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Locational Self-Preference Of Firms

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Locational self-preference of firms

Paper for the 40th European Congress of the Regional Science Association
Barcelona, 2000

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Abstract

An important aspect of the policy of many local and regional governments is to stimulate economic development in their region by attracting companies from elsewhere. From a behavioural point of view, the willingness of entrepreneurs to move to a certain region is not depending on the real qualities of a region but on their perception, their image of those qualities.
Inquiries were held in the Netherlands as well as in Germany. In both cases, entrepreneurs were asked to rate 70 towns in their country as possible locations for their particular companies.
The results show an interaction between a small number of important elements determining the locational preference patterns. One of these elements is the tendency to prefer the areas close to the actual location of the firm. The phrase *locational self-preference* is introduced to refer to this tendency. The other important elements are a general preference for central locations and a preference for large agglomerations.
In this paper, the data of the inquiries are analysed with the purpose of quantifying locational self-preference. Several models are examined, searching for the one with the best fit. The best model is then used to filter out self-preference: the ratings given by a respondent to a particular town are predicted by the model, depending on the distance between the actual location of the respondent and the town being rated. The residuals, i.e. the differences between the observed ratings and the ones predicted by the model, can be interpreted as adjusted ratings. The resulting patterns are analysed and compared to those of the original ratings.

Introduction

In the neo-classical approach to firm location decisions, much attention is given to finding the optimum location for a plant, determined by spatial differences in costs and revenues. Decision makers are 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) point out the limited information that entrepreneurs have and their limited ability to use this information. Decision makers seem to be guided by their subjective interpretation of reality, not so much by reality itself, and because of this, a behavioural approach to location decisions seems to be more appropriate than the neo-classical view.

An important aspect of the policy of many local and regional governments is to stimulate economic development in their region by attracting companies from elsewhere and by preserving existing economic activities. Knowledge of the locational preferences of entrepreneurs may therefore be regarded as relevant to behavioural theory as well as to the practice of government policies. Against this background, a series of studies on locational preferences has been carried out by the author of this paper. Several reports about these studies have been published (e.g. Meester 1994, 1996, 1999).

An important element in this line of research is a number of postal surveys of entrepreneurs, that were carried out for various research areas. In each case, the questionnaire essentially consisted of a map mentioning a number of locations. Respondents were asked to rate each of these locations on a five step ordinal scale, thus expressing its favourability as a possible location for the company concerned. The research population for each of these surveys was confined to those firms that would be capable of judging locations in the entire area. Manufacturing industries and several lines of service industries (wholesale, transport, construction, etc.) were selected. Non-profit organisations, branch plants and companies with less than ten employees were excluded.

In this paper, attention will be focused on the data collected by two of these surveys, the first one carried out in the Netherlands in 1993, the second one in Germany in 1996. The response was 40 % in the Netherlands and 17 % in Germany. Forms from companies with a market area covering only a section of the research area were skipped. Forms with more than 10 % missing data were also excluded. The outcome is a number of 370 and 184 usable forms respectively.

The general pattern of ratings that emerges from the survey in the Netherlands is characterised by a fairly simple structure. Typical are the high ratings for the centre of the country and the low ratings for the peripheral regions, particularly the three northern provinces and Zeeland (figure 2a). The polynuclear character of Germany is reflected in a more complicated rating pattern: large agglomerations are generally preferred to smaller towns. This tendency, combined with a general preference for central locations, results in a pattern with a number of separate peaks, the central one being the highest (figure 3a). These results seem to indicate that the rating of potential firm locations is largely determined by their distance from the centre of the national market and by their size.

At the same time, analysis of the influence of firm characteristics on the ratings points out that the actual location of a firm is clearly the most important variable in this respect, more important than sector, size of market area or company size: entrepreneurs generally prefer their present environment. Preference maps showing the ratings given by the firms in a particular province or federal state confirm the preponderant influence of the actual location on the rating of potential locations: the interaction of the preference for the present environment with the preference for central areas and major agglomerations largely determines the rating patterns for the firms located in a certain area (Meester 1994).

The tendency to prefer the present environment is not confined to the general ratings that express suitability as firm location. It is also demonstrated by the fact that individual aspects of the locational environment in a particular area are generally more positively valued by entrepreneurs located in that area than by entrepreneurs elsewhere. In a different way, the phenomenon is also revealed in the tendency of entrepreneurs to mention ties with the present location and its surroundings as a factor influencing potential location decisions (Meester 1999).

Similar spatial constraints also appear in the results of other research in this field. In a study on location decisions, Stafford finds that entrepreneurs concentrate their efforts on a limited area (1974, p. 182), and McDermott and Taylor conclude from their research that the location of the firm is important for the way in which entrepreneurs perceive their environment (1976, p. 344). Similar results with respect to residential preferences have been reported by Gould (1966), Aangeenbrug (1968) and Lee and Schmidt (1985). The students that participate in their surveys clearly prefer their present environment as potential area of residence.

Cox, discussing the preference maps published by Gould, refers to the preference for the present environment that is shown by these maps as *neighbourhood effect* (1972, p. 112 etc.). The meaning of this phrase is not very clear however, since it has also been used to refer to other phenomena that show distance decay in some form. A more precise way to designate the preference for one's own environment would be *locational self-preference*. That phrase leaves no room for confusion and is therefore to be preferred (Meester 1999).

Locational self-preference makes sense in the light of the social comparison theory that has been formulated by Festinger (1954) and worked out by others. Goethals et al. (1991) make a distinction between two types of social comparison: realistic and constructive social comparison. They define constructive social comparison as the tendency of people to view themselves positively, to the maximum extent that reality, social or otherwise, permits. This kind of self-perception can be explained by the pursuit of inner consistency, emphasised by Festinger (1957) in his cognitive dissonance theory. The positive perception of the immediate spatial environment contributes to the inner consistency of the individual, and, in this sense, it can be viewed as a variant of constructive comparison.

With regard to the preference for one's spatial environment (neighbourhood, town, region), another explanation that can be thought of is selective migration. Individuals that are dissatisfied with their environment are more likely to move elsewhere than those that value their present environment higher than any other area. Every single migration that results from such dissatisfaction strengthens locational self-preference, in the area of origin, where a negative opinion disappears, as well as in the area of destination, where a positive opinion is added.

Reduction of uncertainty may be mentioned as another cause for entrepreneurs to value their present environment higher than areas that they are less familiar with, areas that are therefore associated with additional risks from a business point of view.

Considering the influence of locational self-preference on the rating of conceivable firm locations, the question arises whether the collective preference patterns shown in figure 2a and 3a are genuine. The samples used in the surveys are not stratified, which means that large numbers of respondents are located in areas where economic activities are concentrated. In these circumstances, the possibility should be considered that the observed preferences for central locations and for large agglomerations are just a result of locational self-preference and the distribution of the respondents.

In this paper, locational self-preference will be analysed with the purpose of separating its influence from other rating patterns, for the Netherlands as well as Germany. In order to do this, a model has to be developed that quantifies locational self-preference. Such a model will make it possible to filter out the effect of self-preference and have a closer look at the remaining patterns.

Quantifying locational self-preference

An obvious way to reduce the influence of locational self-preference on the observed spatial preferences is by stratification *ex post*. The ratings given by the respondents can be weighted, either in such a way that every area (province or federal state) will have the same weight, regardless of the number of respondents located there, or in such a way that the influence of every area will be proportional to its area measured in square kilometres.

Both methods have been applied, without much success. In the Netherlands, the pattern of high ratings for the central area and low ratings for the periphery persists, although the differences in rating become smaller. The rating patterns for Germany with and without weighting are practically the same.

This outcome, however, may not be interpreted as evidence for the insignificance of locational self-preference, since the method of weighting has a number of shortcomings. One of them is the increased influence of coincidence, resulting from the fact that more weight is assigned to the few respondents that represent areas with little economic activity. More essential is the failure of the method to perform its very task of eliminating the influence of self-preference, which is basically a consequence of the simple fact that even in the case of an even distribution of respondents over all areas, the average distance to a central area will be smaller than the average distance to a peripheral area (Meester 1999).

A more effective way to eliminate the influence of locational self-preference is by quantifying the relation between distance to and rating of potential locations. Such a quantification will make it possible to adjust all observed ratings for distance, allowing the analysis of spatial preferences without the distorting influence of self-preference.

The data had to be rearranged for the purpose of analysing this relation. A new file was created for each of the surveys, in which every single combination of respondent and rated location represents a case. For the Netherlands, this amounts to 25,900 cases (70 places rated by 370 respondents), and for Germany to 12,880 (70 times 184). These data

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. The white dots in figure 1 represent the average ratings given by the respondents to locations within successive distance ranges. Positive ratings dominate at shorter distances and negative ratings at longer distances, as expected.

The next step is the identification of a mathematical function that expresses the relation between the two variables in the system. A complicating factor in this context is the existence of differences between individual respondents. The rate of decrease that the ratings show with increasing distance is not the same for every respondent, and neither is the rating given by them to distant locations. Accordingly, every mathematical function to be considered can be determined on an individual basis, i.e. for each respondent separately, and on a collective basis, i.e. for the response group as a whole.

Several types of function have been examined. The tendency of ratings to decrease with increasing distance can be regarded as a variant of distance decay, and therefore, gravity models like the ones used in migration studies seem to be an obvious choice. The first five functions mentioned in table 1 belong to this group. They are based on a typology by Goux (1963) of models that predict migration flows from distance.

Linear regression has been applied to the data for each of these functions, with the distance function involved as independent variable and rating as dependent variable. Within the group of functions from Goux' typology, the logarithmic function yields the best results in terms of explained variance. Calculated on an individual basis, i.e. for each respondent separately, and then averaged for the survey in question, it explains 37 % of the variance in the ratings in the Netherlands, and 21 % in Germany (table 1).

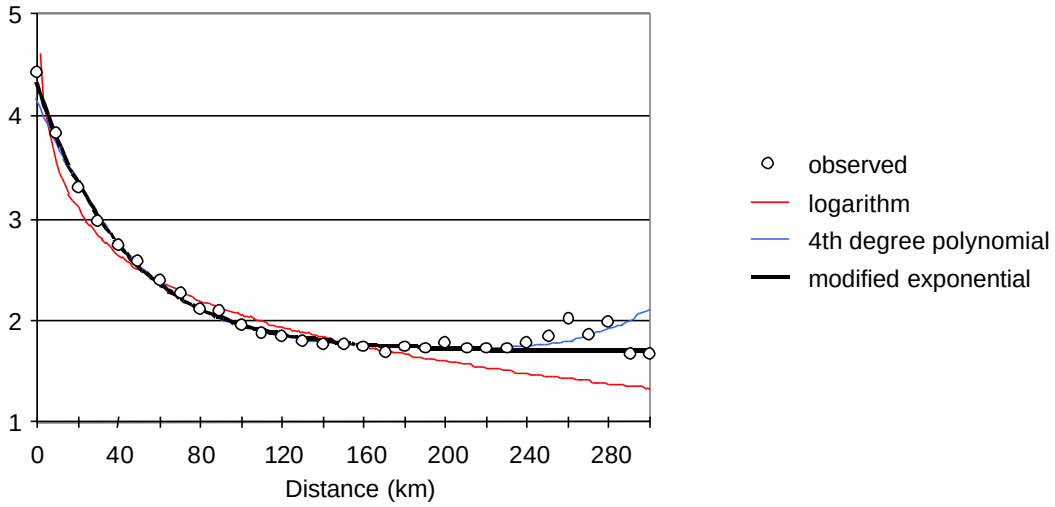
Table 1 Rating of locations, explained by various functions of distance

	Formula	Mean R^2 (individual basis)	
		Netherlands	Germany
Linear	$k+b.d$	0.29	0.19
Square	$k+b.d^2$	0.21	0.16
Square root	$k+b.d^{0.5}$	0.33	0.20
Logarithm	$k+b.\log d$	0.37	0.21
Squared logarithm	$k+b.(\log d)^2$	0.35	0.21
2nd degree polynomial	$k+b_1.d+b_2.d^2$	0.39	0.24
3rd degree polynomial	$k+b_1.d+b_2.d^2+b_3.d^3$	0.44	0.28
4th degree polynomial	$k+b_1.d+b_2.d^2+b_3.d^3+b_4.d^4$	0.47	0.31
Modified exponential	$k+a.b^d$	0.46	0.27

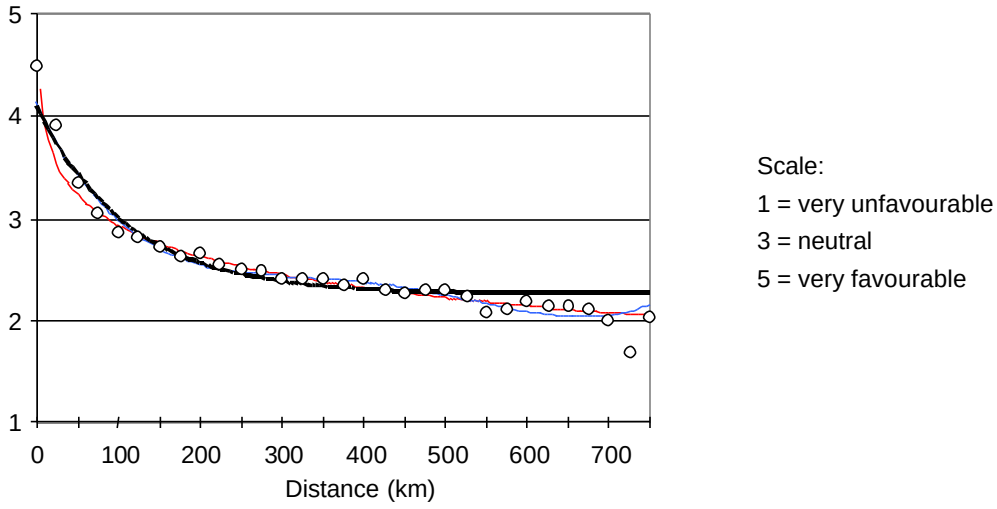
Visual inspection is another way to check the performance of the individual functions. An easy way to accomplish this is by calculating the function coefficients on a collective basis and comparing the resulting function lines to the observed ratings. Comparison of the logarithmic function with the average ratings per distance range shows a good fit for Germany (figure 1b). The results for the Netherlands are not as good: the ratings predicted by the model are too high for very short and intermediate distances, and too low for short and long distances (figure 1a). Similar problems were encountered with the other functions from Goux' typology.

Figure 1 Rating of locations and distance

1a Netherlands



1b Germany



An alternative is offered by polynomials, which are much more flexible. The quantitative performance of the second and third degree polynomials is relatively good, and further improvement is achieved by the fourth degree polynomial. Higher order polynomials do not lead to additional significant improvements. Calculated on an individual basis, the fourth degree polynomial explains 47 % of the variance in the ratings in the Netherlands and 31 % in Germany (table 1), so the quantitative performance of this polynomial is obviously better than that of the logarithmic function. In the case of the Netherlands, the graphic performance is better as well (figure 1a). In Germany, there is not much difference between the two functions in this respect (figure 1b).

A problem encountered with the polynomial in both areas is the increase of predicted values at the right-hand side of the graph. Observed values for the longest distances fluctuate because of the small number of observations at this end of the scale, but they certainly do not increase in a systematic way. Apart from that, ratings that increase with increasing distance are not very plausible in a model that intends to quantify locational self-preference.

A function that can deal with this particular problem is the modified exponential, which has been applied in time series analysis (Croxton et al. 1969). Typical for this function is its horizontal asymptote that, in this case, corresponds to the flattening of the observed values at long distances. 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 non-linear regression, in an iterative process. Calculated on an individual basis, the modified exponential explains 46 % of the variance in the ratings in the Netherlands, and 27 % in Germany (table 1), meaning that its quantitative performance is better than that of the logarithmic function. In the case of the Netherlands, its graphic performance is better as well (figure 1a), but in the case of Germany, the opposite is true: for distances of 550 km and more, the values predicted by the modified exponential are systematically too high, and the logarithmic function shows a much better fit (figure 1b).

The apparent discrepancy between quantitative and graphic performance of the two functions can partially be explained by the fact that, as a consequence of their small number, observations for the longest distances exert little influence on the function coefficients and hence on the exact shape of the curve. An additional explanation can be found in the different methods of calculation: the curves depicted in figure 1 emanate from analysis on a collective basis, the values in table 1 from analysis on an individual

basis. Explained variances calculated on a collective basis show little difference between the two functions (Meester 1999).

Apparently, the answer to the question which mathematical function is the best in quantifying the relation between distance and rating partly depends on the level of analysis. At the level of the individual respondent, the modified exponential shows a better performance than the logarithmic function, in both research areas. At the collective level, the logarithmic function seems to be the most suitable one in the case of Germany, and the modified exponential in the case of the Netherlands.

An important consideration in choosing the most relevant level of analysis is that explained variances are much higher when calculated on an individual basis. Calculated on a collective basis, the proportion of explained variance is less than half of what it is on an individual basis, an observation that applies to all functions examined. Analysis of functions at the individual level apparently offers the best perspectives when it comes to separating the influence of locational self-preference from other rating patterns, and in this context, the modified exponential is the obvious choice.

Table 2 allows a comparison between the two research areas for this function. It shows the function coefficients for each area, necessarily calculated on a collective basis, along with some indicators that can be deduced from these coefficients: a starting value (the rating predicted for zero distance), a final value (the level of the horizontal asymptote) and a turning point (the distance at which the predicted rating is neutral).

Table 2 Coefficients and indicators of the modified exponential

	Netherlands	Germany
k	1.697	2.260
a	2.646	1.840
b	0.977	0.991
Predicted value* for d=0	4.34	4.10
Predicted value* for d=∞	1.70	2.26
Turning point (in km)	31	101

* Scale: 1 = very unfavourable, 3 = neutral, 5 = very favourable

The numbers in this table seem to indicate that locational self-preference is stronger in the Netherlands than it is in Germany: the starting value in the Netherlands is higher than in Germany, and the final value lower, resulting in a steeper curve. Another

indication is that the turning point in the Netherlands is much closer to the firm's actual location than it is in Germany.

These results have to be interpreted with some caution however. The fact that locational self-preference seems to be weaker in Germany may partly be caused by the distribution of the respondents in combination with the polynuclear character of the country and the size of the rated locations: the existence of peripheral large agglomerations like Hamburg, Berlin and Munich lifts the level of observed and predicted ratings at long distances in Germany.

Adjusted rating patterns

Now that a method for quantifying locational self-preference has been chosen, the next step is to filter out self-preference from the original ratings, in order to have a closer look at the remaining patterns. The method in itself is fairly simple: the function coefficients of the modified exponential are determined for each respondent separately. Subsequently, the residuals for the rated locations are calculated, being the difference between the rating predicted by the respondent's specific function and the rating actually given by him to this location. These residuals can be interpreted as adjusted ratings: they represent the extent to which a location is being rated higher or lower than expected, considering its distance from the respondent's present location.

The residuals of all respondents in the survey in question are then collected in a new data file that has exactly the same structure as the original data file: the respondents are the cases, while the variables are linked to the potential locations mentioned in the questionnaire. The patterns of adjusted ratings can then be analysed in the same way as the original rating patterns.

The type of adjustment carried out here, turns out to be more effective than the stratification *ex post* mentioned earlier in this paper. Like the original rating pattern shown in figure 2a, the pattern of adjusted ratings in the Netherlands still exhibits a certain preference for the centre of the country (figure 2b), but the difference between central and peripheral areas is much smaller now.

Negative residuals are concentrated in the coastal provinces. The largest positive residuals are those for the two most central locations, Utrecht and Amersfoort, implying that the high rating of these cities is real, and not just a simple consequence of the distribution of respondents.

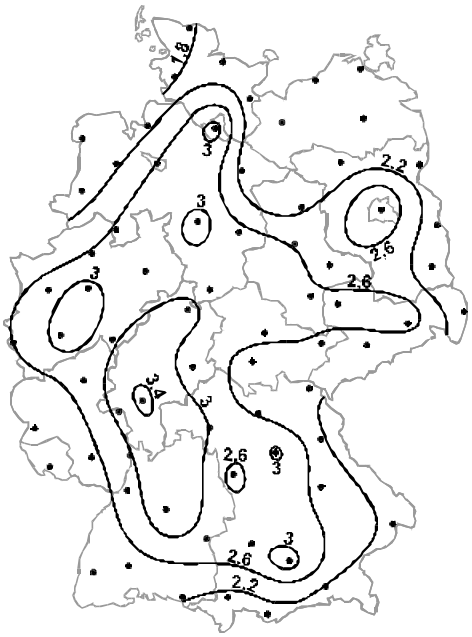
Figure 2 Average rating of locations in the Netherlands

2a Observed

2b Adjusted

Figure 3 Average rating of locations in Germany

3a Observed



3*b* Adjusted

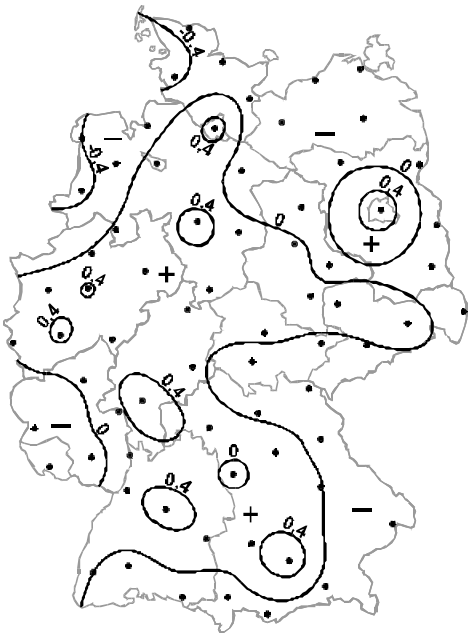


Table 3 Ranking of locations in the Netherlands, based on original and adjusted ratings

	Orig.	Adj.		Orig.	Adj.
Alkmaar	50	63	's-Hertogenbosch	5	6
Almelo	40	32	Hilversum	4	8
Almere	14	16	Hoogeveen	51	43
Amersfoort	2	1	Hoorn	52	68
Amsterdam	13	20	IJmuiden	41	64
Apeldoorn	11	3	Leeuwarden	58	51
Arnhem	10	4	Leiden	21	39
Assen	53	33	Lelystad	28	35
Bergen op Zoom	43	49	Maastricht	42	17
Breda	15	9	Meppel	48	50
Delfzijl	67	42	Middelburg	63	60
Deventer	25	29	Moerdijk	30	56
Doetinchem	32	48	Nijmegen	12	11
Dordrecht	17	22	Ommen	47	52
Drachten	57	53	Oss	19	34
Ede	3	5	Roermond	39	30
Eemshaven	68	40	Roosendaal	36	41
Eindhoven	18	10	Rotterdam	8	7
Emmeloord	49	59	Sittard	46	31
Emmen	55	46	Sneek	59	65
Enschede	35	19	Terneuzen	64	66
Europoort	24	26	Tiel	6	12
Goes	61	67	Tilburg	16	14
Gorinchem	7	13	Utrecht	1	2
Gouda	9	15	Veendam	66	58
Groningen	56	27	Venlo	31	24
Den Haag	22	28	Venray	34	47
Haarlem	26	44	Vlissingen	60	54
Harderwijk	20	21	Weert	38	38
Harlingen	65	61	Winschoten	69	55
Heerenveen	54	57	Winterswijk	44	45
Heerlen	45	23	Zaandam	33	62
Den Helder	70	69	Zierikzee	62	70
Helmond	27	36	Zutphen	29	37
Hengelo	37	25	Zwolle	23	18

A comparison of the rank numbers based on the original ratings with those based on the adjusted ratings reveals some interesting shifts (table 3). Locations in a number of peripheral areas, like the southern part of Limburg and the northeast of Groningen, climb to a higher position on the list as a consequence of the adjustment. Locations in the southern half of the province of North-Holland, on the other hand, drop to lower positions.

Remarkable is that after adjustment the eastern border region, represented by towns like Enschede, Venlo and Maastricht, is rated higher than the western part of the densely populated Randstad area with places like Haarlem, Leiden en The Hague, while the opposite is true for the original ratings. Apparently, the high average rating of the western half of the Randstad area, shown in figure 2a, is at least partially caused by the collective locational self-preference of the many companies located in this area.

Filtering out locational self-preference for Germany leads to results that are similar to those for the Netherlands, in the sense that the basic rating pattern remains the same while the magnitude of the difference between high and low ratings is reduced by the adjustment. In the case of Germany, this means that its polynuclear character is reflected in the pattern of adjusted ratings (figure 3b), like it is in the original rating pattern as shown in figure 3a. The difference in rating between the central area and the peripheral areas is obviously smaller, but the peaks representing the large agglomerations do not seem to be affected by the adjustment.

Positive residuals can be found in the central area of the country and a number of zones that extend from there in the direction of Hamburg, Dresden and Munich (figure 3b). Negative residuals are concentrated in a wide zone along the coast and the national borders.

Table 4 Ranking of locations in Germany, based on original and adjusted ratings

	Orig.	Adj.		Orig.	Adj.
Aachen	30	28	Kiel	60	52
Augsburg	19	13	Koblenz	23	29
Bamberg	33	36	Köln	4	7
Berlin	12	2	Leipzig	14	11
Braunschweig	25	21	Lübeck	55	45
Bremen	31	22	Ludwigshafen	13	18
Bremerhaven	52	46	Magdeburg	32	26
Chemnitz	35	35	Mainz	5	12
Cottbus	64	65	Meppen	62	70
Dessau	41	39	München	3	1
Dortmund	7	8	Münster	28	31
Dresden	26	16	Neubrandenburg	59	47
Duisburg	18	19	Nürnberg	10	9
Emden	63	68	Oldenburg	50	55
Erfurt	22	24	Osnabrück	29	32
Feuchtwangen	36	38	Paderborn	24	30
Flensburg	70	66	Passau	53	44
Frankfurt a.M.	1	3	Regensburg	34	33
Frankfurt/O.	65	63	Rosenheim	49	41
Freiburg	40	34	Rostock	61	49
Friedrichshafen	47	43	Saarbrücken	46	59
Fulda	21	27	Schwedt	67	64
Garmisch-P.	57	61	Schwerin	56	48
Gera	38	37	Siegen	15	20
Görlitz	66	67	Stendal	48	50
Göttingen	20	23	Stralsund	68	60
Halle	27	25	Stuttgart	2	4
Hamburg	9	5	Suhl	39	51
Hannover	6	6	Trier	44	56
Heide	69	69	Uelzen	51	54
Hof	42	58	Ulm	17	15
Kaiserslautern	37	40	Villingen	43	42
Karlsruhe	16	17	Weiden	45	62
Kassel	8	10	Wittstock	58	53
Kempten	54	57	Würzburg	11	14

The visual image may not have changed very much, the shift in rank numbers is substantial (table 4). After the adjustment, Munich occupies the first place on the list instead of Frankfurt. The second position is now for Berlin, a spectacular rise compared to its 12th position on the list of original ratings. Other places that clearly profit from the adjustment are Hamburg, Dresden, Neubrandenburg, Rostock and Lübeck. All these cities are located in peripheral areas, which is in accordance with the results for the Netherlands. Suhl, Hof, Weiden, Saarbrücken and Trier should be mentioned as places that drop to considerably lower positions. This change is not as easy to explain, a common denominator for these locations is hard to identify.

Several types of analysis have been used to study the influence of both firm and place characteristics on the ratings (Meester 1999). The question is whether the results of that analysis are also distorted by locational self-preference, and in what way.

Four firm characteristics were included in the analysis: actual location, sector, size of market area and company size. Before adjustment, the location of the firm is clearly the most important one, followed by sector and market size. Filtering out self-preference causes changes in the strength as well as the nature of the relation between firm characteristics and ratings.

Particularly interesting is that some differences between types of firms practically disappear as a consequence of the adjustment, like the relatively low rating of eastern Germany by companies with an international market, and the relatively high rating of Saxony by manufacturing companies. The relatively low rating of many German locations by small firms belongs to the same category. The fact that these differences are reduced by the adjustment indicates that they are at least partially determined by locational self-preference and, in connection with this, by the spatial distribution of the respondents.

Other differences persist, in many cases differences that are easy to understand. The rating patterns revealed by preference maps for the main sectors in the Netherlands, for instance, are much clearer after adjustment: firms with office type activities prefer the larger agglomerations within each region, while wholesale shows a distinct preference for the centre of the country, in accordance with its activities. Manufacturing industries on the other hand are characterised by a relative lack of spatial preferences. Another example is the market size: after adjustment, firms with a national market show a stronger preference for the central area of the Netherlands than internationally oriented companies.

Analysis of the influence of place characteristics demonstrates that its results are also affected by locational self-preference. Without adjustment, centrality, representing access to the national market, is by far the most important single locational factor determining the average rating of a location, followed by agglomeration size, in both Germany and the Netherlands. Filtering out locational self-preference considerably reduces the influence of centrality, reversing the order in both countries: after adjustment, the influence of agglomeration size is larger than that of centrality, and in the case of Germany, it even explains two thirds of the variance in the average ratings.
Some other changes that the adjustment causes in the proportions of variance explained by particular place characteristics, like the reduced influence of freeway access in the Netherlands for example, can be traced back to a correlation of the characteristic in question with centrality.

Conclusion

Locational self-preference explains a considerable proportion of the variance in the rating of potential firm locations by individual entrepreneurs. Filtering out locational self-preference seems to reduce the level of noise in the rating patterns: a number of relations and structures that are hard to explain, disappear after adjusting for self-preference, other ones that are easier to interpret, become much clearer.

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