The spatial preference map of Dutch entrepreneurs
Subjective rating of locations, 1983-1993-2003

Wilhelm J. Meester* and Pieter H. Pellenbarg**

* Faculty of Spatial Sciences, University of Groningen, P.O. Box 800, 9700 AV Groningen, the Netherlands. E-mail: w.j.meester@frw.rug.nl.
** Faculty of Spatial Sciences, University of Groningen, P.O. Box 800, 9700 AV Groningen, the Netherlands. E-mail: p.h.pellenbarg@frw.rug.nl

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ABSTRACT

Location decisions are often based on inaccurate information about potential locations. Decision makers seem to be guided by their subjective interpretation of reality, not so much by reality itself. Twenty years ago this fundamental idea was the starting point for a research program of the Faculty of Spatial Sciences of the University of Groningen, focused on the subjective rating of locations by Dutch entrepreneurs. Three extensive and identical postal enquiries were held, in 1983, 1993 and 2003. On this basis a comparison can now be made of the changing 'mental map' of Dutch entrepreneurs during those twenty years. The paper analyses the three maps, preceded by a short introduction about the behavioural approach in economic geography, which inspired the research project. The survey data are used in a factor analysis, to establish the basic influences that form the entrepreneurial mental maps. The basic dome shape of the maps did not change much. In 1983-1993 we witness a decrease of appreciation of locations on its West flank (the 'old' Randstad) while in 1993-2003 this decrease extends to the Eastern Randstad. Factor analysis suggests that three fundamental dimensions determine the entrepreneurs' judgments: potency, activity, and evaluation. Potency may be understood as centrality of location. Activity is correlated to agglomeration. It is hypothesized that landscape and culture determine the evaluative dimension.

Key words: firm location, behavioural approach, mental map, image dimensions

Introduction. The behavioural approach in economic geography

In surveys of economic geographical thinking in the last decade it is hard to find any reference to the behavioural approach, which dominated thinking and theorizing about industrial location in the late 1960s and early 1970s. Of course, there are some exceptions. Allen Scott (2000) in his review of the intellectual history of economic geography in the past half century treats the behavioural approach in a full paragraph, meaningly headed: *'brief interlude I: behavioural geography'*, and he approvingly quotes Cullen (1976) who blamed behavioural geography 'to have ended up in a 'positivistic blind alley'. Roger Hayter (1997) in his profound study on *'The dynamics of industrial location'* still dedicates a full chapter to the behavioural episode in economic geography. In there, he memorizes the efforts of behavioural writers such as Pred (1967), Townroe (1969) and Stafford (1972, 1974) to ground a new theory about location decision-making based on Simon's rejection of the *homo economicus* (1957). But in most of the new economic geography textbooks and readers the behavioural episode is now neglected. For example, in *'The Economic Geography Reader'* edited by Bryson et al. we don't find a single article about the behavioural approach, and the introductory text of the reader reduces the contribution of this approach to one subordinate clause, which curtly says that next to the wave of Marxist-based studies in the 1970s 'other methods and approaches continued to have their followers, including behavioural models' (Bryson et al. 1999, p. 9). The same observation applies to another much-used recent reader on economic geography, i.e. *'A Companion to Economic Geography'* (Sheppard and Barnes 2003). Again, among thirty (!) essays covering all possible traditions and themes of economic geographical writing, there is no contribution about the behavioural approach and not a single reference to the behavioural episode in the introductory chapter by the editors. Stutz and Warf's new 500 page textbook on economic geography *The World Economy'* explains the behavioural approach in two sentences (Stutz and Warf 2005). What is true for readers and textbooks is also true for journals, including TESG. The behavioural approach is not only dead but also already forgotten.

The present neglect of the behavioural approach to economic geography stands in striking contrast to the recent explosion in behavioural economics, evoked by the work of psychologist and 2002 Nobel Prize winner Kahneman and his fellow authors such as Tversky and Thaler, who have successfully integrated psychological insights into various field of economic analysis (Rabin 2003). Economists (at least a significant part

of them) thus accept a behavioural approach, whereas geographers massively reject it. This massive rejection is a bit strange, considering the modern idea that different theoretical approaches offer themselves as an actual choice between possibilities much more than as a historical sequence of 'the right answers' of which the last is the best by definition. Martin (1994) effectively characterized the modern eclectical view as a 'multiple voiced' economic geography. Now it must be admitted that originally the behavioural approach did present itself in the older fashion, i.e. not as an alternative, but as a replacement for its predecessor, neo-classical location theory. The central issue in neo-classical location theory was what the best place would be for a firm from an 'objective' standpoint – that is, from an economic point of view. Much attention was given to finding the optimum location for a plant, determined by spatial differences in costs and revenues. In the neo-classical approach to firm behaviour, decision makers were considered to be fully informed and acting rationally. Actual location decisions, however, are often based on incomplete and inaccurate information about potential locations. Simon (1957) and Pred (1967) pointed out the limited information that entrepreneurs have and their limited ability to use this information. They argued that decision makers are guided by their subjective interpretation of reality rather than by reality itself; because of this, a behavioural approach to location decisions seems to be more appropriate than the neo-classical view.

Looking back, the behavioural approach didn't fully prove its promises. Already in the early 1980s, Hayter and Watts (1983, p.160) concluded that the behavioural approach may help to a better understanding of locational choice processes, but is not so helpful in predicting patterns of location change, which especially in case of big firms involve the information space of many individuals at the same time. Sayer (1982) rightfully concluded that the behavioural view concentrates on location choice, but lacks interest for the causal processes preceding such choices. In his 1997 textbook, Hayter adds that the absence of a sense of conflict or controversy that often surrounds matters of location is a weakness of the behavioural approach. Also, it is to be pitied that 'industrial geography has made little effort to operationalize the behavioural matrix', the concept so central in Pred's original plea for a behavioural approach to location studies (Hayter 1997, p. 159). In fact we can say that a comprehensive theory founded on behavioural concepts never developed, the approach ran aground in a mist of interesting case studies.

Still, in spite of all the arguments that explain the decrease of enthusiasm for the behavioural approach, the original starting point of creating a more realistic view of how people understand space and make spatial choices based on imperfect knowledge is quite valid. Decision making under uncertainty undoubtedly still is the point of departure for the behavioural economics of Kahneman and others. And in fact, this behavioural view could very well be incorporated in the now fashionable institutional and evolutionary views on structure and development of the space economy; views that are just like the behavioural approach person-oriented, qualitative, and interested in the role of non-economic factors. In a recent PhD-thesis Pen pleaded in favour of an integration of behavioural and institutional thinking, following up an 'electronic discussion' with a few dozen international experts in critical geography, economic geography, urban geography, and qualitative geographical research that revealed widespread doubts about the rightness of the death of the behavioural approach (Pen 2002). Strengthened by this outcome, in this paper we present the results of a behavioural research line concerning the spatial preference maps of Dutch entrepreneurs, which after being started in the early 1980s covers a period of twenty years now, and results in a number of tentative conclusions about the factors determining the entrepreneurs' spatial preferences. In the next section, the structure of the research program is first explained. After that, the preference maps resulting from three questionnaire surveys are shown and commented. The final sections deal with a factor analysis of the preference data, revealing patterns of thought hidden behind the entrepreneurs' spatial preferences.

A research program on the mental maps of entrepreneurs in the Netherlands

The original starting point of the studies presented here was in the 1970s. In a study of firm migration in the Netherlands Pellenbarg (1977) found a large number of entrepreneurs who regretted their relocation choice afterwards. In many cases, the information that had played a role in the decision-making process turned out to be incorrect. This finding, supporting the behavioural approach of firm location decisions, has been the concrete impetus behind the investigation of the subjective rating of locational environments by entrepreneurs, carried out by the authors of this article. A survey in 1983 was the point of departure for a line of research that has been followed since then for twenty years. Several reports about these studies have been published (e.g. Pellenbarg & Meester 1984; Pellenbarg 1985; Meester 1994, 2000, 2004).

An important element in this line of research is a number of postal surveys of firms that were carried out for various study areas, particularly the Netherlands, the northern Netherlands, and Germany. These surveys were designed to measure the locational preferences of entrepreneurs, and they were all set up in a similar fashion. The survey in the Netherlands that was carried out in 1983 was followed by similar surveys in 1993 and 2003. The fact that the locational preferences of Dutch entrepreneurs have thus been recorded in an identical manner three times, with ten year intervals, creates a unique opportunity to study the development of locational preferences over a rather long period of time.

In this article attention will be focused on the data collected by way of these three surveys. In each case, the questionnaire essentially consisted of a map mentioning 70 locations in the Netherlands. Respondents were asked to rate each of these locations on a five step ordinal scale, thus expressing its suitability as a location for the firm in question. The research population was confined to those firms that would be capable of judging locations in the entire country. Manufacturing industries and several lines of service industries (wholesale, transport, construction, etc.) were selected. Non-profit organizations, branch plants, and companies with less than ten employees were excluded. For every survey, a systematic sample of firms was drawn from this population.

1800 firms were approached per survey. The rate of response was 36, 40, and 30 % for the three surveys, respectively. Forms from companies with a market area covering only a part of the research area were skipped. Forms with more than 10 % missing data were also excluded. The outcome is a number of 388, 370, and 271 usable forms, respectively.

Average rating of locations

The general pattern of ratings that emerges from the 1983 survey in the Netherlands is characterized by a fairly simple structure. The center of the Netherlands – specifically, the province of Utrecht – gets the highest ratings, and from there the rating declines in all directions (Figure 1a). The course of the isopleths also indicates the existence of a number of zones with a relatively high rating, radiating out from Utrecht in the directions of Rotterdam, Breda, and Eindhoven.

Additional inquiries and analyses show that the pattern of ratings, as shown in the map, can largely be explained by the interaction of a limited number of elements. One of

these elements is a general preference for the center of the country, which can be explained in terms of access to the national market. The second element is the tendency of entrepreneurs to prefer their own environment as a location area, a phenomenon that can be referred to as 'locational self-preference' (Meester 2000, 2004). Yet another element is a preference for larger agglomerations. The pattern of ratings that is revealed by Figure 1a thus reflects the importance of centrality and existing economic activity as location factors for firms.

The pattern of ratings in 2003 is largely identical to the one found twenty years before: high scores for places in the central part of the country and low scores for the peripheral regions, particularly the three Northern provinces and Zeeland (Figure 1b). At first sight, few changes in the rating landscape seem to have occurred during the period under consideration. Even the secondary peak of Rotterdam shows up on both maps. A closer inspection of the maps, however, reveals that there actually was a shift in the locational preferences of entrepreneurs: the rating of places in the central areas has decreased.

Figure 1 Average rating of locations

1a 1983 *1b* 2003

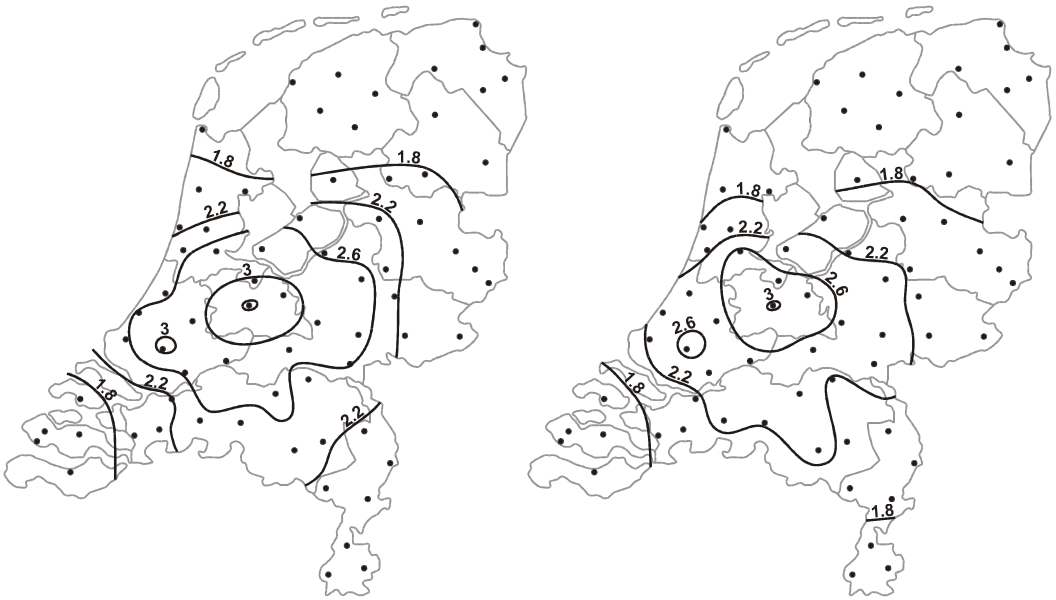


Figure 2 Changes in the rating of locations

2a 1983-1993 *2b* 1993-2003

A more detailed impression of the process of shift is given by Figure 2. It shows the changes in the rating of individual locations in the period 1983-1993 and 1993-2003, respectively. In the decade following the first survey, the decrease in the rating of places was concentrated in the Western Netherlands (Figure 2a). The results of *t* tests per place reveal that the decrease was significant for 10 locations, concentrated in the western part of the Randstad Holland and in the new province of Flevoland. In the second half of the study period, the area of decrease has shifted eastward, covering the eastern part of the Randstad and adjacent areas in the provinces of Gelderland and North Brabant (Figure 2b). The *t* tests show a significant decrease in rating for 25 locations, concentrated in these areas, within and just outside the -0.2 isopleth. Upward shifts in ratings have been relatively small during the first decade, and they were not statistically significant for any of the places covered by the survey. In the second decade, they were practically nonexistent.

A direct comparison of the results of the first survey with those of the last one shows that no less than 30 of the 70 locations have decreased significantly in rating. They are concentrated in an east-west zone that covers the provinces of Gelderland, Flevoland, Utrecht, North Holland, and South Holland. The city of Amsterdam is an important exception in this respect. Its decrease in rating is not significant, suggesting that its

competitive position within the Randstad area has become stronger during the period under consideration.

A plausible explanation for the decreased rating of the Randstad – although not explicitly tested in this research project - would be the increased congestion on the roads in that region. Entrepreneurs look upon accessibility as an important location factor. Therefore, it should be expected that the problem of congestion has a negative effect on the rating of the Randstad as a possible location area. The fact that the decrease started in the western part of the Randstad makes sense: this particular area was the first to be confronted with the consequences of congestion. Here, the distance that one has to travel through congested areas in order to reach less congested areas is larger than elsewhere. The increasing scarcity of land and the rise in land prices in the Randstad, as mentioned by Kemper and Pellenbarg (1999), may also have played a part in the decreased rating of this area.

The decrease of the ratings in the adjacent areas during the second half of the study period should be seen in the same context. The problem of congestion has become worse, and it has spread to other areas. Relative scarcity of land also is not limited to the Randstad any more. The provinces of Gelderland and North Brabant have to deal with these problems to an increasing extent.

Distance and rating

The general preference of entrepreneurs for their own environment has been mentioned above as one of the main elements determining the rating of potential locations. A comparison of the Figures 1a and 1b shows that one of the most important changes in the rating pattern during the last two decades is that the difference in rating between the center and the periphery has become smaller. An obvious question, then, is whether this change is related to changes in the degree of locational self-preference. It is conceivable that firms in the Randstad area are less satisfied with their locational environment than they were in the past. Another possibility is that Dutch firms generally show a stronger locational self-preference, which would also result in a flattening of the rating pattern.

To gain insight into this matter, we need to quantify locational self-preference. In other words, the relationship between distance and the rating given to locations should be expressed in the form of a mathematical function. For this purpose, a new file was created for each of the surveys, in which every single combination of respondent and rated location represents a case. These files contain only two variables: the rating given

to the location by the respondent, and the distance between the respondent's actual location and the rated location, calculated from their map coordinates.

Several types of function have been examined. The modified exponential, a function which has been applied in time series analysis (Croxton et al. 1969), was chosen because it describes the relationship between distance and rating very well. It explains a large proportion of the variance in the ratings, and graphically, it closely approximates the observed values (Meester 2000, 2004). Typical of the modified exponential is its horizontal asymptote or base level (Figure 3). In our analysis, the base level coincides with the average rating that is given to places that are far away. The function can be written as $k+a.b^d$, where d stands for distance. The three coefficients of the model, k, a, and b, can be determined by nonlinear regression, in an iterative process.

The function coefficients of the modified exponential and the corresponding function curves can be used to examine whether or not changes in the relation between distance and rating actually have occurred. Figure 3 and Table 1 show the results. Clearly, locational self-preference has increased in the Netherlands during the period under consideration.

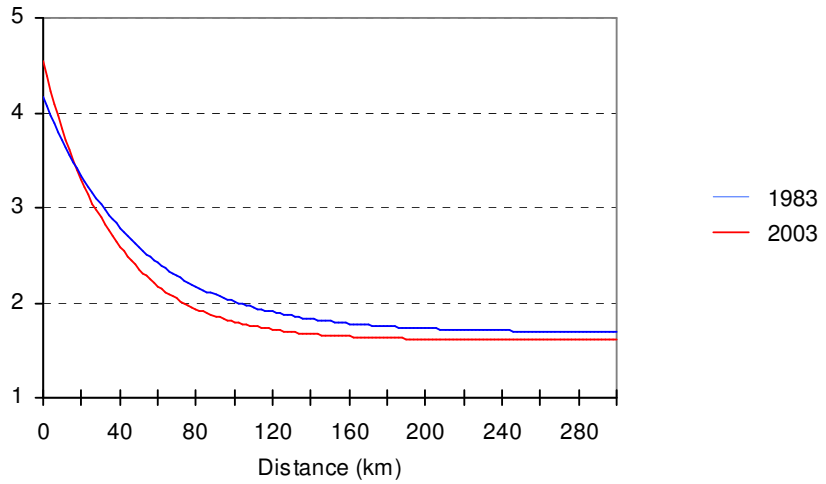
The starting value of the function, representing the rating of the firm's own location, has increased for instance. At the same time, the end value, representing the rating of distant places, has decreased (Figure 3, Table 1). In other words, the difference between the rating of nearby and that of distant places has become larger. Function coefficient a expresses the difference between the starting value and the end value of the curve. Calculated on a collective basis, it increased from 2.49 in 1983 to 2.93 in 2003 (Table 1). Worth mentioning is also the turning point, defined as the distance for which a neutral rating is predicted. It has come closer to the firm's location, which is another indication of an increasing degree of locational self-preference.

Table 1 Coefficients and indicators of the modified exponential

	1983	1993	2003
k	1.686	1.697	1.607
a	2.489	2.646	2.931
b	0.980	0.977	0.973
Starting value* (d=0)	4.17	4.34	4.54
End value* (d=∞)	1.69	1.70	1.61
Turning point (km)	31	31	27

* Scale: 1 = very unfavorable, 3 = neutral, 5 = very favorable

Figure 3 Rating of locations and distance



Scale: 1 = very unfavorable, 3 = neutral, 5 = very favorable

The proportion of variance in the ratings that is explained by the modified exponential has increased from 0.40 in 1983 to 0.48 in 2003. Therefore, the development of this statistic points in the same direction as the development of the function coefficients: an increase in the degree of locational self-preference for the Netherlands as a whole.

Analysis of the function curves for entrepreneurs in the Randstad provinces leads to results that are less consistent. The rating of distant places by entrepreneurs in the Randstad has increased, which seems to support the assumption of decreasing self-preference in that area. On the other hand, just like elsewhere, the starting value has increased and the turning point has come closer to the firm's location. The increase of the starting value is considerably larger than the increase of the end value, so we may conclude that even in the Randstad area, locational self-preference has actually become stronger.

Patterns of thought

Studying average ratings, interesting as they may be, does not give much insight into the differences between the individual survey questionnaires, or into the patterns that these questionnaires have in common. Individual respondents tend to distinguish groups of places that they give a common rating to. By calculating mean ratings, these patterns are hidden from view. Factor analysis is a technique that lends itself well to revealing patterns that are hidden in the data material.

Holvoet (1981) put the technique to good use in his analysis of the rating of locations in Belgium. He had a group of economics students rate locations in Belgium as possible sites for firms, and applied principal components analysis to the data. The three components that he identified represent important and recognizable oppositions, namely Flanders versus Wallonia, the old industrial areas along the rivers Meuse and Sambre versus the rest of Belgium, and the opposition between the large agglomerations Antwerp and Brussels versus the periphery. These oppositions can be seen as patterns of thought that are apparently related to location factors.

In our research, we have applied factor analysis as well. For each of our surveys, the respondents are treated as cases, and the variables are linked to the places subject to rating. The type of factor analysis that we chose to apply is principal components analysis with varimax rotation. To determine the optimal number of components to be rotated, Dirkzwager's (1966) hierarchy model was used. This model implies that separate rotations are carried out on successively larger numbers of factors. In this manner, one sees new factors arise, either by splitting a factor or by forming new factors alongside the existing ones. By following this process step by step, one gains insight in the structure of the factors. In factor analysis, the identity of the factors is usually determined on the basis of the matrix of loadings. In this case, the interpretation of the results is facilitated by the fact that each of the variables is linked to a location. This makes it possible to depict the factor loadings in maps.

For the 1983 and 1993 surveys, the principal components analysis led to similar results. In both cases, the result of the rotation of three components lends itself best to interpretation in terms of location factors. For that reason, this variant was selected for further analysis (Meester 1994). Figure 4 shows the loadings on the three rotated components for the 1993 survey. The patterns for 1983 are almost identical. We will now try to offer plausible explanations for these patterns in terms of location factors at work, but have to underline that this concerns hypotheses; no further testing on their relevance has been done.

The first component, depicted in Figure 4a, expresses an opposition between the center of the country and the periphery. If we want to interpret this component in terms of location factors, an interpretation as 'relative location with respect to the national market' is self-evident.

The second component shows an opposition between the coastal provinces in the West and the provinces in the East and South of the country (Figure 4b). The pattern

displayed here shows remarkable similarities to the pattern of residential preference in the Netherlands as published by Heida and Gordijn (1978), especially concerning the high level of residential preference for the southeastern parts of the country versus the low residential preference for the Randstad area in the West[i]. Therefore, an interpretation as 'residential environment' seems appropriate.

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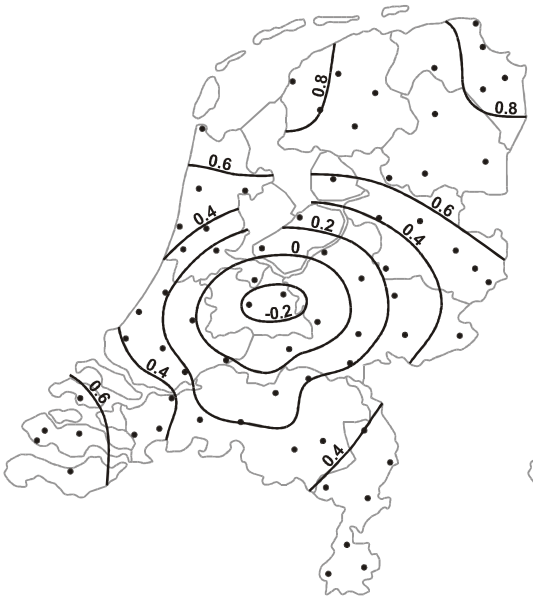
Figure 4 Principal components analysis, rotation of three components, 1993

4a Loadings on factor 1



4b Loadings on factor 2

4c Loadings on factor 3

The third component displays a pattern of high loadings in the West of the Netherlands and low loadings in the eastern periphery (Figure 4c). The area that is bounded by the 0.6 isopleth coincides almost precisely with the Randstad. Apparently, agglomeration effects manifest themselves in this component as a location factor. Under this heading fall the advantages of agglomerations but also the disadvantages, such as congestion, lack of space, high land prices, etc.

The correspondence of the results of the surveys of 1983 and 1993 is remarkable. The identity and the order of the three rotated components are the same. Also the proportion of explained variance is virtually unchanged (59 and 61 %, respectively), and even the factor loadings are essentially the same. All these results must be interpreted in light of the fact that the respondents in the second survey are not the same ones as in the first.

Because the general pattern of locational preferences is still the same in 2003, one might expect to see similar results in 2003 for the principal components analysis as well. This turns out not to be the case, however. The main results, which are not shown in maps here, can be summarized as follows. In 2003, component 1 and 3 seem to have changed places. At the same time, their patterns of loadings have changed substantially. The opposition between center and periphery is represented by the third component now. Its central point has shifted westward. The first component in 2003 shows an opposition between an area consisting of South Holland, Utrecht, and North Brabant, on the one hand, and the northeastern periphery on the other. If it would represent agglomeration effects, this would mean that its center of gravity has shifted southward.

The second component seems to be new. It expresses an opposition between the southern provinces of North Brabant and Limburg, on the one hand, and the central and northern Netherlands on the other. The lowest loadings for this component are found in an area that includes Amsterdam, Utrecht, and Almere, with Hilversum as its central point. It is not easy to interpret this opposition in terms of location factors.

Until we attempted the principal component analysis on the 2003 data set, rotation of three components had yielded results that lend itself rather well to interpretation, not only for the first two surveys in the Netherlands, but also for similar surveys that were held in the northern Netherlands in 1986 and 1997 and in Germany in 1996 (Meester 2004). The same is true for Holvoet's (1981) research in Belgium. Thus, the results for the Netherlands in 2003 seem to deviate rather strongly on this point.

Again, it is Dirkzwager's model that helps to gain more insight in the matter. The choice to rotate three components for the survey of 2003 was made for reasons of consistency. Applying the method of Dirkzwager to the data for 2003, it turns out that in this case, rotation of four components uncovers patterns that are easier to interpret. Figure 5 shows the loading patterns for these components. It is interesting to note that, if we rotate four instead of three components for 1983 and 1993 as well (results are not shown in maps here), the results prove to be basically the same for all three surveys. Apparently, the identity of these four components has not changed during the period under consideration.

In Figure 5, component 1 and 4 look familiar. The first component expresses the opposition between center and periphery, and can be interpreted as 'relative location with respect to the national market' (Figure 5a). Its center of gravity is close to the city of Utrecht. Component 4 represents the opposition between the densely populated Randstad area, and therefore, interpretation as 'agglomeration effects' is appropriate (Figure 5d). The loading patterns of these two components resemble the ones shown in Figure 4a and 4c, respectively.

The pattern that is displayed by the third component (Figure 5c) shows a number of characteristics that were also found in Figure 4b. Particularly, the high loadings in the province of Gelderland and the low loadings in the western Randstad should be mentioned. Since Gelderland is one of the most highly rated residential areas in the Netherlands, there might be a relation with residential attractivity as a location factor here, but the pattern is different in some respects.

Component 2 expresses the opposition between the southern provinces, on the one hand, and the central and northern Netherlands, with Hilversum as the center of gravity, on the other (Figure 5b). The pattern of loadings is the same as the one that was found for the second of three rotated components for this survey, the one that seems to be new. As mentioned, it is difficult to interpret in terms of location factors. It is a fact that North Brabant and Limburg constitute a catholic area within the mainly protestant nation of the Netherlands. The mentality of the inhabitants of this southern region is considered to be different, more exuberant than elsewhere in the Netherlands. Therefore, a relation with aspects of culture cannot be excluded.

Figure 5 Principal components analysis, rotation of four components, 2003

5a Loadings on factor 1

5b Loadings on factor 2

5c Loadings on factor 3

5d Loadings on factor 4

Dimensions of meaning

The application of principal components analysis to the rating of potential firm locations in the northern Netherlands and Germany uncovers components of a similar nature as the ones revealed in Figures 4 and 5. For each of these areas, we find

components that can be interpreted as relative location and as agglomeration effects, in addition to components of a subjective nature that seem to represent the quality of the residential environment and language and/or culture (Meester 2004). Some of these components can also be found in the outcome of the research by Holvoet (1981) in Belgium. In combination with their apparent general validity, the nature of the identified components allows them to be linked up to the results of research in psychology, especially those obtained by Osgood et al. (1957)[ii]. We have to underline that the link in question is rather speculative, but nevertheless sheds light on a possible interesting road fur further research in the border area between geography and psychology.

In their classic study, Osgood et al. investigated the meaning of concepts, using the so-called 'semantic differential' method. This means that people participating in their experiments had to rate the concepts being reviewed on a number of scales, to measure their semantic value. The scales being used gave natural contrasts, such as warm-cold, big-small, black-white etcetera. Positions had to be indicated, even if scales didn't seem to apply naturally, so the process was partly associative. The list of scales was long and the variety of contrasts was wide. The resulting data matrix with three dimensions (concepts, scales, and respondents) was then used as a basis for further analysis. There, Osgood et al. applied factor analysis, to explore the relation between various types of scales – generally, but also as applied to individual concepts. They analyzed a wide range of data matrices. The most surprising outcome was the consistency of the results: no matter which concepts are being analyzed, the resulting factors are essentially always the same. The three most important factors that result, time and again, are identified by Osgood et al. as 'evaluation', 'potency', and 'activity'.

The first factor (evaluation) represents moral judgments and subjective evaluations such as pretty-ugly. The second factor (potency) refers to oppositions such as large-small and strong-weak. It covers all types of scales that can be used to determine the position of an object by means of objective measurements. The third factor (activity) is the dynamic element of the set. This factor consists of typical oppositions such as fast-slow and active-passive. Together, these three factors comprise the main dimensions of the meaning of any concept.

The research described in the present paper also deals with the meaning of concepts, specifically towns, as interpreted by individuals, specifically entrepreneurs, and it is tempting to interpret them in terms of the general dimensions of meaning found by

Osgood et al. We have to be careful here. An important difference with the research by Osgood et al. is that the study of the locational preferences of entrepreneurs is one-dimensional in a sense. It is about the suitability of places as a firm location, a characteristic that is comparable to the evaluative dimension. Nevertheless, the nature of the oppositions expressed by the components that we have found makes it possible to recognize all three dimensions in these components.

The dimension that has been denoted as potency can be identified in the component that has been interpreted as relative location with respect to the national market (Figure 4a and 5a). Relative location, interpreted as distance to the market, can be measured in objective terms. Formulated as the opposition close-far, it is a clear representative of this particular dimension.

The dimension of activity is represented by the component that has been interpreted as 'agglomeration effects' (Figures 4c and 5d). Agglomeration effects are obviously associated with differences in dynamics and activity.

The evaluative dimension is recognized in its purest form as residential environment – the personal, most subjective element in the rating of locations for their suitability for firms. When three factors are rotated, this dimension is represented by component 2 (Figure 4b).

It is an interesting question whether the parallel may be extended to those components that are the most difficult ones to interpret, i.e. the second and third component of the four depicted in Figure 5. In that case, at least one of these two components, and perhaps both, would represent the evaluative dimension. The interpretation of component 3 as 'residential environment' and the suggested relation of component 2 with aspects of culture support this view. Both components would represent an aspect of the evaluative dimension. Component 3 can be associated with landscape (Figure 5c) and component 2 with culture (Figure 5b), two major aspects of residential environment as a location factor for entrepreneurs. In the results of the rotation of three components for the surveys of 1983 and 1993, these two oppositions are combined in the component representing residential environment (Figure 4b).

Conclusion

A comparison of the preference maps of Dutch entrepreneurs in 1983, 1993, and 2003 shows that the basic shape of the maps – a dome or 'mountain' with centrally located Utrecht as its summit – has not changed much in twenty years. This supports the

conclusion that the basic structure of spatial preference maps does not change much over time. A closer look however, reveals that some details of the maps do change significantly. The central dome is clearly flattening. In the period between 1983 and 1993, we witness a decreasing appreciation of the locations on its west flank while in the period between 1993 and 2003 this decrease extends to the eastern flank.

The results of factor analysis on the survey data suggest that three fundamental dimensions determine the rating of possible firm locations by entrepreneurs: potency, activity, and evaluation. Potency for entrepreneurs may be understood as centrality of location. Activity is correlated to agglomeration size. Landscape and culture probably determine the evaluative dimension. Especially this evaluative dimension is a very interesting one. Reacting to straightforward questions in interviews, or when confronted with questionnaire listings of location factors, entrepreneurs tend to avoid the impression that they are sensitive to 'soft' or 'private' aspects of location environments. The consistent results of factor analysis on three spatial preference surveys separated widely in time strongly support the hypothesis that entrepreneurs do in fact consider such soft and private factors quite important, immediately following the still dominant idea of wishing to be in a 'central' location.

References

BRYSON, J., N. HENRY, D. KEEBLE, R. MARTIN (1999) The economic geography reader. Chichester: Wiley&Sons

CROXTON, F.E., D.J. COWDEN & B.W. BOLCH (1969), Practical business statistics. Englewood Cliffs, New Jersey: Prentice-Hall.

CULLEN, I.G. (1976) Human behavior, regional science and the study of individual behaviour. *Environment and Planning A*, vol. 8, pp. 397-410

DIRKZWAGER, A. (1966), Intelligentie en schoolprestaties: Een empirisch onderzoek. Amsterdam: Swets & Zeitlinger.

HAYTER, R. and H.D. WATTS (1983) The geography of enterprise: a reappraisal. *Progress in Human Geography* vol 2 nr. 7, pp. 157-181

HAYTER, R. (1997), The Dynamics of Industrial Location. Chichester: Wiley&Sons

HEIDA, H. and H. GORDIJN (1978) Regionale woonvoorkeuren. Delft: TNO

HOLVOET, M. (1981), Localisation industrielle en Belgique: Cartes mentales et préférences spatiales d'un groupe de futurs responsables économiques. *Revue Belge de Géographie* 105, pp. 41-57.

MARTIN, R. (1994) Economic theory and human geography. In: D. Gregory, R. Martin and G. Smith (eds.) Human geography. Society, space and social science. Basingstoke: MacMillan, pp. 21-53

MEESTER, W.J. (1994), Recent changes in the locational preferences of Dutch entrepreneurs. Paper for the 34th European Congress of the Regional Science Association, Groningen.

MEESTER, W.J. (2000), Locational self-preference of firms. Paper for the 40th European Congress of the Regional Science Association, Barcelona.

MEESTER, W.J. (2004), Locational preferences of entrepreneurs: Stated preferences in The Netherlands and Germany. Heidelberg: Physica.

OSGOOD, C.E., G.J. SUCI & P.H. TANNENBAUM (1957), The measurement of meaning. Urbana, Illinois: University of Illinois Press.

PELLENBARG, P.H. (1977), Bedrijfsmigratie in Nederland: Een onderzoek naar migratiemotieven en hun betekenis voor regionale ontwikkeling, Deel II: Onderzoeksresultaten. Groningen: Stichting Noord-Holland-Noord/Industriecommissie Hollands Noorderkwartier.

PELLENBARG, P.H. (1985), Bedrijfsrelokatie en ruimtelijke kognitie: Onderzoekingen naar bedrijfs-verplaatsingsprocessen en de subjektieve waardering van vestigingsplaatsen door ondernemers in Nederland. Geografisch Instituut, Rijksuniversiteit Groningen (Sociaal-Geografische Reeks 33)

P.H. PELLENBARG and N.J. KEMPER (1999) Industrial mobility in the Netherlands; patterns, causes and impacts for spatial policy. SOM Research Report 99D34, University of Groningen

PELLENBARG, P.H. & W.J. MEESTER (1984), Location decisions and spatial cognition: Some research findings from the Netherlands. In: M. de Smidt & E. Wever, eds., A profile of Dutch economic geography. Assen: Van Gorcum, pp. 105-128.

PELLENBARG, P.H. and P.J.M. VAN STEEN (2005) The Netherlands in Maps. 4. Residential satisfaction. *TESG* 96-4, p.

PEN, C.J. (2002) Wat beweegt bedrijven (PhD thesis) *Netherlands Geographical Studies* 297. Groningen: Faculty of Spatial Sciences

PRED, A. (1967), Behavior and location: Foundations for a geographic and dynamic location theory, part I. Department of Geography, University of Lund (Lund Studies in Geography B 27).

RABIN, M. (2003) The Nobel Memorial Prize for Daniel Kahneman. *Scandinavian Journal of Economics* 105 (2) pp. 157-180

SAYER, A. (1982) Explanation in economic geography: abstraction versus generalization. *Progress in Human Geography* 6, pp. 68-89

SCOTT, A.J. (2000) Economic Geography: the great half century. *Cambridge Journal of Economics* 24, pp. 483-504

SIMON, H.A. (1957), Models of man: social and rational: Mathematical essays on rational human behavior in a social setting. New York: Wiley.

STAFFORD, H.A. (1972) The geography of manufacturers. *Progress in Geography* 4, pp. 181-215

STAFFORD, H.A. (1974) The anatomy of the location decision: content analysis of case studies. In: F.E.I. Hamilton (ed) Spatial perspectives on industrial organisation and decision-making. New York: Wiley, pp. 169-187

STUTZ, F.P. and B.WARF (2005) The World Economy. Upper Saddle River: Pearson Prentice Hall

TOWNROE, P.M. (1969) Locational choice and the individual firm. *Regional Studies* 3, pp. 15-24

[i] The same low level of residential satisfaction in the Randstad is also apparent in the residential satisfaction map by Pellenbarg and Van Steen (2005) in the Netherlands in maps series of the 2005 TESG volume. In this more recent map, based on data from the 2002 national housing demand survey, the high satisfaction area expands to a greater area than in the Heida and Gordijn (1978) map, i.e. from the Southeast into parts of the North and Southwest. For the interpretation of the 1983 and 1993 PCA rotations, we used the original Heida and Grodijn map as a reference.

[ii] See also Meester (1999) for a more complete version of the explanation and discussion concerning Osgood et al.'s research work