

The firm relocation decision: a logit model

A.E. Brouwer* , I. Mariotti*, J.N. van Ommeren^o

a.e.brouwer@frw.rug.nl, i.mariotti@frw.rug.nl, jommeren@econ.vu.nl

* *Department of Spatial Sciences, University of Groningen, Groningen, the Netherlands*

^o *Department of Economics, Free University, Amsterdam, The Netherlands*

1. Introduction

The geographical movements of firms, together with firm formation and expansion, decline and closure, influence the geographical distribution of economic activity at any point of time. The analysis of firm relocation aims to inform and contribute to regional policy guidance and has wider implication in regional planning policy. The close connection between the firm's stage of the firm cycle and relocation has been object of many studies (SISWO, 1970; Palierne, 1966; Keeble, 1968; Board of Trade, 1968). Studies published since the 1970s on firm relocation, especially in the United Kingdom, but also in the Netherlands, Germany, France and Italy, focus on the effect of the firm's age, size and market.¹ We will focus on these factors, but go beyond the current literature and focus on other factors as well.

Three main categories of factors influencing firm migration can be found in the literature (Lloyd and Dicken, 1977; van Dijk, Pellenbarg and Van Steen, 1999): (i) internal factors; (ii) location factors (site and situation); (iii) external factors. In the current paper, the effects of these factors on the decision to relocate are investigated, employing data on firm's relocation behavior in twenty-one countries, mainly European countries, between 1997 and 1999.

The paper is organized as follows. In the next section, a definition of relocation is provided and the motives driving firm relocation are presented. The third section

¹ These studies include Luttrell (1962), Cameron and Clark (1966), Keeble (1968) and Townroe (1972) for the United Kingdom; Molle (1977) and Kruyt (1979) for the Netherlands; Bade (1983) for Germany; Aydalot (1972, 1978) for France; Camagni (1976) and Ortona and Santagata (1983) for Italy – with a heavy accent on the Italian Mezzogiorno. A renewed interest is visible in 1990s especially in the United Kingdom (Cheshire and Gordon, 1994; Prism Research, 1992, 2001) and in the Netherlands (Kemper and Pellenbarg, 1997; Pen and Pellenbarg, 1998).

focuses on the relocation approaches in the light of the main location theories: neo-classical, behavioural and institutional. Section four presents a theoretical model that aims to explain the influence of the internal, external and location factors on firm relocation. On the basis of this model, a number of hypotheses are offered. Section five introduces the data employed for the analysis (the 1999 Cranet Survey). In section six, the empirical results are offered, the hypotheses are tested and discussed. In the final section, the conclusions for the relationships between the factors and the decision to relocate are drawn.

2. Relocation: definition and motivations

Firms tend to stay in the same location for all their life. Firm expansion and more suitable premises are the main forces driving relocation. Once a firm has reached the limit of its production capacity, it may need to relocate. This spatial adjustment process to firm growth may be explained by the internal dynamics of the production process. A second reason driving relocation is cost saving. Firms aim at taking advantage of favourable cost conditions in other locations i.e. due to wage differentials, scale economies, energy prices, local incentives or other factors. Access to raw material and energy sources and market-oriented strategies are other prevailing motivations. Finally, firms are ‘pushed’ to move by government policy through subsidies. This strategy has been adopted in most industrialised countries since the ‘50s, mainly to reduce interregional inequalities in income and employment opportunities.

A firm can expand its production activity in three ways: (i) expansion at existing sites (on-site expansion), (ii) opening new plants (branching), or (iii) relocating to new, larger spaces (Schmenner, 1980). On-site plant expansion is generally the cheapest way to add capacity because of sunk and moving costs.² When on-site expansion is less desirable, firm can turn towards two alternatives: branching and relocation (Scot

² On-site changes deal with diseconomies of scale. For instance, if more production space is added on-site, the layout may become less optimal. Staying at the same site often postpones the introduction of new process technology as well.

and Bruce, 1987).³ Firms that decide to open a branch are, on average, larger than those firms contemplating relocation. Finally, relocation is a strategy mainly adopted by single site firms and tends to be executed locally. Firms prefer to find a new location that is near their existing site to keep their workforce and suppliers.

3. Three theories explaining firm relocation process

This section presents the relocation process on the basis of the three main location theories: *neo-classical*, *behavioural* and *institutional* (see Hayter, 1997). Industrial location theory, formulated in the beginning of the 20th century, focuses on the location factors determining the attractiveness of a site for firm location (*pull factors*). Relocation theory also takes into account the ‘push out’ of the present location (*push factors*). Relocation approaches are hardly applied and treated as special case of location theories or are based on empirical analysis.

The *neo-classical location* theory focuses on the premise of the rationale firm that maximises profit in choosing the optimal location. A firm moves from the current location to a new one when the first is no longer inside the spatial margins to profitability (*push factors*) and the second might be a profitable one (*pull factor*) (see Pellenbarg, Van Wissen and Van Dijk, 2002). The main forces driving firm relocation are transportation and labour costs. This theory implies two key assumptions. The decision-maker has perfect knowledge and power and must be striving to maximise profit.

The *behavioural location theory* claims that the idea of ‘optimal’ decisions is a theoretical abstraction (Simon, 1959). Decision-makers act without perfect knowledge and settle for sub-optimal outcomes. Further, managers may seek to maximise their own utility (Williamson, 1964) or may have multiple goals, as an organisation is made up of individuals each with their own department engaged in different functions (Cyert and March, 1963).

³ Branching is adopted by firms that aim at differentiating their production in space taking advantage of the most favourable locations, avoiding overloading one plant and adopting the latest production technology. Firms tend to keep the ‘intelligence’ (i.e. R&D activities, marketing) in the place of origin and locate the ‘operations’ in areas characterised by low production costs (Rullani and Plechero, 2001).

Neo-classical and behavioural theories have been subject to considerable criticism because, in both approaches, a firm chooses among a number of different alternatives in a static environment. The *institutional location theory* starts from the assumption that economic processes in space are rather shaped by society's cultural institutions and value systems than by firm behaviour. It views the location behaviour as the result of the outcome of a firm's negotiation with suppliers, governments, labour unions and other institutions about prices, wages, taxes, subsidies, infrastructure, and other key factors in the production process of the firm (Pellenbarg, Van Wissen and Van Dijk, 2002). This approach is more suited for large firms that have more negotiating power and are able to influence their environment (Hayter, 1997). However, it can also be applied to explain small and medium sized firms' location behaviour, which is mainly influenced by government policy and the real estate market.

The neo-classical theory is considered too abstract and only useful to analyse relocation behaviour of small firms.⁴ Nowadays, most firms are complex organisations, consisting of many individuals and groups who may influence decisions, as managers, as shareholders or as workers' representatives (Wood, 1987). Most well known migration studies such as Townroe (1971, 1976), Hamilton et. al. (1974), Keeble (1976, 1978), Pellenbarg (1985) and also Louw (1996) and Ebels (1997) are primarily based on behavioural principles.

4. Hypotheses of relocation decision

In this section a number of hypotheses are proposed, on the basis of the literature reviewed in the previous section. Three categories of factors influence firm relocation: internal, external and location factors (Lloyd and Dicken, 1977; Van Dijk, Pellenbarg and Van Stenn, 1999). Table 1 presents a list of factors we will use in the empirical section, grouped into the three categories.

⁴ When the models of the neo-classical location theory were published, firms would have typically been much smaller, featuring perhaps a solitary decision-maker.

Table 1: Firm's factors influencing relocation

Internal factors	External factors	Location factors
<ul style="list-style-type: none">▪ Sector▪ Status*▪ Ownership▪ Size▪ Age▪ Growth in the number of employees▪ Take-over▪ Merger▪ Acquisition	<ul style="list-style-type: none">▪ Market size	<ul style="list-style-type: none">▪ Country▪ Head quarter's location in another country

* Type of organization (i.e. single site firm, subsidiary, head quarter).

While the list of internal factors is rather complete, information on external and location factors are lacking and this is likely to affect the quality of the analysis. The knowledge of some external (i.e. labour market issues, government policy and general economic conditions) and location factors (i.e. information on the type of industrial site and the characteristics of the premises⁵) might be crucial in explaining firm relocation choices.

We will formulate five main hypotheses related to size, age, sector, size of market and change in the firm's structure.

Moving costs and the organizational problems associated with moving are less than for large firms. Further, small firms have less demanding premise requirements and are much more affected by redevelopment (see also Mason, 1980). Consequently, the first hypothesis can be formulated as follows:

Hypothesis 1: Firm's mobility decreases with the size of the firm.

Younger firms have higher growth rates (Dunne and Hughes, 1994) and therefore need more space, one incentive to relocate. When firms grow older they are also more embedded in the spatial environment. Further, as the 'incubator theory' shows, in the first stage of their life, small firms tend to locate in the inner city of the metropolitan areas to benefit of the agglomeration economies (Hoover, Vernon, 1959; Lichtberg, 1960; Vernon, 1960). However, as they grow and need more space to expand their

⁵ Size of premises, accessibility, public parking facilities, distance to customers and suppliers and quality of public space.

production, they tend to move out of the center, because of the increased cost of the central location (land and congestion costs) and the decreased need of external economies because of the large firm's ability to integrate service and production activities (Ciciotti, 1998). Consequently, the second hypothesis can be formulated as follows:

Hypothesis 2: Firm's mobility decreases with the age of the firm

Services sectors are primarily market oriented and need a close connection with customers, which makes firms in the service sector less willing to relocate than the manufacturing industry. Therefore, the third hypothesis is the following:

Hypothesis 3: Firms in the manufacturing move more frequently than those in the service sector

Mobile firms are more export oriented and exhibit significantly wider spatial patterns of customer linkage (Keeble, 1978). A multinational network has a positive impact on the relocation decision. When a firm is part of a global network, production can easily be shifted within its network without incurring sunk costs when situation proves unfavourable to one of its firms. In contrast, a uni-national firm without a network always needs to incur the sunk costs, and is therefore less likely to relocate part of its activity (Pennings and Sleuwaegen, 2000). Sunk costs are known as a barrier to international relocation of a firm (Caves and Porter, 1976; Motta and Thisse, 1994). Generally speaking, a firm that is less dependent on a localized market is more likely to move. It follows:

Hypothesis 4: firms that serve national and foreign markets are more mobile

Firms may experience structural changes in their life that can lead to firm relocation. Firms that experience either growth or decline need to find new premises.⁶ Changes such as merger, acquisition and takeover can modify company's structure and management. In particular, the acquisition of foreign firms is the main strategy

⁶ Growth has a stronger effect on firm's organizational structure.

adopted by firms willing to relocate activities both nationally and internationally. This brings us to the last hypothesis:

Hypothesis 5: Growth, merger, acquisition, takeover are factors inducing relocation.

5. Data

The data set used for the analysis is the 1999 Cranet Survey, where Cranet stands for ‘the Cranfield Network on European Human Resource Management’⁷. It is a representative survey of Human Resource Management policies and practices, regularly carried out by 34 universities and business schools since 1990. The Cranet survey is based on standardised questionnaires sent to private and public firms in different countries. The questionnaire is addressed to the most senior HR/personnel specialist. Firms with more than 200 employees are analysed here⁸. In total we have 5568 observations. In the 1999 survey, respondents were asked whether their firms have relocated in the last three years (1997-1999).

Table 3: Firm relocation within three years (1997-1999) by country

Country	Number of observations	Relocated firms (%)
Denmark	285	17
New Zealand	198	12
Netherlands	172	11
United Kingdom	913	10
Finland	268	10
Ireland	212	10
Austria	215	8
Italy	74	7
Greece	134	7
France	363	6
Sweden	327	7
Germany	193	6
Belgium	218	6
Norway	248	6
Turkey	195	6
Switzerland	133	5
Japan	641	4
Spain	260	3
Czech	162	2
Portugal	142	2
Australia	149	2
TOTAL	5568	8

Source: 1999 Cranet survey

⁷ The Cranet Survey is co-ordinated by the Centre for European Human Resource Management at Cranfield School of Management.

⁸ The response rate are between 16.6-22.5%. The willingness of firms to respond was higher in northern Europe than in Southern Europe.

The data indicate that relocation is not common: 8% of the firms have relocated within three years, so the annual moving rate equals 2.7 %.⁹ The most mobile firms are located in Denmark, New Zealand, Netherlands and United Kingdom (Table 3).

Table 4 presents the moving propensity by sector. Sector is clearly an important determination of moving behaviour. In the agricultural, local government and health sector, moving is less common.

Table 4: Firm relocation within three years (1997-1999) by sector

Sector	Number of observations	% of relocated firms
Other services	158	14
Other manufacture	811	10
Central government	125	10
Transport and communications	281	9
Energy and water	160	8
Distributive trades	435	8
Banking and finance	435	8
Personal services	81	8
Metal manufacture	865	7
Building and civil engineering	280	7
Education	193	7
Non energy chemicals	254	6
Health	310	5
Agriculture	74	4
Local government	400	3
TOTALS	5568	8

Source: 1999 Cranet survey

As concerns company's age, 63% of relocating firms have been founded after 1950 (Table 5) with a large percentage (17%) of moving companies settled down in the last decade (1990-1999). By contrast, only 12% regards old companies founded before 1900. This result is not surprising because young companies are more likely to move as described by the percentage that is higher for companies founded in the last three decades. The fact that younger companies have a higher chance of moving can as well explain the absence of relocated 'older' firms (founded before 1900). If those 'older' firms did relocate, the probability of relocating in the early days of their existence is much higher than the chance of relocating when they are older (Swaminathan, 1996; Vaessen 1993). The Cranet database records show only those firms that relocated in

⁹ Note that the sample of analysis covers firms with more than 200 employees. As the literature points out, small firms move more than large firms.

the period 1996-1999, consequently firms that have relocated in an earlier stage will not be found back in the database results.

Table 5: Firm relocation within three years (1997-1999) by year of foundation

Years	Number of relocations	% of relocated firms
Before 1900	819	7
1901-1910	153	10
1911-1920	206	7
1921-1930	253	9
1931-1940	218	9
1941-1950	1825	1
1951-1960	385	10
1961-1970	537	6
1971-1980	496	12
1981-1990	540	10
1991-1999	1567	8

Source: 1999 Cranet survey

6. The empirical model and the results

The decision to relocate activities is modeled within a logit model relating the probability to relocate to a set of explanatory variables x_i . The probability of relocation is $F(x_i; \hat{\mathbf{a}})$ where $F(.) = \exp(.)/[1+\exp(.)]$, and $\hat{\mathbf{a}}$ is the vector of coefficients.

The explanatory variables are the following: AGE (year of foundation), SIZE (number of employees), MARKET (consumer market), CHANGE (change in number of employees), AQUIS (firm has been involved in acquisition), TAKENO (firm has been taken over), MERGER (firm has been involved in merger), TYPORG (ownership structure) and TYPE (type of organization). The reference group is represented by a firm with the following characteristics: it is the headquarter of an international, private, manufacturing firm; was founded between 1981-1999; has 200-350 employees; operates on a world-wide market; is located in a Northern European country; experienced an increase in the number of employees in the past three years; was not involved in an acquisition, take over or merger and had an increase in the number of external providers.

The results are tested on different significant levels, the 1, 5 and 10 percent level. Most of the categories have a variable that represent 'else' or 'other'. Although these variables are not discussed in the paper, they are taken into the analysis to avoid missing cases.

Table 6 presents the empirical results. In line with the hypotheses, the estimated parameters for AGE show that older firms have a relatively low probability to relocate. The variable SIZE shows that large firms are less willing to relocate. For example, firms with more than 1300 employees have a 40% lower probability of relocation than firms with less than 350 employees.

For the variable SECTOR the estimated parameters are not so pronounced. Firms in the quaternary services have the highest probability of moving, whereas other sectors have about equal probability of moving.

The parameters for the variable MARKET were expected to give an indication that a firm with a 'larger' market has higher chance of relocating. The results are quite different. The world-wide and the national market do not differ significantly. The European and the local market do differ significant from the world wide market and have both a small chance to relocation.

The variable REGION presents four groups. The first three represent the three main regions in Europe (respectively Northern Europe, Western Europe and Southern Europe), the last group refers to non-European countries. The estimates show that firms located in Northern Europe have the highest probability of moving, Western European firms have less chance of relocation and that firms in South Europe are the least mobile.

The variable CHANGE, indicating the change in the number of employees during the last three years, provides an indication of the growth or decline of the firm. The results are as hypothesized. The firms that have experienced an increase or a decrease in employees in the past three years have a higher probability of relocation.

Firms that have been involved in acquisition (ACQUIS) have a lower probability of relocating. Apparently, these firms expand by taking over other firms, which reduces the need to move. Firms that were taken over (TAKENO) have a little higher, but not significant, probability of relocating. Firms that have been involved in merger (MERGER) are significantly more mobile.

The hypotheses for the variable TYPEORG, referring to the structure of ownership are not confirmed. There are no significant differences between the different ownership structures.

The variable TYPE referring to the organizational status shows that the single independent site is less mobile than other firms.

Table 6: Empirical results

	B	t-value ^o
Constant	-1.5313	
AGE (1981-1999)		
AGE (1921-1980)	-.0325	0.25
AGE (0 - 1920)	-.3102	1.96 **
AGE (ELSE)	-.2475	1.44 *
SIZE (200-350)		
SIZE (351-600)	-.1971	1.43 *
SIZE (601-1300)	-.1581	1.14
SIZE (1301- end)	-.4094	2.81 ***
SECTOR (manufacturing)		
SECTOR (public services)	.0859	0.38
SECTOR (quartary services)	.2856	1.76 *
SECTOR (tertiary services)	.0571	0.35
SECTOR (other)	-.0937	0.62
MARKET (world wide)		
MARKET (local)	-.4634	2.13 **
MARKET (regional)	-.3329	1.69 *
MARKET (national)	-.0677	0.51
MARKET (European)	-.4836	2.62 ***
MARKET (else)	-.4864	1.75 **
REGION (Northern Europe)		
REGION (Western Europe)	-.3608	2.77 ***
REGION (Southern Europe)	-.8385	4.23 ***
REGION (Other countries)	-.2759	1.53 *
CHANGE (increased number of employees)		
CHANGE (same)	-.3762	2.71 ***
CHANGE (decreased)	-.0181	0.15
CHANGE (don't know / else)	-.1256	0.35
AQUIS (yes)	-.5165	4.66 ***
TAKENO (yes)	.1497	0.94
MERGER (yes)	.3601	2.64 ***
TYPEORG (private)		
TYPEORG (state owned)	.0954	0.48
TYPEORG (part state owned)	.2765	1.08
TYPEORG (other)	.1424	0.75
TYPE (subsidiary of international)		
TYPE (corporate HQ international)	.2109	1.17
TYPE (corporat e HQ national)	-.1688	0.93
TYPE (independent single site)	-.8325	3.22 ***
TYPE (subsidiary of national)	-.0277	0.14
TYPE (independent more than one)	-.1458	0.85
TYPE (other)	-.3530	1.65 *
LANDISHQ (1)	.0861	0.65
Number of observations	5568	
P. reference group	0.28	

^o : * = significant at 10 %

** = significant at 5 %

*** = significant at 1%

The last variable in the analysis is the LANSISHQ, which represents whether or not the questioned firm is located in the same country as the headquarter of the organization. Whether or not the firm is located in the same country as the location of

the corporate headquarters does not have a significant influence on the probabilities of relocating.

7. Conclusions

This paper investigates the effects of firm's factors (internal, external and location factors) on the decision to relocate, employing data on firm's relocation behaviour in twenty-one countries. In line with the literature, it is found that small and young firms are more likely to move. In addition, the change in the number of employees (increase or decrease) has a positive impact on relocation. Young firms grow faster than old companies and this led them to relocate (Dunne and Hughes, 1994). In contrast, older firms are more embedded in their spatial environment; they are embedded in networks that are established through long term trust-based relations which are likely to be facilitated by spatial proximity (Atakhan, 2001). Firms operating in the quaternary services are more mobile than manufacturing firms. Services are usually small firms and move rather easily. Finally, firms that have been involved in merger are more willing to relocate than firms that experienced acquisition or taken over. Both acquisition and taken over can be considered as substitute of relocation.

References

- Atakhan M. (2001), Examining network embeddedness within industrial relocation: a methodological approach, paper presented at the 14th Advanced Summer Institute of the ERSA, Groningen.
- Atzema, O.A.L.C. and J.G. Lambooy (1999) Agglomeration economies and migration of firms. In: Van Dijk, J. and P.H. Pellenbarg *Demography of firms, spatial dynamics of firm behaviour*. University of Groningen, The Netherlands.
- Caves, R.E. (1998) Industrial organisation and new findings on the turnover and mobility of firms, *Journal of economic literature*, no. 36, pp.1947-1982.
- Cyert R.M. e March J.G. (1963), *A behavioural theory of the firm*, Englewood Cliffs, NY: Prentice Hall.
- Carroll, G.R. (1997) Long-term evolutionary change in organizational population: theory, models and empirical findings in industrial demography, *Industrial and corporate change*, no 6, pp.119-143.
- Dijk, J. van, and P.H. Pellenbarg (1999). The demography of firms: progress and problems in empirical research. In: Van Dijk, J. and P.H. Pellenbarg, *Demography of firms, spatial dynamics of firm behaviour*. University of Groningen, The Netherlands.

- Dunne P. and Hughes A. (1994), Age, size, growth and survival, *The Journal of Industrial Economics*, vol.XLII, no.2, pp.115-140.
- Evans, D.S. (1987), The relationship between firm growth, size, and age: estimates for 100 manufacturing industries, *Journal of industrial economics*, vol. XXXV, no. 4, pp.567-581.
- Hayter R. (1997), *The dynamics of industrial location. The factory, the firm and the production system*, New York: Wiley.
- Keeble D. (1976, 1978), *Industrial location and planning in the United Kingdom*, London: Methuen & Co.
- Keeble D. (1972), Industrial movement and regional development in the United Kingdom, *Town Planning Review* 43/1, p.3-25.
- Klaassen L.H. e Molle W.T.M., Ed., (1983), *Industrial mobility and migration in the European community*, Rotterdam: Gower.
- Lloyd P.E. and Dicken P. (1992), *Location in space. A theoretical approach to economic geography*, 2nd ed., London: Harper & Row.
- Losch A. (1954), *The Economics of Location*, Yale University Press, Connecticut.
- Mason C.M. (1980), Intra-urban plant relocation: a case study of greater Manchester, *Regional Studies*, 14, pp.267-283.
- Molle W.(1977), Industrial Mobility – A review of empirical studies and an analysis of the migration of industry from the city of Amsterdam, *Regional Studies*, vol.11, pp.232-335.
- Pennings E. and Sleuwaegen L. (2000), International relocation: firm and industry determinants, *Economics Letters*, 67, pp.179-186.
- Schmenner R.W. (1980), Choosing new industrial capacity: one-site expansion, branching, and relocation, *Quarterly Journal of Economics*, vol.95 (1).
- Scout M. and Bruce R. (1987), Five Stages of Growth in Small Business, *Long Range Planning*, Vol.20, no.3, pp.45 to 52.
- Simon H.A. (1955), A behavioural model of rational choice, *Quarterly Journal of Economics*, 69: pp.99-118.
- SISWO (1967), Verplaatsing industriële bedrijven. Deelrapport 1,2 SISWO, Amsterdam.
- Smith D.M. (1971), *Industrial location: an economic geographical analysis*, New York: Wiley.
- Smith D.M. (1981), *Industrial Location: an Economic Geographical Analysis*, (2nd. Ed.), John Wiley: New York.
- Townroe P.M. (1972), Some Behavioural considerations in the industrial location decision, *Regional Studies* n.6, pp.261-272.
- Weber A. (1929), *Theory of the Location of Industries*, Chicago: University of Chicago Press.