Industrial Networks and Evolution
of the International Quaternary Place System

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1. Introduction

Over the past two decades, the international economy has changed very rapidly, driven by advances in information technology, business reorganizations, and foreign investments. Multinational corporations (MNCs) have grown rapidly to become central organizers in this globalizing world economy. By the end of 1993, the worldwide foreign direct investment (FDI) stock reached an estimated $ 2.1 trillion, exerted by over 37,000 parent firms controlling over 206,000 foreign subsidiaries (UNCTD, 1994). Globalization of the world economy entails international economic interdependence and financial deregulation. Corporations widen their activity base and expand operations globally to function and to prosper in a borderless society (Omae, 1990). These MNCs reorganize in order to cope with their changing economic environment and to respond quickly to the more complex and larger organizations. Corporate headquarters functions, such as command, control, coordination, and strategic decision-making, increase in number and scope, now concentrating in major quaternary transactional space. On the other hand, organizational flexibility of the corporate system grows through the formation of decentralized internal and external newtorks (Hakansson and Johanson, 1993). These changes result in the formation of global nodal points possessing worldwidecommand and control, information, communication, and financial networks.

These international corporate control centers are the focus of the study. Quaternary places in the past have evolved as a system of interlinked command and control centers. Connections, for the most part, were internal and hierarchical, with only moderate contacts externally. Today, although internal contacts are still important, external contacts are the focus. Not only for the largest domestic places, but also for those centers considered secondary or even tertiary in the internal hierarchy, external contacts are vital. Important domestic quaternary places find most of their activities directed outward to the international community.

This study introduces a model for this evolution of the international quaternary place system. Its five-stage evolution emphasizes the importance of the organizational structure of large corporations, industrial networks and the development of information technology. The proposed model is linked to the national quaternary place model and to the simplified world of the past. This model, thus, enables researchers to examine real world situa-

tions within a system approach incorporating the complex, large in size, and rapidly changing global economy. The study briefly reviews the existing national quaternary place model, followed by a presentation of the five-stage international quaternary place model, developing in close relationships with corporate and industrial network growth. A case study, then, to examine the validity of the proposed model, is offered.

2. The National Quaternary Place Model

The existing model of quaternary place evolution (Semple, 1985) represents the first attempt to conceptualize the long-term evolution of national quaternary centers. The model includes a series of six developmental stages, indicating that quaternary activity centers develop from an initial dispersion towards spatial concentration, and later they tend to disperse again. It postulates a gneral process for the emergence of multinational centers at the final stage in a country's development.

The existing national quaternary place studies explain adequately the evolution of a national system (Wheeler, 1985 ; Wheeler and Mitchelson, 1989 ; Lyons, 1994). They demonstrate that major urban centers eventually acquire international functions and become world-class headquarters cities (Semple, 1985, p.293). These centers must compete in an ever more complex international setting for both domestic as well as foreign corporations, which in turn face unprecedented reorganization of their global activities. In fact, almost all corporate control centers housing large corporations evolve into international control centers. In this vein, any quaternary place system should be viewed as an international system with complex global control linkages among multinatinal corporate headquarters and subsidiaries (Nahm, 1995).

3. Corporate Growth and the International Quaternary Place System

Figure 1 depicts the relationships between corporate and network growth and the development of quaternary places. As a business environment expands and changes, individual corporations grow in a sequential way. Their growth entails internal and external restructuring as well as organizational changes. An important aspect of these changes is the expansion of the industrial network, itself shaped by business organizational changes. Together, these effects foster the development of the global quaternary place system.

[Figure 1]

The major objective of firms is to maximize the growth of revenues(Penrose, 1959, Galbraith, 1974). To increase revenues, a firm pursues several possible strategies. These strategies are associated with the corporate growth sequence. Ansoff (1965) and Chandler (1962) proposed four distinct stages : *market penetration, product development, market development and diversification.* In the early stages of corporate growth, a firm increases revenues through in depth penetration of its existing national markets. Later, it develops new or improved versions of its old products in its existing markets. Throughout these early developments, increasing centralization of capital resulted. Vertical integration of corporate functions then contributes to the emergence of large oligopolistic business organizations (Taylor and Thrift, 1982 ; Storper and Walker, 1989). Over time, a firm develops new foreign markets and increases the demand by product diversification. Throughout these phases, the business sequentially sets up foreign sales agencies and subsidiaries, with foreign assembly and financial units. Finally, autonomous subsidiaries take on export functions that

go beyond intra-firm trade (Hakanson, 1979). Growing corporate size and the liberalization of the international financial system have made multinational operations feasible across national borders. These oligopolistic large organizations are based in the global quaternary centers in almost every sector of the economy. Large business organizations grow into network structures in order to control and coordinate effectively the complex process of interlocking (Amin and Dietrich, 1991 ; Conti, 1993). Improvements in telecommunications, computers and other information technologies contribute to the effective control of this network structure (Miles and Snow, 1986 ; Powell, 1990 ; Yeung, 1994).

Such corporate growth process leads to the development of industrial networks and quaternary places. Industrial networks consist of corporations (actors), transformation and transaction (activities), and human and physical assets (resources). Actors drive the network growth process in order to inrease their control over resources, thereby making better use of new combinations among activities and resources (Hakansson, 1989 ; Hakansson and Johanson, 1993). In the early stages of growth, corporations make a series of investment to reinforce the estabilished structure (*structuring*). At the same time, a process of renewal occurs whereby actors try to exploit new resource dimensions or to use known dimensions in different ways(*heterogenization*). Organizational structure becomes vertically integrated and corporate investment space gradually expands beyond national borders. Consequently, corporate control centers such as, domestic headquarters and foreign subsidiary centers concentrate in major *national* and *world regional* centers.

In the later stages, corporations both increase their control over resources and organize their internal control functions

(*hierarchization*). When hierarchization approaches this state, some of the resources and internal functions that were previously important become less significant. Resources and functions are *externalized* within the expanding network. As the volume and directions of the international investment grow, corporate control centers grow into *international* and *global* quaternary centers. The trend toward increased globalization of production and finance as well as internationalization of the state necessarily entails the globalization of administrative, command, and control capabilities (Cohen, 1981 ; Thrift, 1993 ; Nahm and Semple, 1995b). It also requires the use of acvanced producer services (Daniels, 1993 ; Shachar, 1994). With the growing footlooseness of capital and current advances in 'space-shrinking' technologies, the world-economy depends upon a growing number of quaternary centers (Abler, 1991). Such quaternary system has, in fact, evolved into a complex multipolar system embracing an increasing number of new centers of multinational corporate power and of diversified control linkages among quaternary centers(Nahm and Semple, 1995a).

4. The International Quaternary Place System : The Five-Stage Model

As Alonso(1980) argues, human socio-economic activities can be described by a bellshaped curve. In theory, this model suggests that a system of international quaternary places evolves from a complete dispersion of the corporate centers. In the early stages of evolution, economic power centralizes into a few large corporations, while business organizations concentrate in a few international centers. Later, multinational control centers disperse towards mid-sized metropolitan centers along with diversified corporate control linkages. The international quater-

nary place model illustrates such an evolution.

The model demonstrates spatio-temporal aspects of the idealized evolution of an international quaternary place system, with its associated long term changes in the control network. the hypothetical world has an unspecified number of major regions, with large urban centers in each region. Each urban center is home to a number of quaternary places owned by multinational firms who represent various sectors of the economy. Figure 2 illustrates the evolutionary process. This model utilizes six criteria to partition the international quaternary system into five distinct stages. They are : magnitude and directions of international trade and foreign direct investment among major world regions, changes in corporate organizational structure associated with technological developments, complexity and direction of corporate control linkages among quaternary centers, changes in the nature of international information flows, changes in government policy for international business, and development of foreign industrial activities. These criteria provide a basis for characterizing each evolutionary stage. the development of international quaternary centers in turn contributes to the understanding of the concentration and dispersion of the international quaternary place system.

Figure 3 graphs this idealized spatial trend of quaternary places and tabulates the major criteria by stage. As development takes place, the spatial concentration of corporate control centers increases as a small number of the international centers emerges as globally dominant. Then, as small and medium-sized centers begin to compete successfully with the big international and global centers, the spatial concentration of corporate decision-making declines. By the time that small and medium centers grow enough to compete, the big global centers begin to lose

corporate headquarters and subsidiaries. The overall concentration declines and an era of global maturity exists.

[Figure 2] & [Figure 3]

Stage One : The *era of dominant national centers*. This era corresponds to the period of competitive capitalism. No one corporate sector of the economy and no particular city dominate in the world economy, indicating the initial dispersion of multinational-oriented firms in all the national centers of the quaternary system. Head offices in national centers concentrate decision-making power with little regarding opportunities in the rest of the world. As a result, international trade and flows of information are very limited. Corporate linkages loosely connect several national centers within each world region, while linkages among different world regions are few and far between.

Stage Two : The *era of dominant world regional centers*. This era is associated with the emergence of the world regional centers. The world economy grows and international businesses expand both in scope and scale. Transportation and communication connections begin to improve and develop. International flows of trade, capital, and information expand among major world regions. This stage represents the expansion of industry through branch offices and production subsidiaries throughout the world. National regulations, however, sometimes prevent rapid penetration by foreign companies. Corporate control centers tend to concentrate in major metropolitan areas of each world region, directed by centripetal forces. Accordingly, corporate decision-making and information flows travel downward. Decisions are directed from the world regional centers to national centers through vertical channels ; a functional hierarchy results.

Stage Three : The *era of dominant international centers*. This era charac-

terizes itself by the emergence of international centers housing the world's corporate elite. The growing national economy, with associated international flows of economic resources, leads to global integration for the first time. Along with this expansion of corporate spatial influence, national policies and regulations begin to accept foreign companies as the necessary evils for an integrated world. Keeping pace with this development, international oligopolistic corporations centralize their control in just a few large urban areas. The centripetal forces among international corporate centers reinforce the dominance of international centers as nodal points. Key businesses in major sectors disperse their activities across the entire quaternary place system. By this stage, corporate control linkages develop further into a strict hierarchy through downward information flows ; that is, information proceeds from higher level centers to lower level centers. Headquarters play a strong role in setting strategies and policies and establishing standards.

Stage Four : The *era of dominant global centers*. This era marks the growth of global quaternary centers. The world economy begins to mature ; several global centers start to compete for the domination of the global economy in a variety of corporate sectors. The development of information technology and the rapid increase in flows of capital, products, services, and information lead to the dispersion of headquarters outside the urban core to the suburbs, even to small and remote centers. With this globalization trend, national and provincial governments deregulate national business activities and coordinate new international procedures. Gradually, corporations reorganize their structures from functional hierarchy into a flatter form of externalization ; from rigid control, it turns to strategic coordination. Growing centrifugal forces among quaternary centers

allow national and world regional centers to compete effectively with the global centers. Overall, quaternary centers begin to disperse with the expansion of the international industrial network. Linkage patterns among various sizes of centers become diversified. taking on lateral relationships.

Stage Five : The *era of competing global centers*. This final era sees the dispersion of headquarters centers in all regions. Almost all regions in the world and all areas within each region have developed the infrastructure and the capabilities to house the executives of the largest and most complex corporations. Increasing two-way international trade and investments make national boundaries invisible for MNCs. Advanced industrial technologies and information-transmitting networks allow small centers to grow as global centers and to compete with larger centers. Furthermore, intensifying centrifugal forces among quaternary centers accelerate the dispersion of corporate command and control centers world-wide. National boundaries become invisible for business activities. Cities hosting large corporate control centers compete internationally with one another for global dominance. Global businesses no longer operate in one center, instead in multiple centers, located around cores of expertise and competence. Accordingly, communications among headquarters and lower level units need to be outbound control linkages among these spatial units, or quaternary centers and tend towards the complex and diversified. Lateral or reciprocal linkage patterns dominate the quaternary place system instead of hierarchical relationships.

This five stage model associated with the spatial tendencies of corporate control centers provides a theoretical framework for research. The following section examines the validity of the model by analyzing the world's largest multinational corpora-

tions and their control centers.

5. Dispersion of International Quaternary Places

To assess the concentration and dispersion trends, information statistic analysis is employed. Information statistics calculate changes in the state of a system consisting of a number of component parts, even of hierarchical components(Theil, 1967 ; Johnston and Semple, 1983). They depict changes between two system states : total concentration of size or importance for one component part and total dispersion among all component parts. Thus, information statistics simultaneously account for the actual *configuration* of the system and for its *position* in the range between total concentration in a single component and total dispersion among all components. Furthermore, information statistics produce an unbiased estimate of the statistically most likely form of the probability distribution on the basis of limited information(Pooler, 1983). By this very nature, information statistics are appropriate for studying concentration and dispersion in systems of spatial units.

This study extends the previous information statistic model(Semple, 1973 ; Semple and Phipps, 1982) in order to accommodate time series and hierarchical regional nesting in one equation. In doing so, the statistic can analyze the disaggregated changes between region, within subregion, and between sburegion dispersion for all time period. Furthermore, since the model employed in this study shows the system changes over time for a fixed number of observations(quaternary centers) in one calculation, the statistic no longer necessitate standardization.

To determine overall levels of dispersion or concentration, the study utilizes the magnitude of multinational corporate power, measured by revenues for N centers and T time periods. These distinctions calculate for a particular center at a particular time period, the proportion of revenues contained within the center with respect to the grand total of all revenues for all centers in all time periods. Call this proportion y_{it} so that :

$$\sum_{i=1}^{N} \sum_{t=1}^{T} y_{it} = 1.0 \qquad (1)$$

where $0 \leq y_{it} \leq 1 (i=1,\cdots, N \cdot t=1,\cdots,T)$

Using euations(1) to calculate total dispersion, $H(y)$ for all centers over all time periods is :

$$H(y) = \sum_{t=1}^{T} \left[\sum_{i=1}^{N} y_{it} \log_2 \frac{1}{y_{it}} \right] \qquad (2)$$

In this dispersion measure, $H(y)$ takes on a maximum value of $\log_2 NT$, indicating complete dispersion and a minimum value of zero, indicating complete concentration. The dispersion in equation (2) can be decomposed into between and within regional dispersion. Partition multinational control centers into R regions $S_1, S_2,\cdots, S_r$ assigning each center to one region. Denoting N_r for the number of centers in S_r $(r=1,2,\cdots,R)$ such that : $\sum_{r=1}^{R} N_r = N$.

Expand equation(2) to :

$$H(y) = \sum_{t=1}^{T} \sum_{r=1}^{R} Y_{rt} \log_2 \frac{1}{Y_{rt}} \sum_{t=1}^{T} \sum_{r=1}^{R} Y_{rt}$$
$$\left[\sum_{i \in Sr} (\frac{y_{it}}{Y_{rt}}) \log_2 (\frac{Y_{rt}}{y_{it}}) \right] \qquad (3)$$

where $Y_{rt} = \sum_{i \in Sr} y_{it}$, such that : $\sum_{t=1}^{T} \sum_{r=1}^{R} Y_{rt}$
$= 1.0$

Group regions are subdivided into K sub regions, $S_{r1}, S_{r2},\cdots,S_{rk}$, where each nation belongs to one subregion and K subregions are contained in region r. Expand equation(3) to the final dispersion measure :

$$H(y) = \sum_{t=1}^{T} \sum_{r=1}^{R} Y_{rt} \log_2 \frac{1}{Y_{rt}}$$

$$+ \sum_{t=1}^{T} \sum_{r=1}^{R} Y_{rt} \left[\sum_{k=1}^{K} Y_{krt} \log_2 \frac{1}{Y_{krt}} \right]$$

$$+ \sum_{t=1}^{T} \sum_{r=1}^{R} Y_{rt} \left\{ \sum_{k=1}^{K} Y_{krt} \left[\sum_{1=S_{krt}} \frac{y_{lrt}}{Y_{krt}} \right. \right.$$

$$\left. \left. \log_2 \frac{Y_{krt}}{y_{lrt}} \right] \right\} \quad (4)$$

where, $Y_{lrt} = \frac{y_{lrt}}{Y_{rt}}$ such that : Y_{krt}

$$= \sum_{t=1}^{T} \sum_{r=1}^{R} \sum_{i \in Sr} \frac{y_{it}}{Y_{rt}} \text{ and}$$

$$\sum_{t=1}^{T} \sum_{r=1}^{R} \sum_{k=1}^{K} Y_{krt} = 1.0$$

The first expression in the RHS measures the between region dispersion, the second term measures the between subregion dispersion, and the third measures the within subregion dispersion over all time periods.

The case study uses these information statics to examine trends in spatial dispersion of international corporate control centers for 1974–1991. The data used here includes the top 600 manufacturing, top 100 resource, and top 100 service MNCs based on revenues. These businesses are further ranked according to their location of domestic headquarters and foreign subsidiaries. The primary sources of the headquarters location and corporate size data are the *Directory of Multinationals* (Stopford, Dunning and Haberich, 1980 ; Dunning and Cantwell, 1987 ; Stopford, 1992) and Business Week's *the Global 1000*. The data base is supplemented by data from Forbe's *Foreign 500*, Dun and Bradstreet's *Principal International Business* and Moody's *International Manual*. Subsidiary data on location and corporate size varies according to their host countries. In assigning the magnitude of multinational corporate power for each center, the study adjusts corparate revenues using the annual world consumer price index provided by the International Monetary Fund (1994). Through this practice, the values of the later study years, should not exaggerate the real magnitude.

Figure 4 depicts the components of total dispersion for the top 180 multinational headquarters centers. Total dispersion has increased gradually, with minor fluctuations. That is, the index increases from 1.4973 for 1974 to 1.9252 in 1980, and then decreases a little to 1.6518 in 1985. By 1991, it marks 2.1523, the highest of all years. Between region dispersion and within region dispersion indices also disperse during the study period. This between region dispersion index, the major contributor to the total dispersion, verifies that the importance of North America decreases, while the proportions of Europe and Japan & East Asia increase in multinational business. The North American share in the between region dispersion decreases from 44.7 per cent in 1974 to 33.5 per cent in 1991, while Japan & East Asian share increases from 22.8 per cent in 1974 to 31.7 per cent in 1991. Within subregion dispersion measures revenue differentials among headquarters centers comprising a subregion. The figure indicates that within subregion dispersion is a more important source of total dispersion than is between subregion dispersion. In other words, variability in corporate revenues is greater among centers of a subregion than it is among subregions of a region.

[Figure 4]

The information statistic analysis for the top 300 multinational subsidiary centers indicates that subsidiary centers disperse more rapidly than headquarters centers. In figure 5, the total dispersion index for subsidiary centers has increased from 0.9322 in 1974, 1.6329 in 1980, 1.9781 in 1985, to 2.4833 by 1991. Between and within region dispersion indices also have increased during the study period. Contrary to the pattern of headquarters cen-

ters, the importance of North America increases, while the shares of Europe and Japan & East Asian region diminish. The North American share in the between region dispersion increases from 36.9 per cent in 1974 to 41.1 per cent in 1991, while the European share decreases from 60.0 per cent in 1974 to 42.8 per cent in 1991, implying that the growth and dispersion of subsidiary centers increasingly occur in North America. Between subregion dispersion, though small in the proportion of total dispersion, increases steadily throughout the years. However, within subregion dispersion has a disproportionately large share in explaining total dispersion. The within subregion dispersion of 1991(1.2627) is almost seven times greater than the between subregion dispersion(0.1923). Furthermore, within subregion dispersion exceeds between region dispersion in 1991, suggesting that much dispersion of multinational subsidiary centers can be explained by each urban center dispersion within each subregion.

[Figure 5]

These dispersion indices clearly show the spatio-temporal dispersion trends shown by multinational command and control centers. These control centers have shifted from a rather concentrated pattern in 1974 to a dispersed pattern by 1991. Their concentration period corresponds to the era of Pax Americana, characterized by a dominance of American MNCs and a concomitant predominance of New York as a headquarters center. The dispersion trend emerges with the fast growth of Japanese corporations and the steady expansion of European firms. Such dispersion of multinational headquarters and subsidiary centers are closely related. The decline of North American cities as headquarters centers are balanced by the rise of them as subsidiary centers. Similarly, the increasing importance of Japanese and European headquarters centers are matched

by the decrease of subsidiary centers. Overall, such center dispersion trend occurs within the major trading blocs of the world, suggesting that, first, multinational firms concentrate in information-rich, advanced industrialized countries within existing industrial networks. Second, those firms lead the pace of control center dispersion.

6. Diversification International Quaternary Place Links

Table 1 shows the headquarters-subsidiary linkages represented by the revenues of the controlling subsidiaries, with reference to headquarters regions. In 1974, European countries were the major recipients of multinational subsidiaries, which amounted to almost 70 per cent(133.5 billion dollars). Among them, North American corporations controlled 52 per cent of revenues and European firms controlled 46 per cent. The second largest recipient region, North American, held about one third of total subsidiary revenues. Major controlling flows occurred within North America itself, characterized by cross investment between Canadian and American corporations.

[Table 1]

The most notable changes during the 1974-91 period are, first, the decline of the 'within region cross-national investments', such as cross-investments between Canada and the USA and intra-continental investments among European countries. The second characteristic is the increase of capital flows among major trading blocs. Within the European region, multinational control linkages decrease to 41 per cent in 1991, from 46 per cent of 1974. The decline of corporate linkages within the North American region goes down to 18 per cent in 1991 from 51 per cent in 1974. On the other hand, European control over North American subsidiaries increases from 47 per cent to 49 per cent.

Japanese and Oceanic control over North America rises from 1 per cent to 30 per cent, and control over Europe from 0.5 per cent to 7.0 per cent during the study period. Other regions, especially the East Asian newly industralizing economies (NIEs), are still negligible as multinational headquarters or subsidiary centers in both 1974 and 1991.

The implications of these changes are twofold. First, multinational corporate industrial networks evolve over time. Foreign subsidiary centers diffuse from physically and culturally close markets within continental borders, moving towards more distant and diverse countries across the continents. Second, the global industrial networks, represented by multinational headquarters–subsidiary linkages, develop almost exclusively within the Triad. Increasing cross-control of subsidiaries among the countries in the Train reinforces the concentration trend of multinational corporate control linkages.

The main thrust of the stage model is that multinational corporate control linkages develop from rather rigid, one way, and top-down hierarchical patterns to reciprocal, diversified, and lateral patterns. Figure 6 shows major linkages patterns between multinational headquarters and subsidiary centers in 1974. the origins of the linkages(arrows) are headquarters centers and the magnitudes of the control linkages(thickness of the arrows) are amounts of revenues from foreign subsidiary firms based in a destination city. The biggest flows came from New York, as expected, to London and Toronto, as well as from London to Hamburg, and from Frankfurt to New York. In 1974, North America-Europe linkages dominated the major flow patterns, especially, those patterns from New York and Detroit to London and German subsidiary cities. Canadian and German cities were major recipient centers, while Eastern American cities were major flow originating centers. It is

important to note that Japanese cities were not fully integrated in the multinational networks in 1974, only Tokyo has some minor flows. Also, other centers outside the Triad had negligible inward and outward flows. Corporate power concentrated in the major American quaternary places such as, New York, Detroit, and Chicago. These American headquarters centers controlled globally dispersed subsidiary centers.

[Figure 6]

These patterns of actual control linkage in 1974 may fit stage 3 of the model: *Era of the Dominant International Centers*. At this stage, international corporate linkages are not fully developed and corporate centers are not completely globalized. Only the two major regions, North America and Europe, exchange dominant control flows. A small number of centers, namely New York, Detroit, and London dominate the flow patterns. These dominating centers exert their controls over the rather small centers, implying that top-down, one-way, and hierarchical patterns of control linkages characterize the quaternary system of 1974.

Tunning to Figure 7, multinational control linkages become more diversified and complex by 1991. Contrary to the pattern in 1974, a small number of centers no longer dominate the overall linkage patterns. The heaviest control flow comes from Tokyo, directed to New York. The other destinations of the linkages from Tokyo are London, Los Angeles, Toronto, and Nashville. Major control flows originate from New York, Detroit, and Montreal in North America, from London, Frankfurt, Paris, and The Hague in the European Union, and from Osaka in Japan. These large quaternary places also the destinations of major flows, indicating that multinational control linkages develop among the larger metropolitan areas in the Triad. This linkage pattern is different

from the hierarchical pattern of 1974. Crosscontrol and cross-investment among larger centers and the lateral linkage pattern, characterize the system in 1991.

[Figure 7]

Note that, while the number of European cities as corporate headquarters and subsidiary centers stay almost same, the number of American subsidiary centers increases. As well, several Japanese cities enter into the system as headquarters centers. Furthermore, the relative importance of the control flows originated from European Union and Japan increases, while those from North America show the opposite. This suggests that the dispersion and diversification of the linkages are mainly due to growth of Japanses and European quaternary centers. That growth occurs at the expense of American counterparts. Another characteristic of the linkages in 1991 is the emerging importance of the corporate centers located outside the Traid. South American quaternary places such as Caracas, Mexico City, and Sao Paulo, grow in close connection with North America ; East Asian Centers, such as Seoul and Singapore develop as important headquarters and subsidiary centers. The proposed trading blocs ; namely, AFTA(American Free Trade Agreement) and APEC(Asia-Pacific Economic Cooperation) will accelerate the growth of these cities.

These patterns imply that the international quaternary place system in 1991 enters into state 4 of the model:*Era of the Dominant Global Centers*. Corporate centers disperse within their continental borders and control linkages become more diversifed, both within and between the continental borders of the Triad. The balanced growth of corporate centers and the extension of multinational linkages from the Triad to neighboring nations are another characteristic of this stage. Corporate linkages patterns change from hierar-

chical to lateral lines, characterized by cross-control among bigger centers and middle liners.

7. Conclusions

This study investigates the nature of the spatial concentration and dispersion of corporate control within an international system of decision-making centers for the period 1974-1991. Its research contributes to the theoretical development of international quaternary place research and to the understanding of certain changing trends. The most important trends concern the location and control linkages of multinational corporate headquarters and subsidiary centers.

Increasing globalization of the economy, development of information technology, and concomitant business reorganization are essential element for understanding the concentration and dispersion of multinational corporate headquarters and subsidiary centers. The irreversible trend of economic globalization, along with an unprecedented development of information technology contribute to the internationalization of business organizations. This process occurs at a faster rate, and so does the globalization of the national quaternary place system, through corporate networking and control linkages. These globalization forces also contribute to the centralization of economic power, as well as to the dispersion and diversification of international decision-making centers.

The five-stage model emphasizes the importance of the organizational structure of large corporations, with their technological and informational developments. At the beginning, the spatial concentration of multinational control centers increases as a small number of the international centers emerges as globally dominant. Then, small and medium centers grow enough to compete, the big global centers begin to lose corporate headquarters and subsidiar-

ies. International quaternary centers disperse into the lower levels of the hierarchy ; corporate control linkages diversify and become more complex. In consequence, the quaternary system becomes more spatially balanced. Such statements lead to the empirical study of the evolution of international quaternary places. During the period 1974 to 1991, multinational corporate control centers disperse, while linkages among them are diversified and lateralized. Through these processes, the small and medium sized centers lead the trends.

The findings are in general agreement with the major elements of the stage model, suggesting that an international decision-making system evolves from stage three to four during the study period.

This work is an introduction to a comprehensive study of international control center research. The results of this research emphasize the importance of the international quaternary system for understanding contemporary space-economy, pointing out the need for future research agenda. First, more rigorous and comprehensive analysis is needed to define the spatial impacts of business reorganization and technological development. They clearly define the location of economic activity in general, and the location of corporate control centers in particular. In other words, the importance of the location of decision-making power should be scrutinized, for it relates to the location of productions and services. It has relevance in the wider economy as well.

Second, the international quaternary place system is related to the national quaternary place system. Even in this globalization era, however, the primary economic unit for corporations and quaternary centers is the nation-state. Future research must consider both the national and the international aspects of decision-making(see Dicken, 1992 ; 1994 ; Taylor, 1994) One can not be considered without

the other. These two systems are not to be studied in isolation. One caution should be noted that the international system is more than the mechanical sum of the constituting national systems. New theoretical and analytical effort will find a more complete understanding of the international system.

Third, related to the previous agenda, there is a pressing demand for the analysis of the impacts of the policies of provincial governments and nation-states on the international quaternary location. It is true that multinational firms are gaining more bargaining power than local governments and nation-states hold, but the historical, cultural, and social conditions of the local region are important in directing the location of corporate control centers. This embeddedness of a firm is a crucial element for corporate network development(see Fosgren and Johanson, 1992 ; Grabher, 1993).

Fourth, the economic (sub)sectoral differences in quaternary location should be addressed. There exists a contrasting variance in the degree of globalization among economic sectors. The utility sector, for instance, is prone to develop within national or regional boundaries, while the high-tech sector industries tend to be more globalized than other industries. For the concentration and dispersion trend, there will be some lead and lag sectors. This economic sectoral decomposition can add more detailed explanation concerning the locational tendency of quaternary activity in the globalization era.

Finally, as the future trading blocs may emerge, especially in the East Asian region, more up-to-date and detailed studies are necessary to understand the nature of the concentrations and dispersions of corporate control centers. The consolidation of the major trading blocs and the newly emerging blocs add complexity to the international quaternary place system and to its associated interlocking global net-

works.

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ABSTRACT

This study investigates the nature of spatial concentration and dispersion of corporate control within an international system of decision-making centers. It introduces a simplified model of the global evolution of quaternary places. Linked to the national quaternary place model, the proposed model is useful for examinations involving real world situations associated with international corporations. This five stage model emphasizes the importance of the organizational structure of large corporations, industrial networks and the development of information technology. It suggests the dispersion of international quaternary places along with the diversification of corporate control linkages among quaternary centers. A case study for 1974-1991 uses information statistics to identify the current stage of the international quaternary system. The result is in general agreement with major elements of the stage model. This theoretical concept and empirical research contribute to the expansion of quaternary place theory to the global scale in particular, and to the development of location analysis in general.
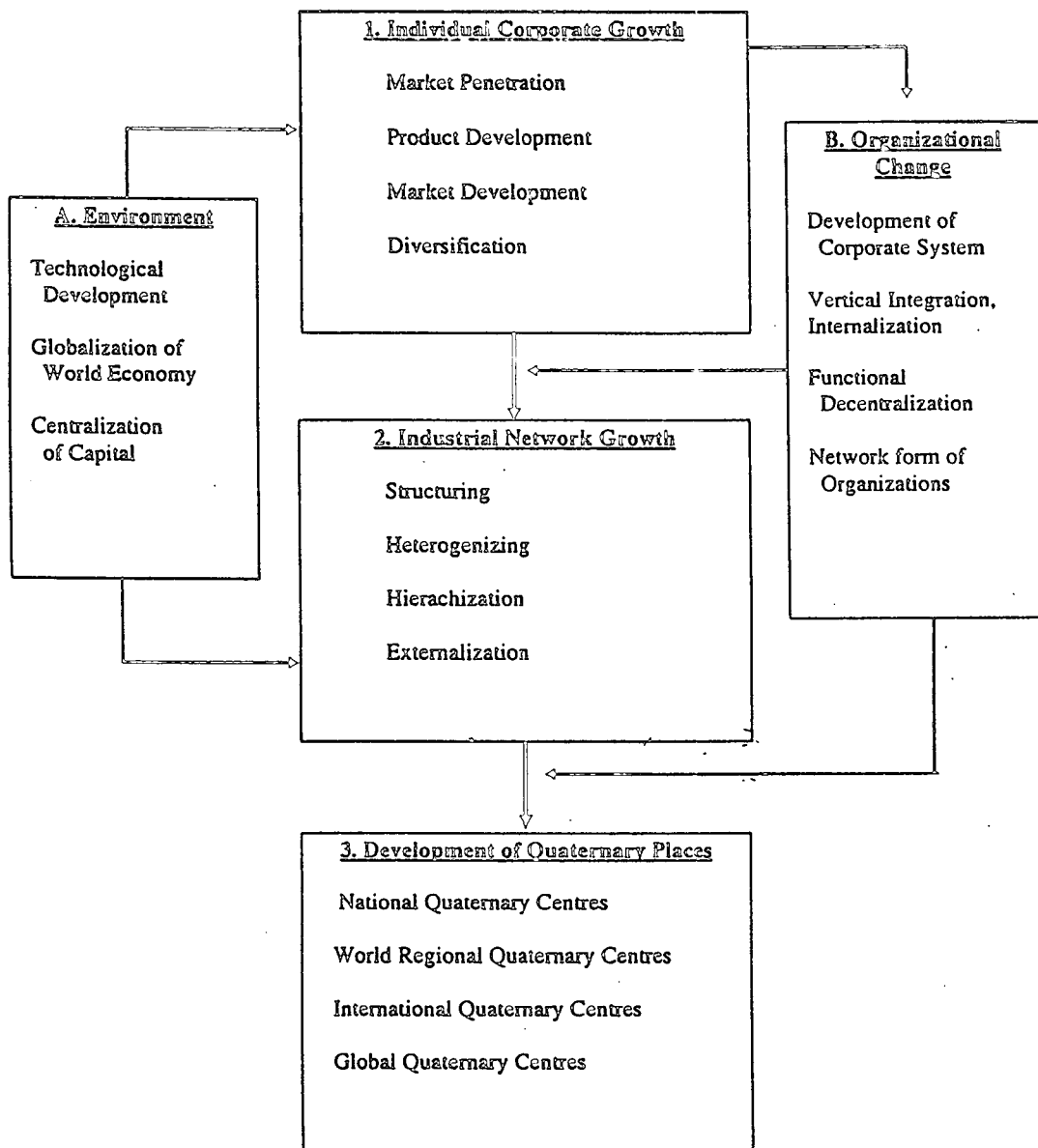
1. Individual Corporate Growth

Market Penetration

Product Development

Market Development

Diversification

A. Environment

Technological
Development

Globalization of
World Economy

Centralization
of Capital

**B. Organizational
Change**

Development of
Corporate System

Vertical Integration,
Internalization

Functional
Decentralization

Network form of
Organizations

2. Industrial Network Growth

Structuring

Heterogenizing

Hierachization

Externalization

3. Development of Quaternary Places

National Quaternary Centres

World Regional Quaternary Centres

International Quaternary Centres

Global Quaternary Centres

Figure 1. Corporate growth and the development of international quaternary places

Stage 3
Dominant International Centres

Stage 2
Dominant World Regional Centres

Stage 1
Dominant National Centres

Stage 5
Competing Global Centres

Stage 4
Dominant Global Centres

Legend

○ Global Quaternary Centres
○ International Quaternary Centres
○ World Regional Quaternary Centres
○ National Quaternary Centres

⟷ Flows of Capital, Products, Services, and Information
⟶ Concentration and Dispersion of Quaternary Centres

figure 2. Spatial evolution of a hypothetical international quaternary place system
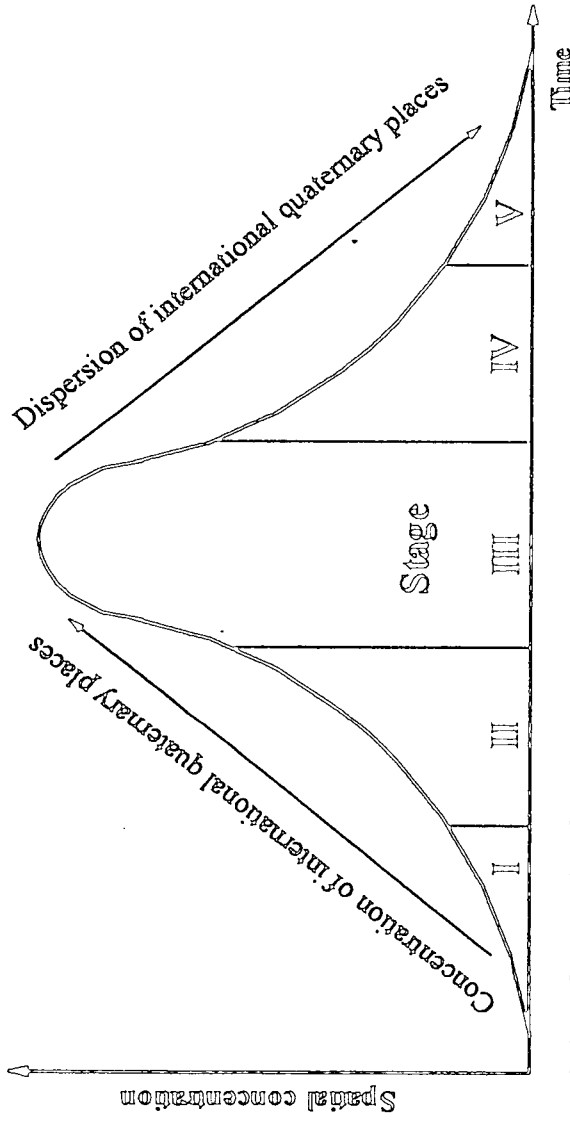
Characteristics of the Major Criteria by Stage

	I	II	III	IV	V
International Trade & FDIs	Limited Trade	Increased Trade, Limited FDIs	Increased Trade Increased FDIs	Growth of FDIs > Growth of Trade	Borderless World
Organizational Structure	Corporate System	Vertical Integration	Oligopolistic Organization	Functional Decentralization	Network Form
Corporate Linkages	Loosely Connected Links	Downward Control Linkages	Hierarchy of Downward Links	Diversification, Lateral Linkages	Complex Reciprocal Linkages
Internat'l Information Flows	Accidental Flows	Incidental flows	Planned Flows	Two-way Flows	Multiple Flow Network Dev't
Government Policy	Expansionism	Protectionism	Recognition of Foreign Firms	Liberalization, Deregulation	No Restrictions on Foreign Firms
Foreign Industrial Activities	Limited Export, Little Foreign Prod.	Increases Foreign Production	Foreign Prod. + Import from subs.	Foreign Prod. > Domestic Prod.	Indifference of HQ and Subs.

Figure 3. Idealized temporal evolution of an international quaternary place system with associated characteristics
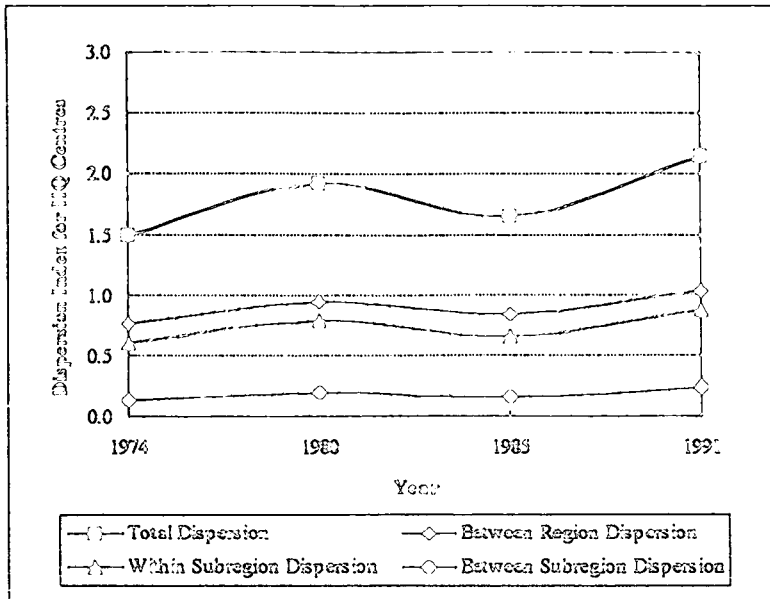
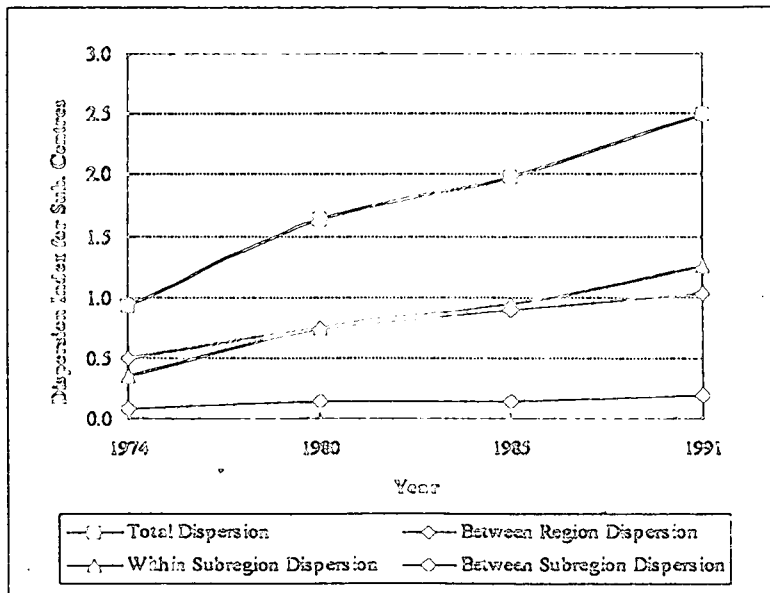Figure 4. Dispersion index for multinational headquarters centres

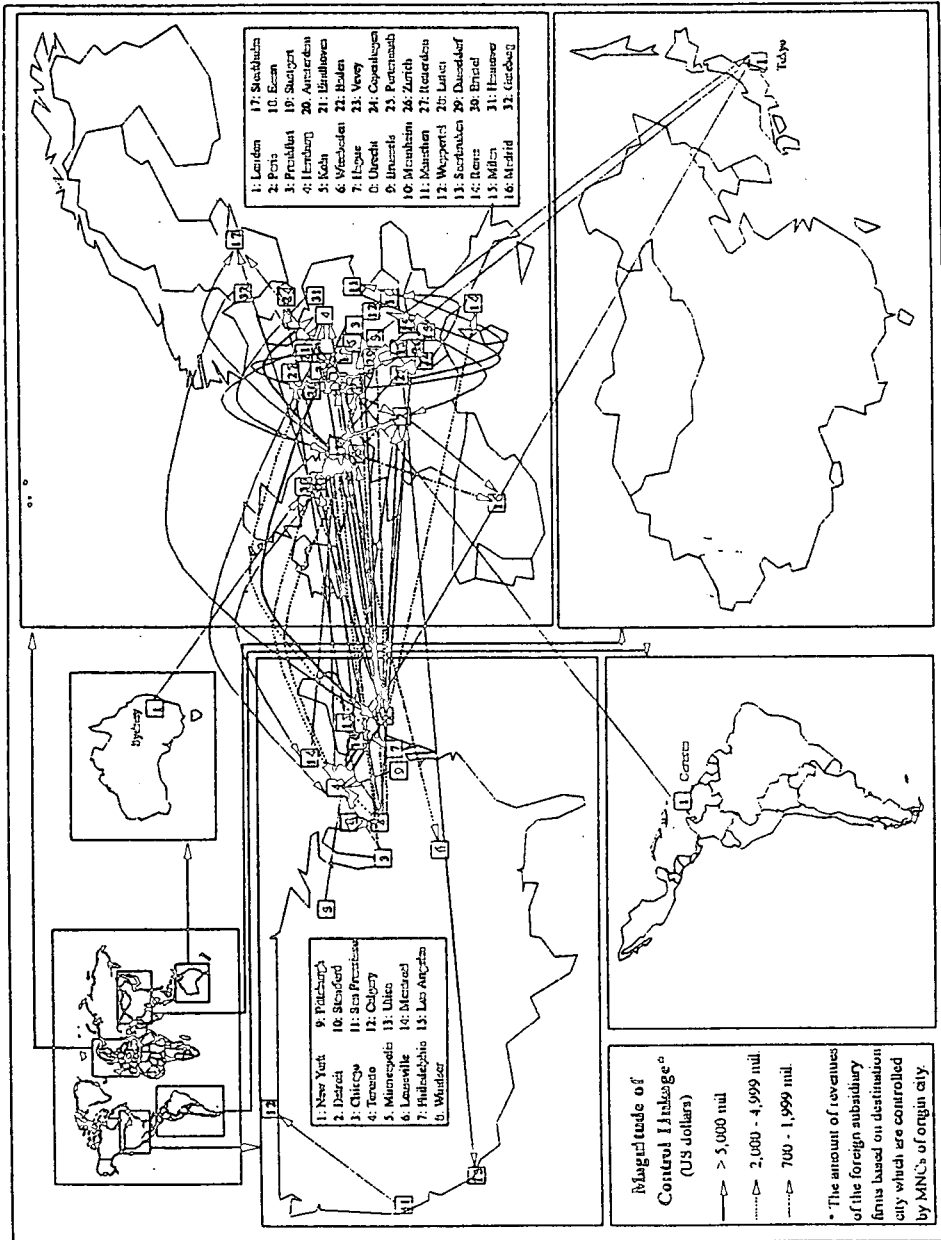Figure 5. Dispersion index for multinational subsidiary centres

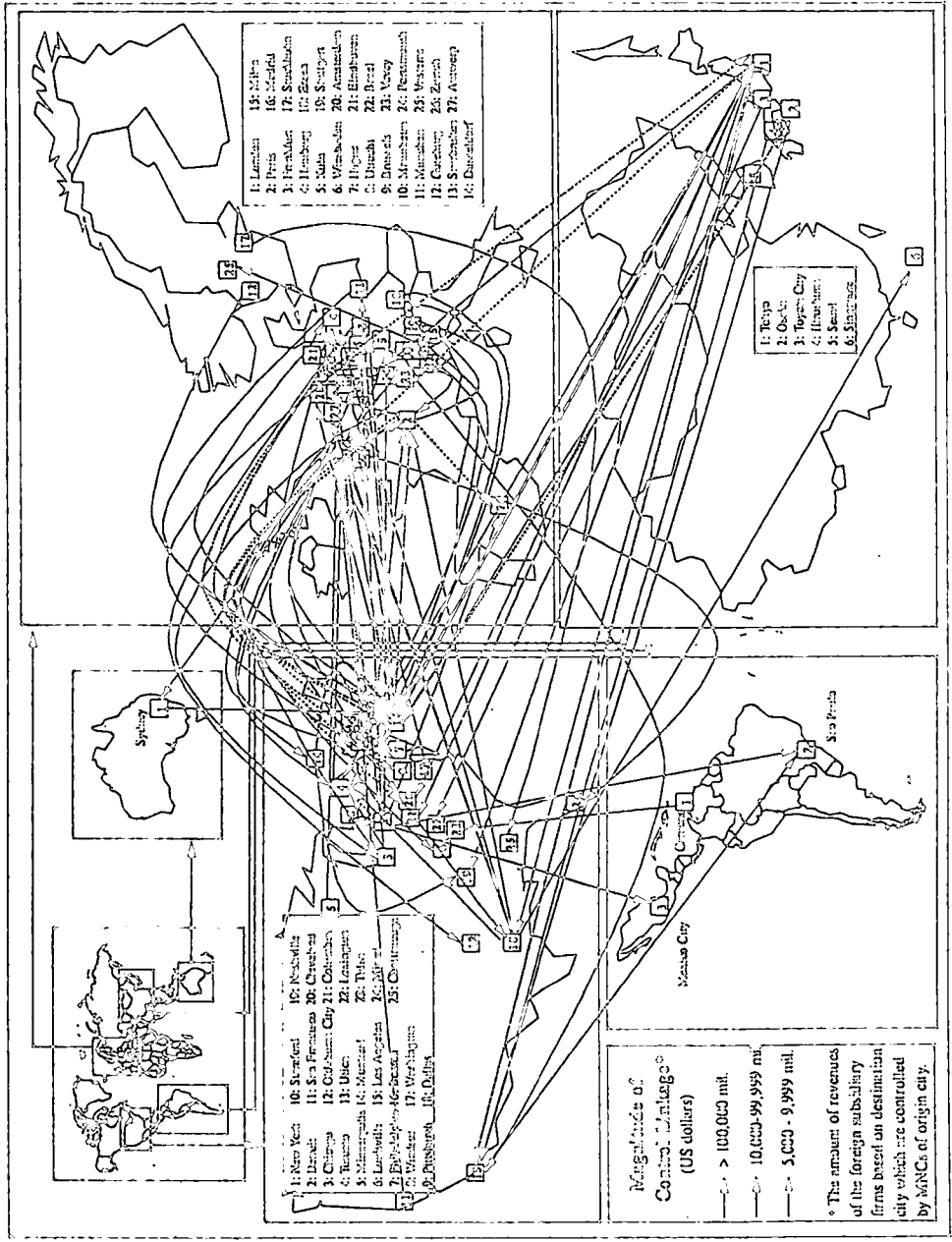Figure 6. Multinational headquarters–subsidiary linkages, 1974

Figure 7. Multinational headquarters–subsidiary linages, 1991