Spatial Diffusion of Japanese Firms in West Germany and West Berlin from 1955 to 1989

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Abstract

This article attempts to explain spatial diffusion of Japanese enterprises within the Federal Republic of Germany as a spatial process following the shift of regional economic power from the northern to the southern part. Hitherto studies have only gone as far as the indication of a concentration of Japanese enterprises in Düsseldorf. But, from the viewpoint of a dynamic approach, this does not seem to fit into today's existing conditions. In fact Japanese enterprises have already entered a stage of diffusion. The innovation centers of the hierarchical diffusion are Hamburg, Düsseldorf, Frankfurt, Stuttgart and München. From these centers, a wavelike diffusion into the surrounding areas took place according to the various diffusion centers in different phases. The hierarchical diffusion can be seen as being carried out from the trade and service sector and with a wavelike motion from the production sector. The main diffusion direction was laid to the south. For the interpretation of the diffusion process described, several hypotheses have been derived and examined with the aid of a non-linear multiple regression model of the gravitation type. The results supported the hypothesis of a hierarchical wavelike diffusion and three determinants explaining the mechanism of the diffusion process were significantly discovered; first the information network of Japanese enterprises, established by the Japanese Chamber of Commerce and Industry in Düsseldorf; second, the spatial distance from Düsseldorf; third, the centrality in the German urban system.

The locational behavior of Japanese enterprises has been influenced, on the one hand, by the altering of the west German urban system, on the other hand, by the changing firm structure itself. For the three sectors, trade, other services and production, it is obtained that each sector has a characteristic location pattern, which received certain alterations during the investigated period. The results suggest that, in an advanced stage of diffusion, the presence of foreign enterprises can be used as a simple indicator for alterations of economic growth in an urban system.

Key words: diffusion theory, foreign investment, locational behavior, West German urban system, regression analysis.

I. INTRODUCTION

1. Some dimensions of Japanese firms abroad

More attention has been given to the strong expanding overseas investment of Japanese firms. Most of these studies are involved in the internal organization of Japanese management. A concentration on case and comparative studies has lead to an overestimate of the Japanese management system, with lifetime commitment, consolidated decision-making, quality-circle and company labor unions. This caused the Japanese model of management to be embraced abroad—although existing cultural and institutional differences were ignored. This led to the wrong assumption that one could merely achieve an increase in productivity through the adoption of the Japanese management system (PARK, 1985).

Correspondingly, EDGINGTON (1988) empha-
sized that internal management structures are an inadequate basis to explain the success and behavior of Japanese transnational enterprises. More attention should be given to external structures.

However, the external relationships of Japanese firms reach farther than the conglomerates of Japanese industrial groupings. While Japanese enterprises stay in hard competition with each other in the home market, abroad they build up a common frontier to conquer foreign markets (ABEGGLLEN AND STALK, 1985; FRANKO, 1984). To mimic this kind of western view; in the case of the Federal Republic of Germany, the Japanese enterprises are allied under the Japanese Chamber of Commerce and Industry at Düsseldorf (JCCI).

The JCCI safeguards the interest of the Japanese traders and producers in opposition to the West German authorities and other organizations. Therefore, a permanent exchange of experiences and interests are conducted among its members. These kinds of indirect services are a great advantage for the small- and medium-sized firms, which would be embarrassed to compete with the information network and capacities of the general traders.

In the following, it will be shown that this form of cooperation has played an important role in the expansion of Japanese firms in Germany and that their spatial organization is also a contribution to their economic success abroad, which should not be underestimated. However, no much literature is available on the principles and the mechanism of the internationalization process of firms in the geographical dimension.

Several researchers have studied about the phenomenon of overspreading multinational enterprises (KNIKKERBOCKER, 1973; DUNNING, 1981, 1988; OZAWA, 1979; KOJIMA, 1978; DICKEN, 1988; HILL, 1989 a.o.). But the results of these empirical and eclectic approaches do not produce a basic theory to explain the internationalization process of enterprises nor their locational behavior. One useful approach was VERNON's (1966) explanation of international investment and international trade in the context of the product cycle. Like theories of other economists it works only on the international scale. For the purpose of analyzing the locational behavior within a country such theories are not appropriate. Neither classic geographic theories, like location theory (WEBER, 1909; BEHRENS, 1961) nor central place theory (CHRISTALLER, 1933) are useful in explaining the determinants of the dynamic expansion process of Japanese firms in Germany.

The central place theory is still essentially static, and little research has been undertaken to extend its applicability to the changing relative importance of central places through time (BARTELS, 1979).

A development-theoretical settlement system analysis in the innovation diffusion theory produced by the Schools of Lund and Berkeley, has been able to close the lack of dynamics of the aforementioned theories (HÄGERSTRAND, 1952; PRED, 1975). Under this theoretical approach Japanese firms could be seen as an innovation in the West German economic-urban system. Regions which receive Japanese investment are to be understood as so called adopting units.

The well known analogy of innovation diffusion as a wave, with it's changing form arising from the origin and moving outward, describes the pattern of the innovation at any distance and time from the origin. HÄGERSTRAND (1970) has suggested, the passage of a wave can be characterized in a four-stage model involving a primary stage (beginning of the diffusion, strong contrast between the innovating center), a diffusion stage (powerful centrifugal effects,
adoption centers in more distant locations), a condensing stage (relative rate of adoption is similar in all locations) and a saturation stage (indicating a glowing of the diffusion process as well as a general but slow asymptotic increase to a maximum acceptance).

Diffusion is to be understood as the spread or movement of a phenomenon over space and through time. Diffusion processes have been distinguished on the basis of expansion or relocation, or the structural character, i.e. contagious or hierarchical. The pattern of a hierarchical graduated wavelike diffusion is a combination of the above mentioned single process, and was clearly described by BAHRENBERG and LABODA (1973) as follows:

"The innovation starts in a center or in several. From there it expands with a wavelike motion into the surrounding areas. At the same moment it jumps to centers of a less hierarchical level, in which the innovation is adopted before the center is reached by the wave. In the following time from the old as from the new center the wavelike diffusion continues and the innovation jumps to the center of the next hierarchical level. This (kind of) process continues until all areas are included and the innovation has been adopted everywhere. Altogether, several waves appear, which are transmitted by centers of different hierarchical levels. These waves are different in their range. In the case of waves starting from higher centers, the range is a result of the greater area of influence in the hierarchical lower centers."

All processes of diffusion are affected by barriers, which hinder the expansion process or can also bring it to a standstill. According to their quality, barriers have different blocking effects (YUILL, 1965). "In most cases, barriers are permeable rather than absolute, allowing part of the energy of a diffusion pulse to go through, but generally slowing down the process in the local area" (ABLER, ADAMS AND GOULD, 1977). The expansion process is disturbed by various kinds of barriers. Cultural and language barriers are common examples. In reality, they don't have to be of visible or physical form, only perceptible (GIESE, 1978).

It would lead to a false conclusion, if one presumed that a spatial process is caused by a spatial pattern. But an important result of the research in diffusion theories is; similar spatial pattern can result from different spatial processes (HÄGERSTRAND, 1953).

It is possible to draw the conclusion that besides the structure of the adaptor, the character of the innovation induces the feature of the diffusion process. Therefore, in the case of diffusion studies, it is of extreme importance to deepen the knowledge about the research object and its character. One cannot inevitably presume that an innovation expands at any time, led by the hierarchy of social communication.

More important than to plot the pattern of spatial diffusion is to identify the relevant communication channels (SUGIURA, 1986).

Hägerstrand defines diffusion of innovation as a function of communication. Of course if there is not sufficient information about investment possibilities, Japanese enterprises will not spend money. Nevertheless quantity and quality are not the only determinants of constitutive decisions. This precipitates a time lag between the adoption of information and the resulting action. Likewise the intermediate time interval is also important, because it embraces a non-visible, mental or perceptual process. This time interval could be found in the orientation phase of firms in the form of a representative office operating until the foundation of an enterprise according to German law. The foundation of an enterprise is very carefully prepared. The job of "pushed forward" representative and information offices is to collect and evaluate information about the market, customers and competitors. In the second phase, they make contacts, organize distribution channels, and conduct interviews with the potential suppliers. Finally, according to the purpose of investment, they choose a right location for their overseas branch. The phase of the representative office varies corresponding to the sector. Investment in the production sector takes much longer than in trade and service. But MERZ AND PARK (1986) also reported that constitutive decisions will be carried out very quickly when a certain amount of information is reached. The time interval is not only a problem of the quantity of information, but is also an informational resource problem that will be determined by the rapidity of the utilised information channels. Therefore,
the analysis of the diffusion process is differentiated into the study of connecting lines and junctions (HÄGERSTRAND, 1966). Intersection lines are routes, along which information and influences flow. Information will be transmitted or diverted by junctions. Junctions could be understood as an individual or as a unit of several individuals (here: firms at the same location) with their reaction on information and information fields. In general, the information field of an individual is a specific set of mental information about surrounding environmental elements. Naturally most of the information fields have steep distance gradients, which means an individual has more information about closer locations than about farther locations. Thus the expansion of innovation relies on contacts with another individual, which transforms specific information. A basic theorem of HÄGERSTRAND is to conceptualize the expansion of innovation over the earth's surface, that is the adoption of innovation at first is a product of a learning and communication process (BROWN, 1981). It is a well-known fact that the possibility of receiving information is greater the better the education of an individual. In the case of the Japanese manager, their function and integration of specific innovative and informative circles should be further perceptual criteria for this analysis. Therefore, the degree of integration of the Japanese manager in Germany considerably differs with location, because common economical and social institutions exist only in a few centers. The Japanese enclave in Düsseldorf is said to be a "miniature society" of their home country. With this, the Japanese managers in Düsseldorf have various formal and informal information networks at their disposal, meanwhile managers at other locations see themselves limited to only a few acquainted interchange possibilities.

The situation or the totality of every individual in a location is described by the operational concept of the Mean Information Field (MIF)\(^1\) which comprises an area containing probabilities of receiving information from, or making contact with, a central point. Such a central point, which connects all or most of the Japanese branches could be a common organization like the Japanese Chamber of Commerce and Industry.

During the course of this, one should not forget that the activity of a coordinating propagandist could be able to decisively determine the spatial diffusion process as well as its resulting patterns (MEYER, 1976).

3. The purpose of this study

The purpose of this study was to investigate:

1) if the spatial spread of Japanese firms follow the principles of diffusion;

2) if the expansion was steered through an information network directed to the firms and what are the other determinants of the diffusion mechanism;

3) what kind of influences did the alteration of Japanese firm structure have on the location strategy.

The findings of this study could also be useful to understand certain changes in the German postwar urban system.

II. THE METHOD AND THE MATERIAL

The first step was to plot a series of maps to differentiate phases of invasion and to find out the main expansion direction of Japanese firms. Namely based on the diffusion theory concept, hypotheses were worked out for the proposal of examining a mechanism responsible for the spatial diffusion process. For testing these hypotheses, a multiple regression model was used, similar to the ones already used by GIESE (1978), BAHRENBERG AND LABODA (1973) and BARTELS (1968) for explaining a hierarchical contagious diffusion process. To propose the steering mechanism of the spatial diffusion of Japanese companies in Germany, the following hypotheses have been put forth and made operational.

1. The hindering effects of distance and the effects of transferability

The economic and spatial expansion of Japanese enterprises depends on the transmission of specific information and experience, which are transmitted from the management of existing enterprises and bundled in specific information channels like the Japanese Chamber of Commerce and Industry. The knowledge about
profitable projects of the investors decreases with the perceptional and spatial distance. The settlement of Japanese enterprises in the adoption regions is less, as the distance from the leading innovation center grows farther.

2. The effect of network or interaction

To identify specific connection lines, a member list of the Japanese Chamber of Commerce and Industry was used, which is understood to be a central junction in the information network of Japanese enterprises. In this institution, Japanese entrepreneurs have regular consultations and work out strategies to cope with common difficulties. Hypotheses were developed to test the research question of interaction, as follows: Japanese written information exchange can only be understood by firm representatives, which are Japanese. On the other hand, only Japanese are able to report about the business conditions of their location. These facts draw nearer to the idea of an absorbing diffusion barrier. Therefore, the Japanese Chamber of Commerce and Industry is to be seen as a central nodal point in their information network. The conjunct enterprises could rely on quick and solid information, which makes management abroad more efficient for them. The higher the regional occupation of the Japanese Chamber of Commerce and Industry enterprises are in a region, the better the probability of further settlements.

3. Centrality and the hierarchical effects

The exchange rate of information between economic subjects is a function of centrality. Thus, the realization of possible sales depends on the procuring and sales contacts. Such contacts are rising with the employees in certain sectors like service, transport and trade.

Communication and information potentials are rising with the degree of centrality of a location. On the assumption that the settlement of Japanese enterprises in a location with higher centrality occur earlier and more quickly, the higher the centrality, the greater the occupation of Japanese enterprises. With the support of multiple regression analysis procedure, the three found hypotheses have been proved as follows:

\[ \text{To operationalize the procuring and sales contacts potential, a centrality indicator was integrated in the analysis. This index is commonly used for measuring the centrality.} \]

\[ \lg Y_i = a_0 + a_1 \lg X_{1i} + a_2 \lg X_{2i} - a_3 \lg X_{3i} \]

\[ Y_i = \text{Quoted settlement of Japanese enterprises, referring to the totality of enterprises in the region at the moment } t_i \]

\[ X_{1i} = (\text{MIF}) = \text{Regional occupation of Japanese management weighted by the employees of the region at the moment } t_{i-1} \]

\[ X_{2i} = (\text{CENTRAL}) = \text{Service occupation: employees of trade, transport and services referring to the employees of the region} \]

\[ X_{3i} = (\text{DISDU}) = \text{Distance of the settlement to the innovation center Düsseldorf in autobahn kilometers} \]

The enterprise data bank was aggregated on a district basis. Selecting from a huge governmental regional data bank, locational quotients were calculated and both data sets combined with each other. Corresponding to the growth and gravitation theoretical approaches, this data has been transformed into a logarithmic form. According to the above mentioned assumption of diffusion barriers, the possibility that non-JCCI-members also receive information from this institution, are taken into consideration by a low probability of ten percent, meanwhile the probability is only one percent that they receive information about profitable investment facilities from regions in which no Japanese enterprise was located before. These premises are operationalized by weighting the quotient MIF. Because of the lack of regional data necessary for the formation of locational quotient CENTRAL before 1980, the centrality variable of 1980 was held constant for this period. All variables of the explicit indicated block were included in the equation in one step in order of decreasing tolerance. This analysis was based on the entire list of overseas investment published by Toyo Keizai (1989). Through systematized statistics for each enterprise, 30 variables could be created. Most important for this study was the year of foundation, which could not be found in other
Representative offices which only function as a firm address or prepare investments were not included. Only firms which were German by law or rather objectively direct investments were admitted into the investigation. In this analyses, 409 enterprises were involved. Members of the Japanese Chamber of Commerce and Industry were identified by a list of members from the same organization. The enterprise related data base was built up to an individual data bank. According to the formulation of the question, aggregational procedures were carried out on different regional levels and interconnected with a regional data set, which was specially created during an internship at the BfLR (German Research Center for Geography and Environmental Planning) for the purpose of this investigation.

III. THE RESULTS

1. A description of the diffusion process

1) The initial phase

Until the end of the World War II Berlin was the center of Japanese external trade with Europe. After the division of Germany, Hamburg took over this role. Hamburg quickly became the primary center of the spatial diffusion of Japanese enterprises in the Federal Republic of Germany. During the mid-1950's a different trend emerged, in which more enterprises decided to locate their offices in Düsseldorf. This settlement decision was influenced by the postwar economic structure of West Germany and its westward shift of economic linkages. Like the Germans, the Japanese made their way to rebuild and modernize their industries, which had been destroyed in the war. Because of the procuring of capital goods and the technology transfer of production techniques, the accessibility to the heavy steel and chemistry industries became an important location factor. "Throughout the 1950's and 1960's Düsseldorf was the optimal location in Europe, to receive machinery for plants and the associated technological know-how which was needed for the purpose of rebuilding the Japanese heavy and chemical industries" (JETRO, 1987b). Correspondingly, locational preferences were found by the special traders, whose primary business was mostly related to the steel industry and therefore the buying of capital goods, as well as by the general trading companies, whose interests allowed them to deal not only with the buying of capital goods, but also the selling of consumer goods. These firms opened their trading offices in Düsseldorf, the so called "writing desk of the Ruhr region", because this location offered the best opportunity to utilize the agglomeration advantages to contact the German steel and heavy industry companies (ZIELKE, 1982). The concentration of administrative functions of German companies in Düsseldorf was a great benefit for the city as well as for the Japanese competitors. Consequently, Japanese pioneer enterprises were the so-called German Bussan (Mitsui), the general trading houses of Marubeni and Sumitomo and the trade with the steel specializing companies of Tokyo Boeki and Yawata Iron Steel (Shin Nippon Steel). They laid the foundation stones and until today, continue the process of gathering momentum, which made Düsseldorf into a center of Japanese economic activity in the Federal Republic of Germany.

The location in Hamburg was favorable as long as the Japanese markers abandoned the export function of the traditional trading firms, which placed distribution and service of the products in the hands of German marketing companies. The harbor of Hamburg has long served as an important gate for Japanese-German trade. With the division of Germany, Hamburg lost not only it's hinterland, which extended upstream of the river Elbe, but the town was also shifted to a more peripheral location of the present day western orientated urban system. The German marketing companies dealt not only with Japanese imported goods, but they also distributed German goods on the German market. Since this produced a conflict of interests, this kind of marketing strategy was not appropriate to expand in Germany. With the rise of Japanese industrial production and as a prerequisite for expansion in the German market, the elimination of this marketing gap first through the specialized traders and later by the producers themselves
became necessary. The liberal economic policy of the Federal Republic of Germany allowed them to expand freely. They covered West Germany with a network of bases, which were also responsible for neighboring countries (ElI, 1977).

Caused by the strong rise of Japanese industrial production, the Sogo Shosha ran into their capacity limit. The more specialized Japanese goods became, the more unsatisfactory the distribution and service performances of the German firms became for the Japanese plants. For many producers the set-up of an inner-German distribution network became an important requirement to guarantee sales of their products in a qualified market such as West Germany.

With the settlement of the marketing companies, an important stage of the multinationalization process was reached. Japanese industrial production grew at an accelerating rate and with it the exports. Correspondingly, the Japanese government enacted between 1969 and 1972 four liberalization amendments, which relaxed the former rigid foreign investment regulation laws (JETRO, 1977). This immediately caused an investment boom in the Federal Republic of Germany with a clear high point in 1973. In 1974, the boom was dampened through the recession caused by the first oil shock. The enthusiasm of the Japanese foreign investors soon decreased. Thus the second oil shock constituted less of a collapse of their investment activity as before. This was also caused by a shift in investment strategy, which will be discussed below in the context of firm structure and their locational changes.

The trade and marketing companies secured not only the sales of the home production plant, but also entered the foreign production stage (located mainly in the South East Asia). For a marketing orientated sales strategy, an inland location was more to be recommended, which was centrally located to other regional markets. Hansa city of Hamburg had a peripheral location in terms of building up a distribution network, which could optimally cover West Germany. Düsseldorf, which at that time was not only located at the largest procuring market for capital goods, but also located at one of the largest sales markets for consumer goods, fulfilled these requests.

The handicap of the locational choices of the general trading companies influenced the locational preferences of the firms that followed, which increasingly wanted to manage their sales by themselves, but nevertheless entrusted their business to the great trading companies who were well experienced with the German market. The already existing relations with the great trading companies in Japan, especially to the Sogo Shosha, had been utilized as well. Corresponding to the trend of greater independence of the producers, the Sogo Shosha had an interest commercializing their experiences and contributed only rarely to projects of the producers abroad. Such external advantages were an important incentive to include the chosen location of the great trading companies in their locational preferences. The city government of Düsseldorf promoted the systematic settlement of Japanese enterprises (Zielke, 1982). The Chamber of Commerce and Industry for the Japanese Trader and Producer located in Germany had been timely established before the first foundation boom of marketing offices of the Japanese producers, who tried to construct their own distribution channels for their own products. It should be mentioned that one difference they had as compared to the great trading companies was the need of information services from the external side. Because of the commercial character of the assistance received from the Sogo Shosha and the attached contracts of participation or profit share, the smaller companies have been endeavoring to detach themselves from the great traders.

Therefore, the firms that followed used common facilities and institutions, such as the Japanese Chamber of Commerce and Industry. Corresponding to the spatial concentration of Japanese enterprises at the time, the locational choice of the Japanese Chamber of Commerce and Industry came to Düsseldorf, and so for the following generation of Japanese firms the location pattern was premarked.

Because full membership can only be received by those enterprises located within North-Rhine Westfalia (NRW), the special membership holders in other countries (Länder)
of West Germany had no right to vote in the main meetings of the JCCI, but through the strategic connection of headquarters located in NRW and recently distributed branches all over West Germany their actual area of validity reached far over NRW (SCHLUNZE, 1991a).

2) The diffusion phase

The producers in Japan are the original power of the overseas expansion. One can pick up from Figure 1 that as Japanese industrial production increased every year, more and more branches (most of them sales branches of the producers) were founded in the Federal Republic of Germany. It shows clearly that the economic situation had a strong influence on the development of the establishment of Japanese firms in Germany. ABBGLEN (1986) looks at the foreign branches founded during the years of recession as an anticyclical strategy for safeguard and expansion of the market share in the most important sales countries. ERNST AND HILPERT (1990) noted that West Germany adopted more investment than other countries in the trade sector. For many Japanese enterprises initially Hamburg, then Düsseldorf and, with recently growing rates, Frankfurt, became the "ideal sales centers" in Europe. However, most of the other enterprises are also to be seen directly or indirectly in the context of trade with Japanese goods.

A relocative shift in locational concentration of the Japanese business activities as reported by ZIELKE (1982) did not occur after the main shift from Hamburg to Düsseldorf was completed. But less impressive alternations in the locational patterns can sometimes be more interesting for geographical analyses on economic change in an urban system.

Until the 1970's the diffusion process took

Figure 1. Industry production in Japan and foundation of Japanese firms in the Federal Republic of Germany from 1955 to 1988 (Index of industry production 1980=100).
place according to the “hierarchical principle”. Therefore, a successive jumping of the innovation of “Japanese enterprises” occurred from the innovation centers in the north to the innovation centers in the south. After World War II, the process of the spatial diffusion of Japanese enterprises started in Hamburg, then jumped over to Düsseldorf in the same decade as reported in detail above. In 1961, with the first Japanese sales branch in Offenbach, the area around Frankfurt was reached. It was not until the third decade, that the expansion extended to the south, with the first trading companies in the areas around Stuttgart (Esslingen, 1970) and München (1971) being founded. It was in this way that after twenty years of the first foundations in Hamburg that the hierarchical diffusion process was basically carried out.

The diffusion process was characterized by the market entry admission of different sectors. Figure 2 describes an overview, of when and to what degree which sectors were entered.

The hierarchical diffusion and therefore the rapid, spatial extensive expansion, was led by the trading companies. They have been followed by sales branches, which are seen as two types, the so called early and late majority. These findings can be found in Figure 3.

From the third decade, a clear phase difference of foundation of other service sectors followed. The service companies were founded to support the activities of the enterprises in the trading sector in the first line and, therefore, they have been strongly tied to their former locational concentration. At first, supplying firms such as restaurants, hotels, food and book stores came to West Germany, and later transport companies, banks, insurance companies, consulting firms, service and repair firms were founded. By the second decade, Japanese architecture offices and building contractors existed, which erected representative buildings.

Figure 2. Cumulative development of the Japanese enterprises according to their sectoral affiliation (1955–1988).

Figure 3. Spatial diffusion of Japanese enterprises in West Germany and West Berlin (1959–1989).
for the Japanese investors.

Although the building and construction trade is counted under the secondary sector, it was intentionally assigned to the service sector because these enterprises have been exclusively orientated to the demands of the Japanese firms. An example of this is the building firm Takenaka-Kajima consultants, which erected the Japanese school in Düsseldorf and the Research and Development center of Mazda in Weisskirchen near Frankfurt a.M. The quickness and effectiveness were praised by the investors, while complaints of the slowness of the German contractors grew (Park and Schlunze, 1991). This showed what kind of efforts are necessary for a successful engagement abroad.

On the other hand, such effectiveness in the area services showed to what extent the economic activity of Japanese enterprises had already progressed. From a geographical point of view, services could indicate the appearance of the condensing stage, because their potential customers are mainly Japanese enterprises. In the case of Düsseldorf, to reach this stage was a necessary prerequisite for the spatial expansion of economic activity in West Germany. More than an "enclave" (Zielke, 1982), Düsseldorf, with its high concentration of Japanese enterprises, is to be understood as an motorical unit, which creates secondary, tertiary and quaternary centers in a diffusion process, like Frankfurt, Hamburg, Stuttgart and München. According to this, the service firms are concentrated in innovation centers and thus indicates the new expansion direction of Japanese enterprises. These results suggest that location specific advantages may be generally realized when a certain degree of independence from the centrifugal forces of the primary innovation center is achieved.

In a second phrase of the diffusion process the wavelike diffusion gradually breaks through. So in the period of the 1960's Japanese firms expanded into the surrounding country side of Hamburg: Storman (1965), Pinneberg (1966), Herzogtum Lauenburg (1969). In the area of Düsseldorf the first districts (Kreise) were Mettmann (1961) and Neuss (1963). Also the surrounding districts of Frankfurt were caught by the activities of Japanese Investors: 1964 the Wetteraukreis, 1968 the Taunus-Kreis and 1969 the Groß-Gerau districts received trade branches, but also early investment in the production sector was undertaken in Frankfurt a.M. (1963) and Offenbach (1967). Meanwhile, as in the case of the innovation centers of Hamburg and Düsseldorf, after nearly a decade passed, the new innovation centers such as Frankfurt, Stuttgart and München immediately expanded into the surrounding area. Characteristic of wavelike diffusion, it is the neighboring districts that will be directly preferred. In the 1960's this process was observable at the innovation centers of Hamburg and Düsseldorf. Likewise in the following decade, as in the case of the southern German innovation centers, the secondary and the tertiary center further expanded into their hinterland.

Because the investment in Neumünster (1971) and Bremen (1979) were carried out in the production sector, these locations were assigned to the waning expansion power of Hamburg. Neumünster and Bremen did not attain great importance in the locational structure of Japanese enterprises. Similar is the situation for the branches in Köln and Bonn, as well as in the southern region with the cases of Freiburg and Nürnberg/Fürth, which in spite of hierarchical distance could be classified as a more wavelike rather than a hierarchical diffusion process (see also Fig. 3). It is important to add that direct investment in the production sector forced the process of expansive diffusion in the sphere of influence of the Japanese trading and service centers. Corresponding to this, Matsubara (1989) pointed out that the locational patterns of Japanese production plants are identical with the chosen locations of the trade bases, but he also noted that from the 1980's peripherical regions in northern and southern Germany, as in England, have been chosen as locations for production.

However, until recently the hierarchy effect had a greater importance than the effect of expansive diffusion. Schlunze (1991a, b) found out, in a locational evaluation analysis of Japanese plants in Germany, that locations with a highly skilled labor market have been preferred to those with a low skilled one. Furthermore, the accessibility of production-orientated ser-
vices like trade, transport and others was identified as a significant locational characteristic. Centrality and agglomeration advantages of the most important urban centers of the German market were an important elements of their settlement strategy. Thus, the three innovation centers Hamburg, Düsseldorf and Frankfurt contained 67% in 1970; 53% in 1980; and 49% of the Japanese firms in 1989. In the 1980's the city of Frankfurt received in the course of direct investment for branches of Japanese financial institutions and other services an increased importance in the locational network. In 1989, Hamburg (8.6%) was overtaken by the concentration in Frankfurt (9.1%). In comparison to the surrounding regions of Hamburg, Düsseldorf and Frankfurt, the investment in southern regions were only singular events. Only München was capable of binding 3.8% of Japanese firms. Corresponding to the theoretical assumption of diffusion, the filling-up-effect decreases with growing distance to Düsseldorf, the city which had been ruling as the main center of the expansion process. It appears that the spatial expansion of Japanese enterprises in West Germany was conducted in an initial phase by a hierarchical relocative and afterwards by a hierarchical wavelike diffusion process.

Merz and Park (1987) found that with the appearance of sales branches of the producers, a downward tendency in the relationship with the general trading companies clearly became recognizable. Their strongest engagement was in 1973 (Laumer, 1983). In terms of geographical examinations, these findings could be a hint to the importance of the Sogo Shosha which cannot be attached to a steering role for the extensive diffusion process.

It is worth investigating which factors could have steered the spatial diffusion process. Since no single enterprise possesses the financial resources of the Sogo Shosha to coordinate an expansion process, only the information and communication network of two institutions are to be considered here. On the one hand, there is JETRO with its headquarters in Düsseldorf and branches in Hamburg, Frankfurt and München and, on the other hand, JCCI in Düsseldorf. Regarding the recent activities of JETRO in Germany, it proclaimed to assist the western trading partners in reducing their trade deficits (Gandow, 1990). The actual efforts are directed towards a better information basis for western products in Japan. The procuring of information about technological development in western countries is a successful instrument of Japanese industrial policy. The question is who makes the best use of the so-called information centers, which should be built up in all prefectures of Japan: the importer or the competitor of new German products. Such information can also be found to the advantage of the smaller producers, which by themselves could not afford a marketing office abroad for prospecting and developing their product. If the producers have the greatest benefit of such a "window to the world market" around the corner, in the context of this study, JETRO's new strategic role could be interpreted as a generator of "departure decisions" for Japanese producers stepping into the export stage.

Corresponding to their rules, the Japanese Chamber of Commerce and Industry in Düsseldorf (JCCI) is based on the rules of association of Japanese traders and industries (JCCI, 1988). The primary target is the promotion of trade between Japan and the Federal Republic of Germany. When the JCCI was juristically recorded in 1966, its regional validity was set in the country of North-Rhine Westfalia, because almost 90% of the Japanese enterprises were located within this country; most of them in Düsseldorf. Nowadays the office of the JCCI is located in a representative building, called the Japan Trade Center. The JCCI had taken over the function of supplying the Japanese firms with information, which is useful in conducting business in foreign trade affairs. The JCCI obtained these materials from German and other European information sources, conducted analyses and organized them systematically, bringing them up to date. Similar to the foreign economic service of the German Chamber of Commerce and Industry, the supplying activities for Japanese firms are of direct and indirect character. For example, direct services of the JCCI consist of information services, consulting and support work for preparing the ground for business with European firms.
The preceding paragraphs only describe the diffusion process, but it is more important to identify the determinants of the diffusion mechanism.

2. The interpretation of the model

Figure 4a displays the partial correlation coefficient; Figure 4b the regression coefficient and its significance. The error of probability is clearly smaller than one percent except in 1974. Since 1972, after the phase of developing the Japanese Chamber of Commerce and Industry into its present form was completed, the first great investment push began.

Multiple $r$, which describes the explanation content of the variables $X_1$, $X_2$ and $X_3$, shows that a high explanation content existed from the middle of the 1970's. The model explained more than 72% of the total variation of all variables.

1) The regional occupation of Japanese Chamber of Commerce and Industry enterprises

First the highest explanation content is brought through the variable MIF, the indicator for the so called mean information field. After 1975, it was more than 0.7 and varies only a little between 0.7 and 0.8. This shows that the Japanese Chamber of Commerce and Industry...

![Figure 4](image-url)
took on with great continuity the role of a very important determinant for the spatial diffusion process soon after their foundation.

Therefore, the indicator MIF shows that potential investors have a greater locational preference for an area in which Japanese firms have already settled, participating in the information network of the JCCI. The high explanation content could also be representative of the high efficiency of these institutions in supplying the expansion process of the Japanese firms in West Germany.

The foundation of the Japanese Chamber of Commerce and Industry in 1966 in Düsseldorf was a prerequisite for most of the smaller Japanese firms to settle down in Germany. Since 1972 the Japanese Chamber of Commerce and Industry has existed in its present form; between 1967 and 1972 it was in a phase of construction. Through this well organized grid-system, these Japanese firms were able to create synergy-effects. This marked the beginning of the second phase, in which it became possible for smaller firms to build up their own distribution channels independent of the great trading firms.

The Japanese Chamber of Commerce and Industry had a strong effect on the spatial diffusion process through establishing an information and communication network for the Japanese enterprises in West Germany. More importantly for the expansion than what is called "internationalization" seems to be the installation of such networks to flank and thus realize the economic interests of the Japanese enterprises, which enable them to act global. Because of changes in the spatial parameters, for example, that caused by the unification of Germany and soon to be caused by the common European common market, I would forecast a further enlargement of the existing information network.

2) The distance

As expected, the influence of the factor of distance was great at the beginning of the diffusion process. It shows a greater distance of resistance as a concentration on the mean innovation centers. With a long term view, the distance is smoothly decreasing. After the investment push in 1973, the distance decay effect sank down to 0.4 in 1974 and 1977. Between 1979 and 1981 the distance effect was high once more. This was caused by the increase of services and plants in North-Rhine Westfalia. The spatial diffusion process was complicated by problems within the spatial transfer of information, for example, the feasibility of profitable investments. This is the reason why in the initial stage the diffusion of Japanese enterprises had been lead less by the hierarchical structure of the urban hierarchy, as by the given structure feeling the advantages of the pioneer enterprises. In the diffusion stage, this kind of persistence has been overcome and a better spatial organization of Japanese enterprises has been worked out.

3) Centrality

In the beginning the centrality factor "potential procuring and sales contacts" has had only a little influence, although throughout the third expansion phase it rises continuously. The factor itself also has not had such a high significance as have the other two of the model. In the beginning of the 1970's the value of this factor was once negative. The negative sign is caused by Japanese entrepreneurs investing more in Düsseldorf, although the centrality of the other innovation centers has been higher. Although other West German cities could have offered more potential procuring and sales contacts, Düsseldorf was chosen because of specific locational advantages. This appears to be unmeasurable with a common centrality coefficient, but the coefficient has been steadily rising since the mid 1970's and since the mid 1980's the partial coefficient finds its level around 0.3.

There are several reasons for the rise of the centrality factor. A possible explanation could be derived from the sectorial change and the resulting locational behavior. Aside from the trade sector, direct investment in the service sector has taken place continuously since the 1970's. In the last decade these kinds of firms increasingly settled down in other centers that were competing with Düsseldorf. Therefore adequate investment corresponding to the centrality degree of the settlements seems to
gain more acceptance. Also, in the 1980’s numerous production plants were founded within the sphere of influence of the innovation center, which contributed to a better balance of locational distribution. So a system was worked out, in which not only some centers with only a few offshore plants and trade firms existed, but clusters of production plants around these centers were also built up.

A certain consolidation of Japanese enterprises along the urban hierarchy can be noticed, and it roughly paints over the recent West German urban system.

As mentioned above, the expansion of Japanese firms followed the principles of a hierarchical wavelike diffusion process. A model was constructed to make clear the driving mechanism of the diffusion process. Three determinants were worked out. They could significantly explain most of the variance, but a model can not explain the whole process in reality. Therefore, in the following section, the outlined changes in enterprise structure along with regional changes in West Germany and their influence on the locational behavior of Japanese enterprises will be discussed.

3. The spatial influence of the change in trade and investment structure

The economic structure of a sender and receiver country, which implicitly underlies trade theory, determines not only which kinds of goods are to be traded, but also how and where they are traded. Therefore, the economic structure of the Federal Republic of Germany is an important determinant for the trade between Japan and Germany.

From the structural change of the German economy and the Japanese trade structure ensues a series of explanatory approaches that take place over a long-term expanding spatial diffusion process. It is foreseeable that Japanese trade companies react on currency induced changes of their price position and, therefore, increase their export prices when currency is undervalued or try to keep market share up through price cuts in the case of an overestimated currency. The real national economic rate of exchange is, as a rule, not effective for all industries. The branch specific real rate for exchange of the four most important German export branches (chemistry, mechanical engineering, automobile engineering and electrical engineering) deviate considerably from the average of national rate of exchange. The industry of electrical engineering has especially shown, since 1970, a continually increase in the real exchange rate. Blame must be laid to the Japanese Yen, the currency of the main competitor in this field has been revalued in real terms.

The pressure of revaluation causes Japanese makers and producers to open marketing offices and, more recently, production plants located directly in the regional sales markets in order to react not only by price cuts, but to keep up their competitiveness through advantages of accessibility.

The competitive position of a branch can be measured by the revealed comparative advantage \((RCA)\) (Meissner and Fassinger, 1989). This value showed the German chemistry and electrical engineering industries with a decreasing tendency between 1970 and 1985. Recently, both branches have been weak on an equal level. The loss of comparative advantages is regrettable. However, the industries of mechanical and automobile engineering possess a steadfast foreign trade position. In an empirical study, the \(RCA\)-value for the foreign trade of Japanese industries in comparison with the EC was calculated for the year 1985. According to the study, in five of twenty industries, Japan possessed a comparative advantage: electrical engineering, precision engineering, automobile assembly, mechanical engineering as well as musical instruments (Heitger and Stehn, 1989). It is interesting to note that the sector which represented the highest comparative competitiveness, electrical engineering, has become weaker for the German side. Heitger and Stehn prognosticated the erection of additional trade barriers by the EC in industries in which the share of Japanese imports from inland production is high. The progress of the commission of the EC in terms of reduction of internal barriers and by simultaneously enhancing external protection will give rise to an adequate adaptation reaction on the side of Japanese companies. They will try
Spatial Diffusion of Japanese Firms in West Germany

This prognosis has already been realized. It is possible to see this from Table 1, as Japanese direct investment since 1984 in the sector of electrical engineering has been carried out with intensity. Before 1984 the direct investment in the chemistry sector was predominant, but in accordance with comparative advantage, the electrical engineering industry is now preferred. Recently the sector of electro (precision) group accounted for more than 50% of trade in production. This bears out the hypothesis of HEITGER AND STEHN that the sector which is already strong in trade will try to substitute their imports by production facilities (Table 3). As a result, the share of traders and producers in the electro (precision) group is now the highest. Nearly half of the production plants are producing capital goods (Table 2). Meanwhile, the situation has arisen in which the share of producers of capital goods clearly dominate those of consumer goods. It is normal that such market segments are increasingly preferred, since they lie between the category of consumer and capital goods. Concerning the case

Table 1: Japanese production plants founded until and since 1984 according to group and sectoral affiliation.

<table>
<thead>
<tr>
<th>Group and Sector</th>
<th>until 1984</th>
<th>Since 1984</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Share</td>
</tr>
<tr>
<td></td>
<td>of plants</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>14</td>
<td>40.0</td>
</tr>
<tr>
<td>Chemistry</td>
<td>8</td>
<td>22.9</td>
</tr>
<tr>
<td>Synthetic material</td>
<td>5</td>
<td>14.3</td>
</tr>
<tr>
<td>Stone and Earth</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Metal</td>
<td>8</td>
<td>22.9</td>
</tr>
<tr>
<td>Iron + Steel</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Mechanical engineering</td>
<td>7</td>
<td>20.0</td>
</tr>
<tr>
<td>Automobile engineering</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Electro</td>
<td>12</td>
<td>34.3</td>
</tr>
<tr>
<td>EDP</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Electrical engineering</td>
<td>6</td>
<td>17.1</td>
</tr>
<tr>
<td>Precision engineering</td>
<td>4</td>
<td>11.4</td>
</tr>
<tr>
<td>Optic</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Toys</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Food</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Foodstuff</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Toyo Keizai (1989)—Own calculation.

Table 2: Japanese production plants founded until and since 1984 according to category of product.

<table>
<thead>
<tr>
<th>Category of product</th>
<th>until 1984</th>
<th>since 1984</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Share</td>
</tr>
<tr>
<td></td>
<td>of plants</td>
<td></td>
</tr>
<tr>
<td>Consumer product</td>
<td>16</td>
<td>45.7</td>
</tr>
<tr>
<td>Capital product</td>
<td>17</td>
<td>48.6</td>
</tr>
<tr>
<td>Ambivalent product</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Toyo Keizai (1989)—Own calculation.
of computer and copy machines, which could be classified as capital goods or consumer goods, they are simply classified here as ambivalent goods.

Because more trade companies and marketing offices have capital goods as a main commodity, it can be analogically predicted from the thesis of HEITGER AND STEHN that the Federal Republic of Germany will receive more importance as an possible locations for production (Table 4).

According to the over-industrial thesis set up by the group of economist of the World Economic Institute of Kiel, the Federal Republic is one of the largest world markets for capital goods. The Federal Republic is not only a huge exporter of electronic goods, but also an important sales market for the foreign electronic industry (ZVEI, 1989). Although perhaps "unchallenged", Japan is indisputably the most important exporter of electronic goods to Germany. A rise in the consumer tax and its restrictive effect on the sale of Japanese consumer goods is responsible for the corresponding proportion of categories of goods with possibilities of development in the area of the capital goods. The umbrella organization of electronics industries sees this as of great importance for German industry. The response of Japanese companies can already be recognized as the increase of electronic engineering plants and the concentration of sales branches and plants in this sector indicates. An important locational characteristic of Japanese plants belonging to the electro (precision) group was that they were directed to the regional concentration of their German competitors (SCHLUNZE, 1991a, b).

The activities of the Japanese enterprises in Germany could be differentiated corresponding to the theory of multinational enterprises into an export stage and an foreign production stage. The export stage can also be broken down into subphases: 1) the export stage carried out by the great trading companies; 2) the export stage of the producers, which starts (in the case of Germany) with the beginning of the 1970's. The initial phase of the foreign production stage overlaps the export phase, but the expanding phase is clearly in the second half of the 1980's (see also Fig. 2). In other words, according to that foundation boom the

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### Table 3 Wholesale trade, trade and distribution agencies according to group and sectoral affiliation.

<table>
<thead>
<tr>
<th>Group and Sector</th>
<th>Amount</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Raw material</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Chemistry</td>
<td>26</td>
<td>9.5</td>
</tr>
<tr>
<td>Chemistry</td>
<td>20</td>
<td>7.3</td>
</tr>
<tr>
<td>Synthetic material</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Stone and Earth</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Ceramic</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Glass</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Metal</td>
<td>57</td>
<td>20.8</td>
</tr>
<tr>
<td>Iron + Steel</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>Mechanical engineering</td>
<td>32</td>
<td>11.7</td>
</tr>
<tr>
<td>Machine parts</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Automobile</td>
<td>11</td>
<td>4.0</td>
</tr>
<tr>
<td>Electro (Precision)</td>
<td>141</td>
<td>51.5</td>
</tr>
<tr>
<td>EDP</td>
<td>13</td>
<td>4.7</td>
</tr>
<tr>
<td>Electronical engineering</td>
<td>99</td>
<td>36.1</td>
</tr>
<tr>
<td>Precision engineering</td>
<td>8</td>
<td>2.9</td>
</tr>
<tr>
<td>Optics</td>
<td>21</td>
<td>7.7</td>
</tr>
<tr>
<td>Toys</td>
<td>10</td>
<td>3.6</td>
</tr>
<tr>
<td>Jewellery</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Wood</td>
<td>20</td>
<td>7.3</td>
</tr>
<tr>
<td>Wood</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Paper</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Textile</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Food</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Foodstuff</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>20</td>
<td>7.3</td>
</tr>
<tr>
<td>Trade agencies</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Other trade</td>
<td>7</td>
<td>2.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>274</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Toyo Keizai (1989)—Own calculation.

---

### Table 4 Wholetrade, trade and distribution agencies according to category of goods.

<table>
<thead>
<tr>
<th>Category of trading good</th>
<th>Amount</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer goods</td>
<td>101</td>
<td>37.0</td>
</tr>
<tr>
<td>Capital goods</td>
<td>121</td>
<td>44.3</td>
</tr>
<tr>
<td>Ambivalent goods</td>
<td>27</td>
<td>9.9</td>
</tr>
<tr>
<td>All kinds goods</td>
<td>22</td>
<td>8.1</td>
</tr>
<tr>
<td>No trading goods</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>273</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Toyo Keizai (1989)—Own calculation.
production plants in Germany are to be seen as a late phenomenon in the spectrum of Japanese investment. The multinationalization of the Japanese producers has been forced by protectionist measures of the EC countries, while it was also a result of the aggressive marketing strategy of the Japanese investors. Japanese direct investment in Germany might be seen as proof of the future of direct investment in the EC.

The scheme above (Table 5) shows what influences the change of the firm structure might have had on the market and locational strategy. Therefore, these findings have more of the characteristics of estimations rather than that of results. Obviously different types of firms have corresponding market strategies and a different locational behavior. The sectors of trade, service and production are, by themselves, subjected to temporary change. The change of preferences and motives seen in the service sector should be illuminated as follows: the service sector became more and more attractive for investors in the process of internalization. In this case, the relation between the German economy structure and the Japanese foreign trade structure should also be emphasized: Although half of the gross value added of the Federal Republic was achieved by the service sector, only 13% of this sector was relatively weak in exports during the mid-1980's. The cause is to be seen in higher costs of transactions in opposing to the cross border goods traffic. In the heterogeneous service sector, costs are very different and decrease the most in the area of information transfer, finance and insurance services. The foreign trade with services is to be evaluated as a very prosperous market in future. The prospects of expansion are good, because the technical process promises a further lowering of costs. The multinational Japanese great trading companies have had early discovery commercialized and are now about to expand in this field. Measured by the number of newly established companies in the 1980's (see Table 6), the Sogo Shosha have increased their activities in anticipation of the EC market and have concentrated them mainly in the service sector.

With sectorial differentiation goes also a spatial differentiation. Their financial activities primarily had the function of financing the Japanese traders. This was especially true for the Japanese banks located in Düsseldorf (ZIELKE, 1982), but the Japanese banks in Frankfurt could be considered in the context of international finance business, a new activity of the Sogo Shosha. Until the 1980's, the Ministry of Finance laid down narrow limits for the Japanese financial institutions. Thanks to the deregulation politics of the Japanese government, in abroad the finance sector and other services overseas became more free. Corresponding to the worldwide deregulation and liberalization in finance business, they integrated their banks into a strategy to globalize their economic activity (ELI, 1988). However, a strong trade position in the service sector will have consequences on the changes in the economic structure of the country and abroad. In the case of the Federal Republic of Germany, it seems to become apparent that the Sogo Shosha crystallized a functional use of space. Therefore, the trade function would at first take place in Düsseldorf and Frankfurt and would possess the service function, in which financing has the largest role. According to the regional distribution of involvement of the Sogo Shosha in the production sector, the southern Germany would receive the function of production in future.

Because the Sogo Shosha had already been forerunners in the initial phase of trade with the Federal Republic of Germany and thereby shaped the locational structure for the following enterprises, it could be presumed that this functional perception of space will be anticipated by the potential investors. But what we see now from Figure 5 in the case of production plants is something quite different from that kind of assumption. On the one hand, the industrial settlements diffused into peripheral regions, and on the other hand, a regional concentration of Japanese plants is visible. It appears to me, the procuring of preliminary work from Japan and the “in-take” of regional incentives for building a plant have become more important recently for more independently financed plants than access to high-technology or nearness to their advanced
### Table 5  Changing structure of Japanese enterprises and location tendencies.

<table>
<thead>
<tr>
<th>Decade</th>
<th>Firm type</th>
<th>Market strategy</th>
<th>Locational orientation type</th>
<th>Increasingly frequented locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>50s</td>
<td><em>Sogo Shosha</em></td>
<td>sale of various products, using German distributors</td>
<td>combined procuring and sales contact orientation (oversea harbor)</td>
<td>Hamburg</td>
</tr>
<tr>
<td>60s</td>
<td>special trading companies</td>
<td>procuring of capital goods know-how transfer</td>
<td>heavy industry competitor proximity</td>
<td>Düsseldorf</td>
</tr>
<tr>
<td></td>
<td>smaller trading companies</td>
<td>set-up of distribution channels—mainly for consumer products</td>
<td>sales contact orientated (river port)</td>
<td>Düsseldorf</td>
</tr>
<tr>
<td>70s</td>
<td>sales branches of producers service companies</td>
<td>market access, building up an own distribution network</td>
<td>sales contact orientated follower type: pioneer type: orientated to the concentration of Japanese enterprises</td>
<td>area of Düsseldorf area of Frankfurt 1. Düsseldorf 2. Hamburg 3. Frankfurt hinterland of southern Germany</td>
</tr>
<tr>
<td></td>
<td>production plants</td>
<td>services for Japanese trading companies and agencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>production plants</td>
<td>capital goods: technology-transfer through cooperation with German companies</td>
<td>opportunity orientated</td>
<td></td>
</tr>
<tr>
<td>80s</td>
<td>service companies</td>
<td>internationalization strategy of the <em>Sogo Shosha</em></td>
<td>communication &amp; information orientated—high centrality and quick accessibility to international and Japanese customers in Europe</td>
<td>Frankfurt</td>
</tr>
<tr>
<td></td>
<td>production plants</td>
<td>defense of expected and existing trade barriers of the EC (mostly for electronic goods in the high-tech field)</td>
<td>combined procuring and sales orientation, good accessibility (mostly located near the autobahn)</td>
<td>proximity to the innovation centers Düsseldorf, Frankfurt, Hamburg, Stuttgart, München</td>
</tr>
</tbody>
</table>
Figure 5. Spatial distribution of Japanese production plants.
Table 6 Enterprises of the great trading companies (Sogo Shosha).

<table>
<thead>
<tr>
<th></th>
<th>50s</th>
<th>60s</th>
<th>70s</th>
<th>80s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>non Sogo Shosha</strong></td>
<td>17</td>
<td>36</td>
<td>126</td>
<td>181</td>
</tr>
<tr>
<td><strong>Sogo Shosha</strong></td>
<td>11</td>
<td>4</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Sumitomo</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Mitsui</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>C. Itoh</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Marubeni</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Toyo</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Nichimen</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nissho</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Okura</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kanematsu-Goshō</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Chori</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toshoku</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Itoman</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>


competitors. It seems to be that after the production phase of standardized goods in developing countries or so called newly industrialized countries, production units will not be relocated to Japan, but built up as an extensive automatized production unit located in the center of the target sales market. Examples of such plants are production facilities established after 1984 and belonging to the electro sector, and those producing such items as copy machines, electrical elements, system technics and NC-steering systems. The process of direct investment seems to become more complicated after 1984. Overlapping influences create counter tendencies. But this should not obscure the fact that until the 1970's, the main expansion direction for a large part of the Japanese enterprises was laid to the south. As one can pick up from Figure 5 most of the northern districts have two or more Japanese plants while the southern until now had only received one plant per district. This is also to be understood as a result of the diffusion process. The surrounding areas of the early innovation centers are earlier effected than the later center by the wavelike spread. Therefore, the northern districts adopted more plants.

Corresponding to the structural change of German industry, from heavy steel to chemical and electrical engineering the economic power of West Germany thus shifted from the north to the south. Nowadays this is discussed under the catchword "south-north-slope" (FRIEDRICHS et al., 1986), in which the Japanese enterprises followed tendentiously the regional center of their competitors.

IV. CONCLUSION

The diffusion theory led us to infer that the expansion of Japanese enterprises in West Germany would have performed in a hierarchical wavelike diffusion process. The findings go along with the theory. It was discovered that the process depends at first on the information network of the Japanese enterprises, identified by the Japanese Chamber of Commerce and Industry; secondly on the distance from Düsseldorf; and thirdly on the centrality of the chosen locations.

The results of the present study are synthetically summarized by pointing out firstly that the expansion of Japanese companies in Germany took place within three distinctive periods. These periods are characterized by changes in the investment structure. Although many factors contributed to this change, the main influence stemmed from various production cycles in the Japanese and German economies, and thus caused effects on locational patterns.

In the primary stage (1955–1970), the diffusion depended on the supply of information through and in the commercial interest of a few big Japanese trading companies, the so called Sogo Shosha. The Sogo Shosha were the dominant force within the first period of bilateral trade between Germany and Japan. Their shift from Hamburg to Düsseldorf caused a relocation diffusion process on "locational" behavior of Japanese firms during the entire fifty year period.

The location behavior of Japanese firms in Germany depends on the product to be sold in Germany and in other European countries. In the first period, the Japanese trading companies orientated their location to the concentration of German heavy and primary industry, while during the second period, the Japanese com-
petitors in the engineering and electronics industries located their enterprises tendentiously more to the south of West Germany, where most of their German competitors are located. For the bulk of firms the persistence in the Japanese enclave Düsseldorf has been strong, but caused by the alternations of both the German urban-economic system and the Japanese investment structure, the direction of the diffusion process was laid to the south. The innovation centers of the hierarchical diffusion process have been Hamburg, Düsseldorf, Frankfurt, Stuttgart and München. From these centers a wavelike diffusion directed to the hinterlands took place with distinct phases. In other words, the given urban structure and previous settlement of Japanese firms modified the spatial behavior. In the third period (1980–1989), the powerful trading companies again spread out their activities. As they became highly diversified, their locational choices also grew more differentiated. This also caused a functional alignment of the other firms. The expansion of service and production arose rapidly and production facilities were grouped in cluster around the innovation centers, where the service enterprises were located.

This technique has promise as a tool in evaluation of locational behavior. A complete understanding of the spatial behavior of foreign firms within an urban system requires a new body of theory that incorporates theory of multinational enterprises and geographical theories.

Notes

1) The mean information field describes a negative logarithmic relationship between the probability of contact between any cell and the center, and the distance separating them. The more developed a society is, the distance gradient is bent flatter and the possibility of communication over long distance is greater (Abler et al., 1977). According to this, less developed systems have a steep gradient. Among other things within this study, it should be researched in greater detail whether and how the distance gradient changed over time.

2) Because there was no data available to calculate the possibility of information flows between the JIHK and the regions of possible settlement, fictitious values were used.

3) This is in so far as legitimate as Pædø (1975) already pointed out in that there are only small range-size-differences over a long period.

4) Direct investment is a form of foreign investment. Direct investment constitutes a capital export by economic objects of a country with the aim to erect branches or to acquire real estate, plants or foreign firms or a share of them, which grant a decisive influence on firm policy. Because Japanese direct investment of the production sector in the USA was carried out according to takeover strategies, in the Federal Republic of Germany a similar strategy was suspected, but this kind of direct investment is set equal only to Japanese enterprises and will be named in the following "Japanese enterprises" as also investment in other sectors.

5) According to the idea of diffusional studies, a similar role had been played by the branch office of German employment exchange in Ismir for the spatial diffusion of Turkish workers in West Germany.

6) The German administration and cooperating firms actually reported their fear of an investment drain, because nowadays the trade sector depends heavily on Japanese economic activity.

7) This measure is formed by comparing the exports of a branch with its corresponding imports. The difference, which could be called the sectorial net foreign trade position, is set into relation with the net foreign trade position of the national economy.

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旧西ドイツにおける日本企業の空間的拡散

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本稿は旧西ドイツにおける日本企業の空間的拡散を、経済の重心の北から南への移動を背景にして説明する試みである。従来の研究は日本企業のデュッセルドルフへの集中を指摘しているが、この指摘は動的な視点からみると現状に合わない。既に日本企業の分布は拡散段階に入ったと考えられる。

階層的拡散プロセスのイノベーション中心はハンブルク、フランクフルト、シュトゥルトガルトとミュンヘンであり、各中心からその周辺地域に向かう波状の拡散はそれぞれ異なった時期に生じた。商務・サービス業部門では階層的拡散が、生産部門では波状的拡散がみられ、拡散は主に南方に向かった。

上記の拡散プロセスを説明するために、いくつかの仮設を非線形重力型重回帰モデルを用いて検討した結果、三つの要因が拡散メカニズムの決定に関して有意性を示した。第一の要因は日本企業の情報ネットワーク（特に日本商工会議所の会員である企業）、第二はデュッセルドルフからの距離、第三の要因は中心性である。

日本企業の立地行動は、一方では旧西ドイツの都市システムの変化に影響され、他方では日本企業自体の構造変化の影響を受けている。商務・サービス・生産の各部門はそれぞれ特徴的な立地パターンを示す。以上の結果より、拡散の進んだ段階においては外国企業の立地行動が都市システムの変化の簡便な指標となりうることが示唆された。

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