active searchers’ choice resemble windfall movers’ choice?

These answers of this question improve insight in the vacancy chain. The result may be that the Markov Chain may forecast well, but at least this based on an analysis of micro-behavior. In the next sections we will discuss above questions in more detail. The analyses are descriptive. In the nearby future statistical modelling is foreseen. Clearly this paper only shows a small part of the wider conceptual framework as applied in marketing studies, but this framework is necessary condition to ‘frame’ our ideas.

3. Data & Methods

3.1 Regional data

The data we use is regionally specific. As Van Oort (2007) indicates the region is spatial level were we have to match demand and supply. Almost 75% percent of the moves happen within the municipality and 25% in the region. Our region is Rivierenland (Riverland)(see figure 1). It is located south fourth largest Dutch town Utrecht and located between the rivers Lek and Meuse and the Waal (branch of Rhine). It is accessible by two main highways: the A2 motorway from Amsterdam to the south of the Netherlands (southeast) and the A27/A16 form
Almere (close to Amsterdam) to Breda/Antwerp. Still, it is the countryside with four small/moderate towns: Tiel, Gorinchem, Culemborg and Leerdam.

**Figure 1 Rivierenland**

The stock of employment land in Rivierenland in 2000 and 2007 is shown in table 1. Between 2000 and 2008 the amount of employment land in Rivierenland increased nearly 200 hectares. In the same period the supply (amount of available building land) increased substantially from 34 hectares in early 2000 hectares to 145 hectares end 2007. However, the amount of building land in the development pipeline halved in this period.

**Table 1 Stock and supply of employment land on industrial estates in Rivierenland in hectares in 2000, 2004 and 2008.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Employment land in use</th>
<th>Building land readily available</th>
<th>Building land in the development pipeline</th>
<th>Total stock and supply of employment land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin 2000</td>
<td>1,351</td>
<td>34</td>
<td>246</td>
<td>1,631</td>
</tr>
<tr>
<td>Begin 2004</td>
<td>1,487</td>
<td>67</td>
<td>210</td>
<td>1,759</td>
</tr>
<tr>
<td>End 2007</td>
<td>1,549</td>
<td>145</td>
<td>120</td>
<td>1,814</td>
</tr>
</tbody>
</table>

In the Netherlands most of the industrial property is built in commission by firms that will use the property. The role of developers in this market is limited. However, their role in the market for offices and shops is more substantial, particularly for the larger offices and shops. National data show that the amount of industrial and commercial floor space built each year is larger than the amount of second-hand floor space traded each year. We have no reasons to assume this is different in Rivierenland. Data for these markets in Rivierenland are not available. With the data from the Chambers of Commerce survey, we can estimate the total stock of industrial and commercial property. According to the 2007 survey, there was 3.7 million square meters of business accommodation among the responding firms. Because the response rate was 51%, the total amount of business accommodation in the region could be somewhere around 7 million square meters.

### 3.2 Dataset

Our analysis is executed on survey data from the former Chamber of Commerce Rivierenland. In 1997-1998, 2000, 2004, and 2007, this chamber held four almost identical surveys among all companies in their region (appropriate 10,000 and 15,000 firms). The survey was called ‘Bedrijven onder Dak’ (BOD) which means “Firms under a Cover”, with the aim to analyze the demand for employment land and commercial property in the region. The four surveys used an almost identical questionnaire, in which firms were asked to answer questions about:

- Their current land and floor space use, and location.
- Their contentment with their property and location.
- Their plans for renovation, relocation, or firm closure.

#### Table 2 Survey response

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of returned questionnaires</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997-1998</td>
<td>6,949</td>
<td>64%</td>
</tr>
<tr>
<td>2000</td>
<td>7,796</td>
<td>58%</td>
</tr>
<tr>
<td>2004</td>
<td>7,075</td>
<td>50%</td>
</tr>
<tr>
<td>2007</td>
<td>7,952</td>
<td>51%</td>
</tr>
</tbody>
</table>

#### Table 3 Datasets for analysis of relocated firms

<table>
<thead>
<tr>
<th>Combination</th>
<th>Number of firms in dataset</th>
<th>Number of firms that relocated</th>
<th>Share of firms that relocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997-1998 and 2000</td>
<td>3,644</td>
<td>347</td>
<td>9.5%</td>
</tr>
<tr>
<td>2000 and 2004</td>
<td>2,975</td>
<td>324</td>
<td>10.8%</td>
</tr>
<tr>
<td>2004 and 2007</td>
<td>3,211</td>
<td>367</td>
<td>11.4%</td>
</tr>
<tr>
<td>Total</td>
<td>9,891</td>
<td>1,034</td>
<td>10.5%</td>
</tr>
</tbody>
</table>
The basic extra feature of longitudinal data is that they are able to reveal the underlying variation in the extent to which firms choose in relation to their previous stated preferences (Davies & Pickles, 1985, see section 3.3). The BOD-survey is a regional survey limited the firms within the region. Companies that moved into, or out of the region are not included in the analysis because either their stated or revealed preference is not known. In this respect the analysis is limited to movement over short distance. However, according to a recent study on relocating firms in the Netherlands 75% of all firms’ move with their own municipality and 94% is moving within its own NUTS 3 region between 1999 and 2006 (Van Oort et al., 2007). Rivierenland has 15 municipalities and is of the size of an EU-NUTS 3 region.

The response rates of the surveys were high, between 64% in 1997-1998 and 50% in 2000 (see table 2). This allowed us to perform a longitudinal analysis at the firm level. It is possible to compare relocation plans of firms a moment t, with their actual behavior at t+1. That means that a comparison between stated and revealed preferences of firms that relocate within the region is possible. We decided not to use the 1997-1998 survey data because it was less suitable for our analysis. Firstly it was not carried out at one moment, but in the course of 2 years, so on the firm level there are differences in time span to the next survey in 2000. Secondly in the 1997-1998 survey some questions we want to use in our analysis are different to the 2000 survey. To investigate the divergence between stated and revealed preferences of firms that actually relocated, two datasets containing two successive surveys were made (2000 and 2004; 2004 and 2007).

### 3.3 Defining mobility

By comparing the addresses of the firms in these three datasets we identified whether a firm had relocated. Relocation is moving to another building. So firms that moved within a building were not identified as moving firms in our analysis, but firms that moved within a street were. If we combine the dataset we get figure 2 (Davies & Pickles 1985).

#### Table 2: Transitions in a cross-sectional and longitudinal perspective

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intension to move 2000</td>
<td>Expected (1)</td>
<td>Unexpected (2)</td>
<td>See below</td>
<td>See below</td>
</tr>
<tr>
<td>Intention to stay 2000</td>
<td>Unexpected (Windfall) (3)</td>
<td>Expected (4)</td>
<td>See below</td>
<td>See below</td>
</tr>
<tr>
<td>Intension to move 2004</td>
<td>X</td>
<td>X</td>
<td>Expected (1)</td>
<td>Unexpected (2)</td>
</tr>
<tr>
<td>Intention to stay 2004</td>
<td>X</td>
<td>X</td>
<td>Unexpected (Windfall) (3)</td>
<td>Expected (4)</td>
</tr>
</tbody>
</table>
This data structure reveals a lot of information:

- Four events emerge: expected moves, expected stays, unexpected stays and unexpected moves. In a cross-sectional approach or just measuring moves these four events are never traced.

- A difference between cross-sectional and longitudinal data. The annual 4% relocation is based on the sum of expected and windfall moves (1+3). Without longitudinal data this would never be known. This is problematic if both groups differ in many respects. This would cause problem for the homogeneity assumption the Markov model! It is possible that both groups are homogenous, but that is to be tested.

- In the longitudinal approach (1+2, 3+4) we analyze how intentions are split up in expected and unexpected events. This is important for forecast especially if preferences (see below) are involved.

- In the longitudinal approach we can compare the preferences and choice of successful intended movers (1).

- In the longitudinal approach we can compare the choice of successful intended movers (1) and the windfall movers (3).

- In the longitudinal approach we can compare the motives for moving, the firm capital (opportunities and constraints) to understand all four events.

- In the longitudinal approach we can reveal the sequence of events over a longer time. For instance a successful move 2000-2004 can be repeated in 2004-2007.

It should be note however, that the events are also a result of the measurement. The present intervals are large. If we would measure it every month the information would be enriched. It would be advisable to measure preferences and so on yearly. The best estimation would be based on the information of our dataset plus an analysis of the geo-coded relocation data that the Chamber of Commerce could collect.

In this paper we limit ourselves to gray cells of figure 2. We will not evaluate the events in the sequence 2000-2004+2004-2007. This will be done later.

3.4 Defining preference, choice and substitution

We assume that a firm selects an alternative out of a choice-set. The choice-set is a set of vacancies that is available in the search region of the firm at a specific time. An alternative is often conceptualized as a bundle: a set of attributes of the land/property and its
‘neighborhood’. Each attribute has a level like for instance the price, the floor space etcetera. If we assume choice-by-attributes a consumer assigns a utility to each attribute level. These so-called part-worth utilities are combined according to a ‘combination’ rule into the total utility (Bettman 1979). The combination rule is the preference function that a decision-maker uses to valuate vacancies. We can imagine many combination rules. Do people combine the part-utilities in the same way and if so, which combination rules is the best? Very often algebraic models use the additive rule to combine the part-utilities of the relevant attributes. The additive rule postulates compensatory behavior of people. The sum of these part-utilities results in a total utility. This implies that even if a part-utility is zero, the total utility may remain positive. However, one may postulate that if a part-utility of only one attribute is zero, the total utility may be zero. If a vacancy suits the housing consumer perfectly except its price, we may assume that the utility is zero. The result is that the vacancy will be rejected in contrast to the additive rule. Varies & Wittink (1990) show the distributive rule. This formula combines a nested additive and normal multiplicative rule. Van Zwetselaar & Goetgeluk (1994), Goetgeluk et al. (1995) and Oskamp (1998) find the last rule in housing choice modeling. In economic geographical studies of moving Louwers (1997) and Daalhuizen (2004) find this rule as well, although this often referred to small business that combine the floor space for working and living. We further assume that all vacancies of the choice-set can be ranked accordingly. Which vacancy the consumer takes is based on the decision rule: often this is ‘take the maximum utility.’

In this paper we will not model and just compare the levels of the preferences and the attributes. Based on Louter (2009), Raspe et al. (2004), Schutjens et al. (2006), Van Oort et al. (2006), Van Steen (2005) en Van Wissen (1999) we have select a number of preference/attributes (see table 4). In the analysis we compare them. Finally we have differentiated between various segments of firms as the Markov Chain demands. Not surprisingly we distinguish the economic sectors: Manufacturing, Construction, Wholesale, Retail and catering, Transport and Services.

<table>
<thead>
<tr>
<th>Preference</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of accommodation</strong></td>
<td>Accommodation at or near home</td>
</tr>
<tr>
<td><strong>Ownership</strong></td>
<td>Rent floor space</td>
</tr>
<tr>
<td><strong>Floor space</strong></td>
<td>Non / accommodation at or near home</td>
</tr>
<tr>
<td><strong>Plot size</strong></td>
<td>Non if not wanted</td>
</tr>
</tbody>
</table>
In this paper we will not model and just compare the levels of the preferences and the attributes. Based on Louter (2009), Raspe et al. (2004), Schutjens et al. (2006), Van Oort et al. (2006), Van Steen (2005) en Van Wissen (1999) we have select a number of preference/attributes (see table 4). In the analysis we compare them. Finally we have differentiated between various segments of firms as the Markov Chain demands. Not surprisingly we distinguish the economic sectors: Manufacturing, Construction, Wholesale, Retail and catering, Transport and Services.

4. Descriptive Results

4.1 Mobility

We used table 3 for our analysis. Table 5 shows the aggregate results expressed in various figures for all sectors. First of all we show the absolute figures. Next we show column-shares. These reveal the share of windfall movers in the total sum of moves. Next we show the row shares. They reveal to what extent intended moves have been successful. Finally we show the total shares to give an impression what the actual shares of each ‘event-class’ are.

The conclusions are very unrevealing compared to the commonly used table 3. Of course the total rate of moves is in both periods is equal to table 3. In both periods we see that the number of moves 11%. Given a 4-year period this is an average of less than 3% per year. This seems less than the Dutch average of 4%. However, we may relax this difference since the data are a subset of the whole populations of firms in Rivierenland (table 2). A t-test would show that difference is not significant at all.

But unrevealing are the column-shares. In both periods of every 100 moves more than 80% are based on windfall moves. We may postulate that this share will be the same every year. This figure differs extremely from housing studies that use longitudinal data. Goetgeluk (1997) and De Groot et al.(2008) show that successful intended moves are approximately 35 à 55 percent for moves in 1 or 2 years depending on the selection of respondents based on active searching. Of course the row shares reveal the same problem. Of every 100 intentions to move only 25 to 30 actual is successful. In housing models this is between the 35 and 55%.

We can conclude that forecasting moves based on intentions is extremely dangerous. We can only relax this is the choices made by successful movers does not differ from the windfall movers and their start situation is equal. And if this is not the case, we also need to analyze to what extent substitution exists.
Table 5 Moving or not moving: 4 events for 2000-2004 and 2004-2007

<table>
<thead>
<tr>
<th></th>
<th>Moved 2000-2004</th>
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Column shares (%/100)

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Row shares (%/100)

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Total shares (%/100)

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4.2 Preference, choice and substitution

To gain insight in preferences, choices and substitution we show a set of graphics which are based on contingency tables. The graphics are called factsheet. We have two sheets per preference/attribute: one for 2000-2004 and one 2004-2007. In the appendix all are shown.

The top of the sheet shows the starting point (2000, 2004) for each attribute for each sector. Only those firms are included that wanted to move and whose preferences were valid. So the fact sheets show the starting points (2000 or 2004) for all groups. The differences between the
sectors are largely based on their share in the dataset. However, some preferences are less likely to be mentioned than others controlled for a sector. We may assume for instance land that is less interesting for services than for industry.

Below this graphics the main point of interest is depicted. It contains four rows and three columns. The rows define the four groups we identify in a longitudinal dataset: Search-Moved, Search-Stayed, No Search-Moved (Windfall) and No Search-Stayed. N is given. The columns express start and end state. The first one shows the ‘housing’ situation on 2000 or 2004. The third column shows the end state: 2004 or 2007. The central column shows the preferences in the years 2000 and 2004. The combination logically excludes some columns for specific rows. Firms that have not stated to move lack the central column. However, they differ with respect to the end-state: windfall-movers have moved! The graphics reveal on the rows substitution of preferences, in the column it shows to what extent the four groups of firms differ.

The essential comparison is between Search-Moved and the No Search-Moved (Windfall movers). Why? In section 4.1 we concluded that we may accept a projection on future demand based on Search-Moved only if their final choices and starting position are equal. Exactly this is assumed in the static aggregated approach like the Markov Chain. The conclusion that we can draw here only based on the simple descriptive analysis is: we have to be very careful just draw conclusions on overall figures like ‘In the Netherlands 18,000 firms and government organizations move per year. This is approximately 4 percent of the firm population (Van Oort et al 2007).’ (See introduction). We will discuss some of the findings below, but the reader can analyze the graphics more in detail by himself.

**Type of accommodation (Fact sheet 1)**

The starting point (2000, 2004) shows a bimodal distribution: accommodation at / near home or solitary accommodation. In general the four groups do not differ that much, although the heterogeneity in the group ‘Search’ is larger than in the group ‘No Search’. The group ‘Search-Stayed’ is less housed in accommodation at / near home or in multi-tenant buildings. There is minimal difference between both periods; it seems that in 2004 more firms are housed in these segments: housed in accommodation at / near home or in multi-tenant buildings.

Are these segments less attractive? No! If we look more carefully, we notice that ‘Search-Moved’ more often opts for leaving accommodation at / near home in favor of especially multi-tenant buildings. Solitary buildings are less preferred. Based on above observation that
potential movers (Search) differ, the graphics show that their preferences differ as well. For ‘Search-Stayed’ the segment accommodation at / near home is large and stable. Controlling for this group however the same pattern emerges: the solitary accommodation is less wanted! Starting point times preferences may result in choices. And the graphs show striking differences! The group ‘Search-Moved’ ends up in the less preferred solitary accommodation in 2004. This substitution effect is radically reduced in 2007. If we take the preferences in both periods into account this suggest that the preference structure is less dynamic than the choice structure. And the only logical answer must be: new supply. The question is why this pattern differs between both periods. The time lag between planning new opportunities and the actual offer on the market seems a logical explanation as Louw (2009) also suggest on the same data! Finally we discern a difference between the choice of Windfall movers and the group ‘Search-Moved’. The Windfall movers perform better.

We draw two conclusions. Forecasting total demand for accommodation based on the group ‘Search-Moved’ is not advisable. The second conclusion is that solitary accommodation is less attractive for firms in this region. This might be a composition effect since many firms are small and active in sectors that do no need solitary accommodation (see Louw 2009).

Ownership (Fact sheet 2)
The starting point (2000, 2004) shows three categories: (1) no accommodation or accommodation at / near home, (2) ownership and (3) renting in each period. If we look at the starting point (2000, 2004) we see that all groups are very alike. However, we discern that the Searchers opt for ‘Buying land and construct yourself’. It is not possible to deduce from the survey whether the firms succeeded in realizing this preference. We only know if they have accommodation and whether this is owned or rented at t+1. The share of the firms that owns their accommodation indicates that only a minority succeeded in building their own accommodation, which implies that substitution is high.

Again Windfall movers differ from the group ‘Search-Moved’. Windfall movers significantly more often end up in no accommodation of accommodation at / near home. If we compare the starting and end state of Windfall movers the difference is absent. Still they have moved for some reason. To some extent it can be explained by the shift in type of accommodation, but maybe also by floor, plot size and location.

We draw three conclusions. Forecasting total demand for accommodation based on the group ‘Search-Moved’ is not advisable based on one hand on the rate of substitution and the
different choices Windfall movers make. Finally, ownership is more preferable than renting although ‘Buying land and construct yourself’ is a dream that is difficult to fulfil.

**Floor Space (Fact sheet 3)**

Floor space is the most mentioned preference in literature. And indeed, space matters a lot as we will see. The starting point (2000, 2004) shows that various sector differ significantly. Industry, whole sale and retail have skewed distributions; large floor space dominates (250 square meters and more). The other sector shows a more equal distribution.

We discern that all four groups differ in the starting year of each period with respect to the floor space. The group ‘Search-Moved’ significantly is found in segment ‘70-250 square meters,’ while the ‘Search-Stayed’ has a significantly large share of 250 square meters and more. Both have a very small share in accommodation at / near home. If we compare them with the windfall movers then again they differ. So, Searchers are the larger firms in the data set.

The Searchers indeed want more space. In both cases the preference structure is simple in its ranking: 250 square meters or more, 70-250 square meters and finally till 70 square meters. The ‘function’ is for the largest firms simple: double my floor space!

Do they succeed? Yes. If they move on the aggregate they gain floor space. The segment 250 square meters or more has a higher likelihood than 70-250 square meters. Surprisingly in both periods accommodation at/near home is a choice as well. Another important observation – a surprising observation – is that in 2004-2007 the share 70 square meters or less has increased. This is an awkward result which can not be understood here. More in debt analysis of the data is necessary. Finally we have to conclude again that windfall movers differ from the other group.

We draw two conclusions. Forecasting total demand for accommodation based on the group ‘Search-Moved’ is not advisable based on one hand on the rate of substitution and the different choices windfall movers make. Second we notice a general preference for more space, especially for the larger firms.

**Plot size (Fact sheet 4)**

Floor space and plot size are spatially linked by definition, but the ratio floor space and plot size depends on the building. High rise constructions give high floor space indexes. The type of construction depends of course to some extent on the production process, but also on the land market and so on (see Louw 2009). As might be expected the share of missing values is
high. Many of the firms are located in accommodation at / near home. Only wholesale and retail score high on large plot sizes (more than 1,500 square meters). In both periods the patterns are alike.

In contrast to floor space the four groups do not do differ that much. This means that we must concentrate on substitution behaviour and the difference between ‘Search-Moved’ and the windfall movers. No doubt, searchers want larger plots than they had. But reality has hard: supply does not match with the preference. Substitution is solving this mismatch. The shares of all three plot sizes increase at the same rate. Sadly enough windfall movers differ again.

We draw two conclusions. Forecasting total demand for accommodation based on the group ‘Search-Moved’ is not advisable based on one hand on the rate of substitution and the different choices windfall movers make. Second we notice a general preference for more space, but the majority of firms not even consider this preference as important.

5. Conclusions

We started this paper with the statement that the current system of matching demand and supply and governance structures for employment land in the Netherlands work inefficiently. Municipalities are not eager to stop attracting firms as game theory illustrates (prisoners’ dilemma). Problems have to be solved at a functional spatial scale: the regional level (Van Oort et al. 2007). We argued that solving this problem is only possible if we have sound forecasts. Forecasting demand, supply and the efficiency of the employment land and commercial property market partially depends on a valid estimation of behaviour of migrating firms. Inspired by housing research we proposed the vacancy chain optimization and in general we proposed to use some of the concepts of residential geography and applied demographics in the domain of the firm. This proposal is not entirely new; the demography of firms exists, but the research is limited.

In a theoretical framework we showed that a Markov Chain model may be suitable. It is static aggregated model that resembles any multiplier model. Based on data on relocation, which is available in the Netherlands, the shift from location of origin to location of destination is used to estimate the multiplier matrix. In housing studies the model was used. However, the models only functions validly for forecasts of vacancy chain effects due to strategic new land and floor space, if assumptions are met. Markov models assume that the probabilities are homogenous. We have to assume that these probabilities are stationary over time. This is problematic assumption since market conditions can change suddenly. On the housing market these probabilities seem less volatile than on the market for land and commercial properties.
(Louw, et al. 2005). This implies that Markov models can only be used if we test especially the stationarity. A first step in optimizing the chain we firstly must concentrate on how valid a chain approach is. Based on demographical models we raised three questions:

- how can the total mobility split up into active searchers and windfall movers,
- to what extent do movers substitute their preferences if supply lacks,
- to what extent does the active searchers’ choice resemble windfall movers’ choice?

Luckily we have longitudinal data to analyze the chain. Our analysis is based on survey data from the former Chamber of Commerce of the region Rivierenland. In 1997-1998, 2000, 2004 and 2007 this chamber held four almost identical surveys among all companies in their region (appropriate 10,000 and 15,000 firms). We compared preferences, choices and substitution of preferences between 2000-2004 and 2004-2007. This resulted in four groups of events: ‘Search-Moved’, ‘Search-Stayed’, ‘No Search-Moved’ and finally ‘No Search-Stayed’. In cross-sectional approaches the total annual sum of relocated firms is equal to ‘Search-Moved plus No Search-Moved’.

The estimations on demand are always based on preferences by two groups: ‘Search-Moved plus Search-Stayed’. In short, longitudinal data can unravel if the composition of mobility in various aspects: differences at start, differences in the end state (choice) and substitution. If these differences are significant all assumption with regard to homogeneity and stationarity are falsified.

And, are these assumption falsified? Yes. First, we conclude that forecasting moves based on intentions (preferences) is extremely dangerous. We can only use intentions when the choices made by successful movers do not differ from the windfall movers (search-stayed group) and their start situation is equal. Sadly enough this is not the case. Also the group of windfall movers is much larger than the search-moved group. Secondly forecasting total demand based on the group ‘Search-Moved’ is not advisable based on at het one hand on the rate of substitution between preferences and the other hand different choices windfall movers make.

Both groups are fare from homogeneous. Thirdly, the preferences seem not stable over time, but show considerable changes. Although, this can be due to a composition effect we should be careful because preferences seem not stationary.

The consequences are the same as in housing models. We just have to shift more to the micro-level and longitudinal approaches to understand search and substitution behaviour. Efforts in modelling the demography of firms show that this may be far more complex than the housing market modelling. Still, analytical models applied in housing studies may suit well. It might well be that existing macro models might be improved with micro-analysis.
Literature


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**Bureau Louter (2009),** Ruimtelijk-economisch prognosemodel: AREA. http://www.bureaulouter.nl/modellen.html#AREA


**Heida, H & H. den Otter (1988),** Quarto - simulatie van vraag en aanbod op de woningmarkt, Planning 34, INRO-TNO, Delft.


Oskamp, A. (1997), Local housing market simulation; a micro approach; Amsterdam (Thesis Publisher).


Van Oort, F et al. (2007), Verhuizingen van bedrijven en groei van werkgelegenheid.


Appendix: Fact sheets
Fact sheet 1
Valid preferences
N=208
% 6,9

Type of accommodation
Search-Moved N=52
Search-Stayed N=158
No Search-Moved N=262
No Search-Stayed N=2432

Type of accommodation 2000-2004
non at home
multi-tenant
solitary
2000
non at home
multi-tenant
solitary
2000
non at home
multi-tenant
solitary
2000
non at home
multi-tenant
solitary
2000

Preference
non at home
multi-tenant
solitary
2004
non at home
multi-tenant
solitary
2004
non at home
multi-tenant
solitary
2004
non at home
multi-tenant
solitary
2004

Type of accommodation 2004-2007
non at home
multi-tenant
solitary
2004
non at home
multi-tenant
solitary
2004
non at home
multi-tenant
solitary
2004
non at home
multi-tenant
solitary
2004

Preference
non at home
multi-tenant
solitary
2007
non at home
multi-tenant
solitary
2007
non at home
multi-tenant
solitary
2007
non at home
multi-tenant
solitary
2007

Manufacturing Construction Wholesale Retail Catering Transport Services
Accommodation at or near home
Multi-tenant building
Solitary accommodation
None
**Fact sheet 2**

**Valid preferences Ownership per sector**

Ownership 2000-2004

- N=207
- 6.9%

Ownership per sector

- Search-Moved N=52
- Search-Stayed N=156
- No Search-Moved N=260
- No Search-Stayed N=2415

Ownership 2004-2007

- N=185
- 5.7%

Ownership per sector

- Search-Moved N=66
- Search-Stayed N=154
- No Search-Moved N=296
- No Search-Stayed N=2642
### Fact sheet 3

#### Floorsize 2000-2004

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#### Search-Moved

- **2000:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

- **2004:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

#### Search-Stayed

- **2000:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

- **2004:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

#### No Search-Moved

- **2000:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

- **2004:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

#### No Search-Stayed

- **2000:**
  - 250m²: 150
  - 250m²-70m²: 150
  - 250m²-250m²: 150

- **2004:**
  - 250m²: 150
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  - 250m²-250m²: 150
## Fact Sheet 4

### Valid Preferences

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### 2004-2007

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