

**Penetration Without Dependence:
A Network Analysis of
Japanese Economic Activity in the U.S.**

Ellen R. Auster

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Professor Ellen R. Auster
The Amos Tuck School of Business Administration
Dartmouth College

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ABSTRACT

Economic activity between the U.S. and Japan has skyrocketed in the last decade, yet there is little cross-industry research exploring entry patterns of multiple forms of investment. This study explores the form and occurrence of new Japanese investment across the U.S. economy in 1984. In the first part of the paper, a conceptual scheme for classifying investments is developed and then compared to the results generated from an empirical classification using structural equivalence analysis. The second part of the paper predicts and maps where the three key forms, direct investment (DI), high resource investment linkages (HRIL's), and low resources investment linkages (LRIL's) predominate. The results show that LRIL's are found primarily in less predictable environments with rapidly changing technologies. HRIL's are found in stable environments with difficult barriers to entry. DI's are found in more accessible, profitable environments, often providing suppliers for Japanese companies already established in the U.S. Implications for theory and policy are highlighted.

INTRODUCTION

Japanese involvement in the U.S. is a topic of great interest to Americans and much of the world. Over the last decade, researchers, managers and the business press have noted the growing economic activity by Japanese companies in the U.S. Technological hook-ups and joint ventures between Japanese and U.S. companies, as well as direct investment by the Japanese in the U.S. have become common features of the economic landscape (Business Week, 1989; 1988; Reich and Mankin, 1986; Hamel, Doz, and Prahalad, 1989).

Although most analysts agree that this upward trend will continue, there are differing predictions about its consequences. Analysts focusing on the organizational level of analysis tend to view these trends optimistically. Interorganizational linkages are a sensible and necessary strategy for penetrating new markets and lowering the costs of developing sophisticated new products in an era when international competition is intensifying and technological life cycles are shortening (Perlmutter and Heenan, 1986; Hamel, Doz and Prahalad, 1989). Japanese direct investment forces U.S. companies to improve quality, cut costs, and evaluate their management practices (Christopher, 1986).

In contrast, analysts focusing on higher levels of analysis are more pessimistic. They argue that what appears to be beneficial to individual companies is extremely dangerous aggregately. The net effects of collaboration and continued direct investment will be an economy of "hollow corporations" stripped of their value (Jonas, 1986; Reich and Mankin, 1986) as expressed in this quote: "Over the long term, U.S. companies that enter joint ventures with Japan cannot maintain high profitability by providing services, such as assembly and distribution which add very little value to the product being sold. The resulting interplay, while superficially promising, could really be just an extended dance of death" (Reich and Mankin, 1986:85). In its most extreme form, this would result in a U.S. that "supplies Japan with foodstuffs and raw materials and receives Japanese manufactures in return -- a sort of 'colonial' or 'underdevelopment' trading status it has not known for a century and a half" (Kennedy, 1987:460). In addition, there is fear that the industrial health of industries that should carry the U.S. into the next century is being jeopardized

as U.S. companies give away technology to the Japanese in exchange for short-term profits (The New York Times, 1987; Business Week, 1989).

Understanding this phenomenon and unravelling this debate is clearly a complex challenge. Research grounded in strategy and transaction cost perspectives has begun to tackle the competitive costs and benefits at the firm level of analysis (Contractor and Lorange, 1988). Case studies and business press coverage of some of the highly visible joint ventures such as NUMMI are illuminating the dynamics of specific relationships (Weiss, 1987; The New York Times, 1988). Industry specific studies are enhancing our knowledge about the activity in certain sectors of the economy (Mowery, 1988). This study widens the scope of analysis by exploring the nature and patterns of the entry of multiple forms of Japanese investment across many different sectors of the U.S. economy. Cast theoretically, this study classifies and analyzes multiple organizational forms and their environments.

The first part of the analysis focuses on classifying these different investments by Japanese companies into meaningful forms. A conceptual scheme of classification is developed and then compared to the results emerging from an empirically derived approach called structural equivalence. The three key forms that emerge are: direct investment, high resource investment linkages, and low resource investment linkages.

Based on an analysis of the levels of resource investment required for each of the three forms, propositions about the environments in which they are likely to occur are developed and analyzed using a market topological map of the U.S. economy. Implications of the study for organizational theory, international management research, and policy are highlighted.

CLASSIFYING RESOURCE INVESTMENTS

Resource investments are defined here as entities or relations created to transfer, exchange, develop or produce technology, raw materials, products or information. This term encompasses both interorganizational forms of resource flows such as OEM supply relationships, technological

exchanges, technological transfers, licensing agreements, joint ventures, etc, and non-interorganizational forms such as direct investment. All of these investments have contractual boundaries, but may or may not have physical space boundaries.¹

Once resource investment is defined, the next more difficult challenge is to identify and classify distinct forms. In this study, classification was approached both conceptually and empirically.

The conceptual classification scheme in this study was based on analysis of the input side of resource dependence -- what each party invests and for how long. For example, resource investments such as licensing arrangements, technological transfers and joint R&D that have shorter time horizons and require relatively small amounts of capital, resources and physical space would be classified as lower resource investment linkages. Joint ventures, defined as a separate organization created by two or more companies to manufacture a product, in contrast, would be classified as higher resource investment linkages (HRIL's) because they typically require a longer-term commitment, greater financial investment, a space to house the venture, equipment and technology to produce the output and substantial management time to oversee the venture. At the highest end of the scale, would be direct investments (DI) which, like joint ventures, require substantial resources on each of these dimensions, but the level of investment is greater because there is only one owner. The resource investment is not shared.

Empirical approaches to classification have been discussed, although rarely applied, because of difficulties in collecting, quantifying and differentiating the necessary data. Ecologists, for example, have devoted considerable attention to the generic question of classifying forms with the hope of developing empirical approaches to classification. Hannan and Freeman (1977:182) and (1984:156) propose that differences in "stated goals, forms of authority, core technology and marketing strategy" serve as the basis for classification, McKelvey (1982:192) uses a biological

¹ Moreover, unlike other terms such as strategic alliance, collaborative agreement, or industrial cooperation that are often used, resource investment is more neutral. It does not imply that the partners are working together towards mutually shared goals. It allows for conflict, exploitation and changing interests over time (Auster, 1987).

analogy isolating dominant and distinctive competencies -- the technical, managerial and operations knowledge and skills -- required. Unfortunately, specific information on these dimensions suggested by both Hannan and Freeman and McKelvey have been difficult to obtain (Hannan and Freeman, 1986; 1989:45-63). As a result, broad-brushed types of organizational forms (classified conceptually) such as specialists or generalists are used in practice (Freeman and Hannan, 1983).

A network method called structural equivalence offers an alternative empirical approach to classification. Structural equivalence can be used to empirically classify forms by analyzing the extent that actors in a network behave in similar ways. Using network analysis to classify forms makes sense because as DiMaggio (1986:362) notes, "the population ecology definition of form as 'a common fate with respect to environmental variation' is based firmly in the logic of structural equivalence: organizations (or in this case, forms) that share a common fate are those that depend on the same external actors." Framed in the context of this study, this method classifies different investments according to the extent that they have similar patterns of occurrence across the industrial sectors of the U.S. economy. Those investments with similar patterns would be classified as analogous forms.

Data

The data are derived from case information compiled by the Japanese External Trade Organization (JETRO), an organization charged by the Ministry of Trade and Industry with both tracking and documenting economic activity between the U.S. and Japan. JETRO draws on numerous sources, but relies primarily on announcements that appear in six newspapers including Nihon Keizai Shimbun, Nikkei Sangyo Shimbun, Nikkan Kogyo Shimbun, Nihon Kogyo Shimbun, Jiji Fax News and Kyoda Sogo Sekai Kezai Tsushin. The data employed here, called "cooperations" by JETRO, are interorganizational linkages and direct investments formed in 1984. For each case, JETRO provides a short description of the nature of the investment, the companies involved, and the date it was established. The data and their frequencies are shown in Table 1.

The categories listed are based on the labels in the original case information and, for clarity, hereafter called "JETcats," short for JETRO categories.

 Insert Table 1 about here

The inclusion of direct investment, defined as 100% ownership on foreign soil (Arpan, Flowers and Ricks, 1981), is an important feature of this study. Although theorists often argue that the decision to form an interorganizational linkage, such as a joint venture, is evaluated in light of its costs and benefits compared to direct investment (Mowery, 1988; Contractor and Lorange, 1988:21-25), few studies empirically analyze both interorganizational linkages and direct investment. Moreover, qualitative interviews conducted by the author with top managers in the U.S. and Japan further indicated that direct investment is part of a continuum considered when contemplating overseas investments (Personal interviews, March, 1989).

For the network analysis, it was necessary to code the industrial sector in which the resource investment was established. Each case was coded into the Department of Commerce Survey of Current Business Input/Output 77 Sector Classification of non-government production activities using the JETRO case information and Standard and Poor's Compustat services for SIC classification combined with the Survey of Current Business: Appendix B (which converts SIC codes to input/output sectors).

Method: Structural Equivalence

Structural equivalence is strictly defined as "elements in a network that have identical relations with every other element in the network" (Burt, 1988:359). Because the relationships between elements are seldom identical, it is typically calculated as a continuous variable based on Euclidean distance.

Classification of forms of Japanese investment in the U.S. based on structural equivalence analyzes the extent to which different JETcats in a network connect the same industrial sectors.

The network analyzed is a matrix where columns are the JETcats and rows are the 77 sectors of the economy. JETcats that have similar patterns down their columns would be clustered together. For example, if one JETcat, such as joint research, occurs in the same sectors with similar frequency as another JETcat, such as technological exchanges, those two JETcats would be classified as a form and distinguished from JETcats with different patterns across the sectors.

More specifically, structural equivalence is derived from a hierarchical cluster analysis of the Euclidean distance between JETcats where Euclidean distance is based on the sum of the differences in relational patterns between two JETcats i and j and sectors k as shown in the equation below, where d is distance, X_{ik} is the value of the relation between i and k , and N is the number of observations (Burt, 1989; Faust, 1988).

$$d_{ij} = \left[\sum_{\substack{k=1 \\ k \neq i, k \neq j}}^N (X_{ik} - X_{jk})^2 + (X_{ki} - X_{kj})^2 \right]^{1/2}$$

The analysis for this study was performed using Structure (network analysis software). See Burt (1988; 1989) and Burt and Minor (1983).

Results

Five different forms emerge from the structural equivalence analysis of the U.S.-Japan data. Two forms are based on only one JETcat and three other forms are comprised of clusters of JETcats. The JETcat in Form 1 is direct investments. The JETcat in Form 2 is joint ventures. Form 3 has five JETcats -- technological cooperation, technological transfer, joint development, OEM supply and joint investment. Form 4 includes patent transfer, technological affiliation, joint manufacturing and management exchange. Form 5 is comprised of technological exchange, licensing, joint R&D, technological information transfer and other.

The reliability and extent of structural equivalence of each form are shown in Table 2. Reliability ranges from 0 to 1 and is the correlation between the distance to a JETcat and the mean

distance to the other JETcats which are included in the form. Reliabilities indicate which JETcats are most equivalent to the other JETcats in the form. The extent of structural equivalence is a ratio of variance accounted for by a single principle component that is typically presented as a percentage. Since direct investment and joint ventures are the sole JETcats in their clusters, they have reliabilities of 1, and 100% of the variance is accounted for. Form 3 has a structural equivalence of 78%. Three of the JETcats in Form 3, technological cooperation, technological transfers and joint development, are tightly bound with respective reliabilities of .984, .967 and .957. OEM supply linkages and joint investment, however, connect slightly different sectors because their reliabilities are .779 and .449, respectively. Form 4 and Form 5 have very high reliabilities and structural equivalences but they only include 5 cases and 33 cases, respectively.

 Insert Table 2 about here

Discussion

The results of the empirical classification provide some supporting evidence for the resource investment conceptual typology. Three forms that emerged -- Forms 1, 2; and 3 -- require distinctly different levels of resource investment. Direct investment, with extremely high resource investment and sole ownership, stands apart from the interorganizational forms. Joint ventures with high resource investment but shared ownership is also distinct. Form 3 is comprised of low resource investment JETcats -- technological cooperations, technological transfers, joint development, OEM supply relationships and joint investment ; all require a less significant resource commitment (time, physical space, capital outlay, technology, managerial expertise, etc.).

Further comparisons of the patterns of the three forms down the columns of the matrix reveals that Form 1 is more similar to Form 2 in the sectors it connects than to Form 3. This is consistent with the level of resource investment, since in both direct investment (Form 1) and joint ventures (Form 2) demands and commitment are high.

Within Form 3, the three technological JETcats which require similar types and levels of resource investment adhere more closely, while differing from the other two JETcats in that form OEM supply and joint investment that are more distant. However, these last two JETcats still were classified in Form 3, reinforcing that the degree of resource investment may be a critical factor.

Forms 4 and 5 both include an amalgamation of low resource investment JETcats. Further analysis and graphing of the results suggests that the small numbers of each JETcat may partly explain these clusters. The lack of a pattern due to small n's may be the similarity causing these JETcats to adhere. The exception to this is a cluster of 8 in the Business Services sector in Form 5. However, given the predominance of the sample in the other categories, subsequent analyses will focus on Forms 1, 2, and 3.

Thus, the conceptual classification fits the empirical results of the SE analysis fairly well and offers a possible explanation for the forms that emerge. The results indicate that the majority of the cases fall into three forms and that the degree of resource investment provides a framework for conceptualizing their differences. The next part of the study sought to predict and analyze the occurrence of these three forms of Japanese resource investment across the U.S. economy.

PREDICTING AND ANALYZING THE OCCURRENCE OF THE THREE FORMS ACROSS THE U.S. ECONOMY

At the heart of predicting and analyzing the patterns of direct investment, joint ventures and the low resource investment linkages across the U.S. economy is the theoretical question of the relationship of forms to environments.

In particular, this study focuses on the relationship between environmental predictability and the three forms. Uncertainty or unpredictability is a critical environmental dimension in macro organization theory that has been connected to the formation of interorganizational linkages and other types of loose coupling. Both ecological and resource dependence approaches propose that the creation of these forms may help organizations cope with uncertainty in their environments.

According to resource dependence perspectives, "when situations of exchange and competition are uncertain and problematic, organizations attempt to establish linkages with elements in their environment and use these linkages to access resources, stabilize outcomes, and to avert environmental control" (Pfeffer and Salancik, 1978:144). Similarly, ecologists argue that the problem of resource scarcity is exacerbated by conditions of uncertainty produced by complexity and rapid change in the environment. Loose coupling provides a means to acquire information and critical resources to manage that uncertainty (Aldrich, 1976:421).

For the purposes of this study, the concept of environmental uncertainty was defined more narrowly, as "not capable of being predicted" (The American Heritage Dictionary) or unpredictable. Unpredictability could stem from a variety of sources, including technology, organizational turnover, complexity, or competition and could be affected by the speed of changes in the environment or the magnitude of changes. Regardless of the source of unpredictability, however, following the discussion above, it is assumed that interorganizational forms and other forms of loose coupling are likely in environments that are less predictable.

However, it is important to consider the variation in forms when analyzing the relationship between form and environmental unpredictability. Low resource investment linkages have relatively low costs and risks for both partners. They typically are set up in one of the parent companies, use employees already on staff, have short time spans, require limited capital and can be initiated and terminated fairly easily. Consequently, they would be well-suited to more turbulent environments. They allow flexibility to cope with changes in the environment but offer a source of information, expertise and technology -- three components that are competitively advantageous in unpredictable environments. Therefore:

Proposition 1: Low resource investment forms are expected in less predictable environments.

Two other forms, both demanding higher resource investment, emerged from the classification analysis. One form, comprised of joint ventures, was an interorganizational form.

The other was not interorganizational. Both of these high resource investment forms require a significant financial investment, construction or acquisition of a physical space to locate in and equipment, technological and managerial time. These forms are difficult to create and terminate. The switching costs and barriers to exit are high (Vernon and Wells, 1991). More predictable environments would be most attractive to insure the cost and risks would offer the necessary returns. Thus:

Proposition 2: High resource investment forms would be expected in more predictable environments.

Both joint ventures and direct investments are likely in more predictable environments because of their similarities in their high resource investment needs. Yet, because of significant differences in the characteristics of these two forms, the types of predictable environments they are expected in are expected to differ. In one form, joint ventures, there is a partner, and thus the high resource investment costs and risks are shared. There are additional up front demands of trust and commitment from the two partners and downstream costs of managerial time and expertise to oversee the relationship between the partners. This form would be expected in "problematic" environments (Pfeffer and Salancik, 1978:144) that are difficult for foreign partners to gain access to. More specifically, as it relates to the context of U.S. and Japan, joint ventures would be advantageous in environments with high knowledge-based or market-based barriers to entry that a U.S. partner could help overcome. Under these conditions, the opportunity to penetrate an unfamiliar or inaccessible market might outweigh the costs and time spent on governance and coordination between the partners in this form.

Proposition 2a: Joint ventures are likely in predictable environments with difficult barriers to entry for the foreign partner.

Direct investment demands even greater levels of resource investment because unlike interorganizational forms of resource investment, the costs are not shared with a partner. Direct

investment is ideal when a company has the necessary resources, skills and technology in-house, knows the foreign market or can hire people who do and is confident of their ability to understand and manage foreign suppliers, distributors, personnel and customs (Root, 1982). Given these characteristics, direct investment is expected in more stable sectors of the economy where the future of the products and markets looks viable and profitable. Stated more generically:

Proposition 2b: Direct investment is likely in predictable environments that would be accessible and profitable for a foreign partner.

The Environment: A Market Topology of the U.S. Economy

Understanding the relationship between these forms and 77 sectors of the U.S. economy is a complex problem. A market topological map of the economy (Burt and Carlton, 1989) provides a theoretically appealing and mentally comprehensible method for accomplishing this task. The theoretical attractiveness of the map rests on its portrayal of the economy as patterns of transactions between different sectors. Environments, rather than being something distinct, reified and sitting "out there," instead are the medium through which transactions are carried out. (For further discussion along this vein, see Aldrich, 1979; Pfeffer, 1987.)

More specifically, the map is generated by analyzing the dollars of goods transacted by both suppliers and consumers across the sectors delineated in the U.S. Department of Commerce input-output tables (Burt and Carlton, 1989). The result of the analyses is a map where different industrial sectors are located in different multidimensional spaces which represent different types of industrial characteristics, as shown in Figure 1. (See Burt, 1988, and Burt and Carlton, 1989, for a more detailed description of the methodology.)

 Insert Figure 1 about here

A brief tour through the map highlighting a few of the dimensions that Burt and Carlton (1989) analyze reveals that newer sectors with more rapidly changing technologies tend towards

the bottom, whereas older, maturing sectors are located towards the top. Diversified markets tend to reside on the periphery, with specialized markets towards the center. Other notable patterns analyzed by Burt and Carlton (1989) include the clustering of lower growth, lower market performance and low technology industries in the upper left, while higher growth, high value added and high market performance sectors stretch across the lower middle region to the lower right. Moving around the map clockwise, plant and animal markets are in the upper right, human services in the lower right, electrical products in the lower left and mechanical products in the upper left (Burt and Carlton, 1989).

Results

Figures 2, 3, and 4 display the patterns of the three forms -- LRIL's, joint ventures and direct investment, respectively, between the U.S. and Japan. The data generated form a matrix where the 77 sectors of the economy are rows and the three forms of resource investment are columns. Using Figure 1 as a platform, each map represents the relationship between one form and the 77 sectors of the U.S. economy. Dots indicate that the form is found in that sector. The size of the circle represents the proportion of activity of the form in that sector. The location of sectors in Figures 2, 3, and 4 are based on Burt and Carlton's (1989) market topological map in Figure 1. For clarity, compass terms north, south, east and west are used to discuss locations on the map, although sector locations are not connected to geographic locations in the U.S.

 Insert Figures 2, 3, and 4 about here

A comparison of Figures 2, 3, and 4, reveals that the three forms display distinctly different patterns. Figure 2 (the LRIL's) are active in 40 different sectors and activity sweeps from the northwest to the southeast with much of the activity in the center of that belt. Joint ventures (the HRIL's), in contrast, are found in only 25 sectors and are mostly concentrated in the southeast (see

Figure 3). Direct investment is more dispersed, found in 32 sectors, but sectors with heavy activity are in the west (Figure 4).

Proposition 1, predicting that low resource investments will be found in less predictable sectors, is partly supported. LRIL's are found mostly in the lower half of the map in sectors with newer technologies, although there is some activity in other sectors as well. Sectors with significant activity in Figure 2, such as Office and Computing, Scientific Instruments and Communication, have fairly unpredictable environments stemming largely from technological change, but also from competitive pressures and shifting consumer markets. As Burt and Carlton (1989:746) note, "change and uncertainty are the rule." In sectors such as Wholesale and Retail, the LRIL's are in rapidly changing technological sub-sectors.

Looking more specifically at the case data of the JETcats within this form, technological linkages predominate in markets with rapidly changing technologies, such as software, computer support, silicon wafers, new materials (plastics and resins) and biotechnology. OEM supply arrangements, also part of this cluster, are transacting products such as CD players, video systems and supplies, robots and electronic ranges, often for wholesale and retail markets (the large circle center). Joint investments focus on biotechnology, robotics and venture capital firms.

Additional analysis of the joint investment cases provides insights as to why this form is part of this cluster. To begin with, joint investment is a low resource investment form that is suited to these unstable environments. However, from the case information it appears that joint investment may also be used by Japanese firms to gain control of, and access to, smaller firms with potentially lucrative or innovative technologies and products but limited capital resources.

Examining in more detail the sectors where LRIL's were not predicted, such as Iron and Steel, Motor Vehicles or Machinery, reveals that process improvements appear to be the primary reason for the presence of LRIL's. ~~Whether it's a technological transfer to improve a braking~~ device, technological cooperation on car stereos, a cold rolling mill for sheet steel or cold isostatic presses, the case data suggests that these LRIL's are being used to revitalize, expedite and update

production in sectors not facing such rapidly changing technologies, shifts in dominant designs and ongoing turbulence.

Turning now to the pattern of joint ventures, shown in Figure 3, what is most noticeable is the concentration of activity in the southeast quadrant. This particular region, as Burt and Carlton (1989:746) highlight, is characterized as high value-added and selling to a diverse, stable mix of consumer markets, reinforcing Proposition 2.

In Wholesale and Retail trade, for example, joint ventures were established to sell everything from carpet fixtures to poultry for yakitori (a Japanese food), sheet steel, halogen headlights, industrial detergents and rust preventative paint. In Communication Services, most of the joint ventures were established to create satellite communication or international VAN (value-added network) systems to enhance communication (voice, video and data) between the U.S. and Japan. The joint ventures in Finance, Business Services and Medical/Educational Services are similar in that they are providing professional services (financing, leasing equipment, legal counsel, tax expertise, public relations advice, medical services, English language training), often to Japanese companies and families in the U.S.

In evaluating Proposition 2a, significant barriers to entry appear to be present in the sectors where joint ventures are found. Burt and Carlton's (1989) analysis and interpretation of exports in the southeast quadrant is particularly relevant for explaining the activity in these service sectors. In the southeast quadrant, they state a "homophily component in the market shows up in the form of little exporting and exceptional absence of foreign firms" (Burt and Carlton, 1989:746).

One interpretation of the joint ventures in the professional service sectors is that they help the Japanese partner overcome the level of assimilation and domestic cultural knowledge that are required to run these businesses and serve U.S. customers, and the Japanese partner aids access to the Japanese clients.

Joint ventures in non-customer contact segments may face different but equally challenging barriers to entry. In Wholesale and Retail, difficult to access distribution networks may be driving forces (Harrigan, 1986). In Communication, joint ventures appear to be formed to enable access

to the VAN infrastructure already in place. Regulatory and capital expenditures required to set up a foreign-owned system would be formidable barriers to overcome if investment were attempted with sole Japanese ownership.

Major sectors of activity for direct investment (Figure 4) that support Proposition 2 are Motor Vehicles and equipment, Electronic components and accessories and Machinery. Additional information drawn from the cases indicates that, in automobiles, the Japanese investments include not only the establishment of assembly plants for the production of cars and trucks, but also plants to supply the automakers with plastic parts, bearings, instrument panels, wheels and air conditioning units. In electronics, production of television sets was the emphasis. Direct investments in machinery were mostly supply houses for tools and equipment. Many of these markets are mature and relatively predictable.

Whether this activity supports Proposition 2b is more ambiguous. While these sectors are now fairly accessible to Japanese companies, some might argue about their long-run profitability. What is important to consider is that the map is generated from the standpoint of the U.S. economy. Thus, while the future of these markets may not look promising for U.S. companies, they are vibrant for Japanese companies. In addition, some of these direct investments are supply companies formed to provide inventory for Japanese companies already established in the U.S. They offer demand and a customer base that is likely to be both predictable and profitable.

Challenging Proposition 2b are the smaller concentrations of direct investments found in the more technologically unpredictable environments such as communication or office and computing, and the activity in sectors such as food, eating and drinking establishments that have volume volatility (Burt and Carlton, 1989). Examining the case data of these sectors in detail shows that the direct investment in office and computing includes hardware, software and printers. In communication there is not much detail except that communication equipment is being produced.

Direct investments in food are manufacturing facilities producing Japanese style food, beer or supplies in the U.S., as well as setting up a number of Japanese restaurants.

In finance and business services, the other two sectors with some activity, the focus is on setting up facilities for commercial financing and other business services.

As with some direct investments in more stable sectors, further examination of the case information in these more unpredictable sectors reveals that many of these direct investments have been set up to provide resources, supplies, expertise or services to Japanese companies already operating in the U.S. They are buffered or protected from some of the competitive turbulence and uncertainty characteristic of the sector because they serve a stable and reliable Japanese customer base. Thus, they operate in more predictable and profitable sub-environments within these sectors.

DISCUSSION

This study sought to explore the relationship between diverse forms of economic activity and their environments using data on economic activity between U.S. and Japan. In doing so, it contributes to the emerging theoretical work bridging macro-organizational and network approaches and the topical work on international interorganizational relationships, and has implications for economic policy between U.S. and Japan.

The first part of the study examined the different ways Japanese companies invest in the U.S. In addition to the specific findings, this analysis suggests that structural equivalence may be useful for theorists developing taxonomies of other types of forms. A classification approach based on extrinsic characteristics, such as whether the form connects similar markets, can be used as an alternative or complimentary classification approach to classification based on inferred intrinsic characteristics. The second part of the study explored the distribution of the three forms using a market topological map of the U.S. economy. This approach is particularly appealing because it uses flows of transactions to portray different sectors of the economy. The results indicated that ~~low resource investment linkages are found primarily in the less predictable sectors with newer technologies such as computers, new materials and biotechnology, although they are also used to~~ revitalize processes in more mature sectors.

Joint ventures, as predicted, predominate in areas of the economy where independent operation by a solely Japanese owned company would be difficult or risky. Joint ownership is used to overcome barriers of entry ranging from lack of cultural specific knowledge, to access to distribution networks, to the necessary capital and access to set up communication infrastructures.

Direct investment is concentrated in the west, although there are pockets of activity elsewhere. Consistent with Proposition 2, some direct investment is found in predictable sectors. Yet many of these are maturing sectors in the U.S., which might seem to contradict Proposition 2b, suggesting that direct investment would be attractive in high profitability sectors. What is critical is that the market topological map is based on the U.S. economy. While weak industries for U.S. companies, sectors such as autos and electronics are growing and yielding high profits for Japanese companies operating in the U.S. Perhaps most interesting are the direct investments in support of businesses for Japanese companies and individuals based in the U.S. In effect, a just-in-time inventory system of Japanese supply firms for Japanese business has been created in the U.S. This allows the penetration of markets while avoiding dependence on U.S. suppliers, thus leaving these companies in an optimal power position.

Although this paper was framed in loosely macro-organizational and network perspectives, this study is also relevant and contributes to academic research on international interorganizational linkages. One contribution is the number of different forms of economic activity included in the analysis. Although some previous research analyzes both equity and non-equity forms (see, for example, Pisano, Russo, and Teece, 1988; Klepper, 1988; Contractor and Lorange, 1988), few studies in this field examine a wide spectrum of interorganizational forms and include direct investment. Direct investment adds an important additional dimension to this literature because it is another form of overseas economic involvement. Decisions to form interorganizational linkages are often evaluated in light of their costs and benefits compared to direct investment. Moreover, for researchers working within a transaction cost framework, direct investment is a "market" form that is useful to compare to interorganizational forms that rest between markets and hierarchies.

Second, many of the studies on international interorganizational linkages have been industry specific (see Mowery, 1988). While these studies offer critical within-industry insights, cross-industry studies help us to assess the persistence of patterns under varying conditions and discern more macro trends.

Third, the countries included often vary tremendously across studies, making comparisons difficult (Contractor and Lorange, 1988; Mowery, 1988). In this study, U.S. and Japan are the sole focus, thereby isolating the phenomena between these two countries.

Fourth, except for a few notable exceptions (Powell, 1989; Jarillo, 1988; Walker, 1988), dyads of relationships have been the focus of analysis in research on international interorganizational relationships. This study uses network analysis to bring the web of relations these dyads are "embedded" in into the picture (Granovetter, 1985). In short, this study's unique contribution to this body of literature is that it focuses exclusively on U.S. and Japan and uses network analysis to examine the patterns of a range of interorganizational forms and direct investment across many industrial sectors.

This study was exploratory, however, and its limitations suggest a number of directions for future research. To begin with, although there was support for the propositions, it is clear from the insights gained from the within sectors analyses that the level of aggregation of sectors poses problems. More sophisticated analyses of the sub-environments in which the forms are found would be important for additional theoretical refinement. Here, further application of a network approach may be useful for classifying both forms, as is done in this study, and specific niches within sectors (Freeman and Barley, 1989).

In addition to the benefits of a structural equivalence approach for the classification of forms and niches, this method may be applicable to the many other veins of organizational research where the question of classification is critical. For example, this approach might also enhance strategic research on the boundaries of strategic groups or market segments, or a transaction costs researcher trying to identify whether a set of exchanges constitute the same form of transaction.

Second, we need to know more about the causes and motivations for different forms of investment. Currently, much of the work on why these investments are created is framed within one theoretical framework. Economists argue that profitability is the driving force, strategists emphasize competitive positioning or the transaction costs involved, and resource dependence features managing uncertainty. Theoretical strength probably lies not only in building and synthesizing current perspectives but also in searching for new explanations (Oliver, 1990). For example, one interesting path might explore whether institutional factors are also at play. To what extent do social legitimacy, normative expectations and bandwagon effects help explain the creation and evolution of these forms (Oliver, 1991)?

In addition, managers and executives overseeing or engaged in these forms may have useful perspectives, but academia lags behind. For example, personal interviews with top managers of international divisions of a number of major Japanese companies involved in foreign investment in the U.S. (March, 1989) suggested that choices and decisions about whether to invest in the U.S. and what form the investment should take are often evaluated in light of the portfolio of resource flows the company wanted to be engaged in. The decisions were not driven by whether one investment or dyad was efficient or profitable but rather by how that investment helped the company position itself within and across the industry, given the other arrangements already intact and future relationships planned.

This suggests that a network approach is valid both theoretically and practically and that more information on networks at the firm level of analysis may offer additional understanding of the dynamics underlying the overall patterns. Mapping the networks of firms that are key players in a portfolio and analyzing the diversity in investments, and the multiplexity and centrality of their partners, might provide fascinating insights. For example, structural equivalence analyses of dependencies might offer a very different view of competitor analysis for strategists.

Following the history of a firm and its linkages and foreign investments over time would be another extremely intriguing path, for it would uncover how the portfolio of a firm unfolds. It

might also bring the role that individual relationships play and the individual level of analysis into the picture.

Another limitation of this study was that the data were based on only one year. Longitudinal data would shed light on the evolution of aggregate patterns and particular forms over time. At the organizational level of analysis, the life cycles of particular dyads and networks and how they interact with their environments could be tracked. Topics at population and community levels of analysis might include exploring how the distribution and evolution of forms affects technological diffusion and competitive dynamics within and across sectors.

Lastly, it is important to return to the specific context of this study, the nature and extent of Japanese economic involvement in the U.S. The conflicting predictions of the optimists and the pessimists and the possible macro policy implications can be considered in light of the results but also recognizing their limitations.

One interpretation of these findings is that direct investment is penetrating our weak sectors and being used to create a network of Japanese suppliers in the U.S., thereby removing U.S. companies from that role. Joint ventures are found in sectors that are needed to support the Japanese in the global economy but where operating without a U.S. partner at this stage would be extremely difficult, risky or costly. Low resource investment linkages are targeted primarily towards high technology, potentially draining technological advancements from the U.S. and creating a strong technological foundation for the Japanese for the future. The net effect of this activity may be that Japanese firms are in the envious position of penetrating U.S. markets while maintaining relative autonomy by creating their own systems of support and supplies within the U.S.

Clearly, one should be cautious about inferences based on one exploratory study. However, if it is assumed that informed actions are more likely to lead to desired outcomes than uninformed actions, then these results raise some important questions and reinforce the need for further research.

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TABLE 1

Frequency of Different Investments *

JETcats

Direct investment	147
Joint venture	63
OEM supply	47
Technological cooperation	30
Technological transfer	24
Joint development	23
Joint investment	17
Technological information transfer	12
Joint R&D	6
Technological exchange	6
Licensing	3
Management exchange	2
Technological affiliation	1
Patent transfer	1
Joint manufacturing	1
Other	7

* Categories are based on labels used in the original JETRO case information.

TABLE 2

The Results of the Structural Equivalence Analysis for Classification of Forms

Data on JETcats in Form 1: n = 147

<u>JETcat</u>	<u>Reliability</u>	<u>Correlations among distances</u>
direct investment	1.000	1.000

Percentage of variance in distances to the above JETcats accounted for by a single principal component --- 100%

Data on JETcats in Form 2: n = 63

<u>JETcats</u>	<u>Reliability</u>	<u>Correlations among distances</u>
joint ventures	1.000	1.000

Percentage of variance in distances to the above JETcats accounted for by a single principal component --- 100%

Data on JETcats in Form 3: n = 141

<u>JETcats</u>	<u>Reliability</u>	<u>Correlations among distances</u>				
tech coop	.984	1.000				
tech tran.	.967	.909	1.000			
jt devel	.957	.906	.890	1.000		
OEM	.779	.736	.858	.662	1.000	
jt invest	.449	.551	.419	.658	.173	1

Percentage of variance in distances to the above JETcats accounted for by a single principal component --- 78.23%

Data on JETcats in Form 4: n = 5

<u>JETcats</u>	<u>Reliability</u>	<u>Correlations among distances</u>			
tech affl	1.000	1.000			
jt manuf	.999	.995	1.000		
patent tran	.998	.995	.993	1.000	
man exchge	.995	.989	.995	.988	1.000

Percentage of variance in distances to the above JETcats accounted for by a single principal component --- 99.46%

Data on JETcats in Form 5: n = 33

<u>JETcats</u>	<u>Reliability</u>	<u>Correlations among distances</u>				
jt r&d	.992	1.000				
tech exch	.990	.933	1.000			
tec inf tr	.990	.955	.912	1.000		
other	.987	.955	.936	.970	1.000	
licen	.973	.955	.956	.922	.923	1

Percentage of variance in distances to the above JETcats accounted for by a single principal component --- 95.38%

Figure 1 Market Topology Map of American Economy

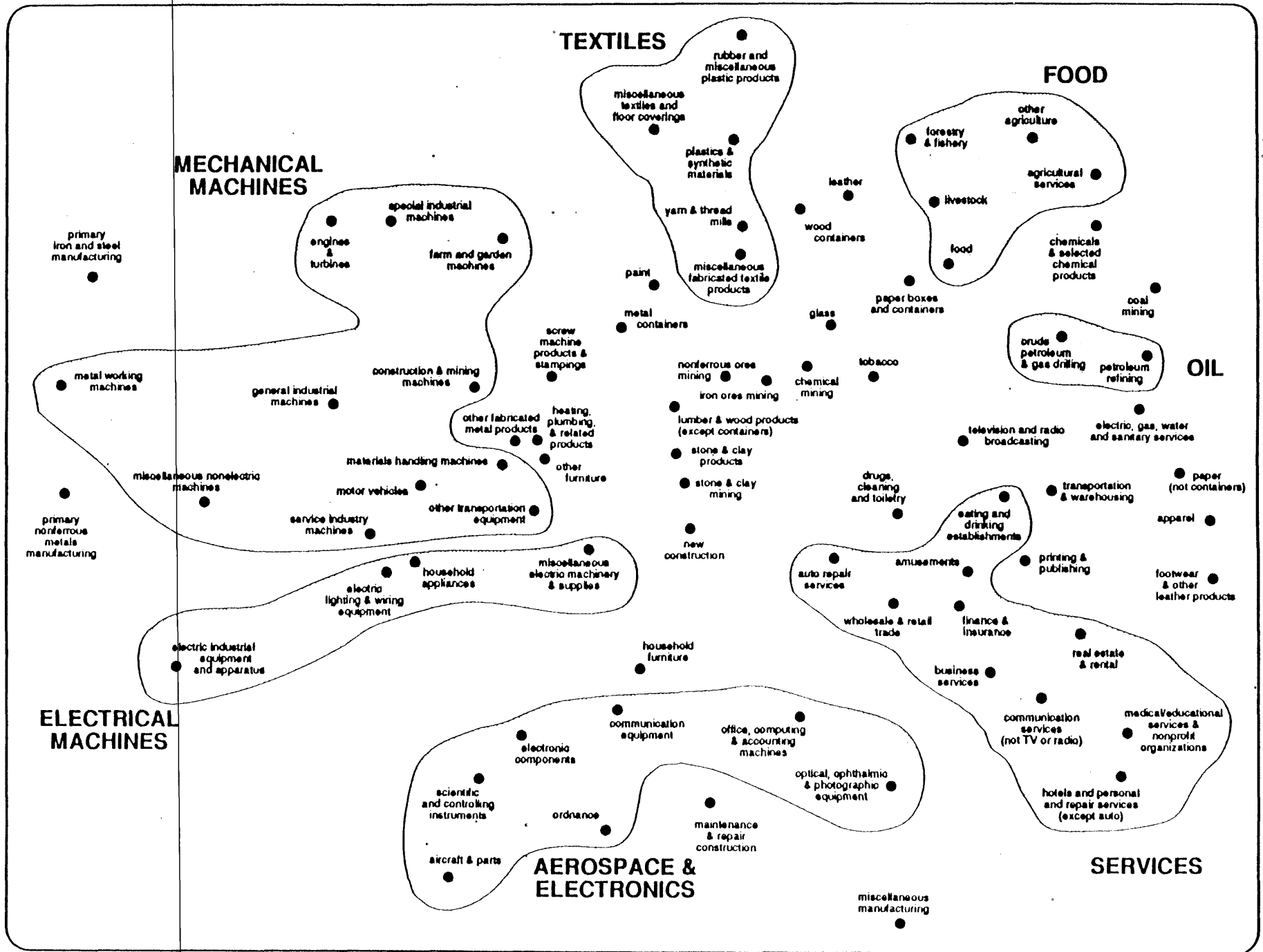


FIGURE 2

Low Resouce Investment Linkages Across the U.S. Economy

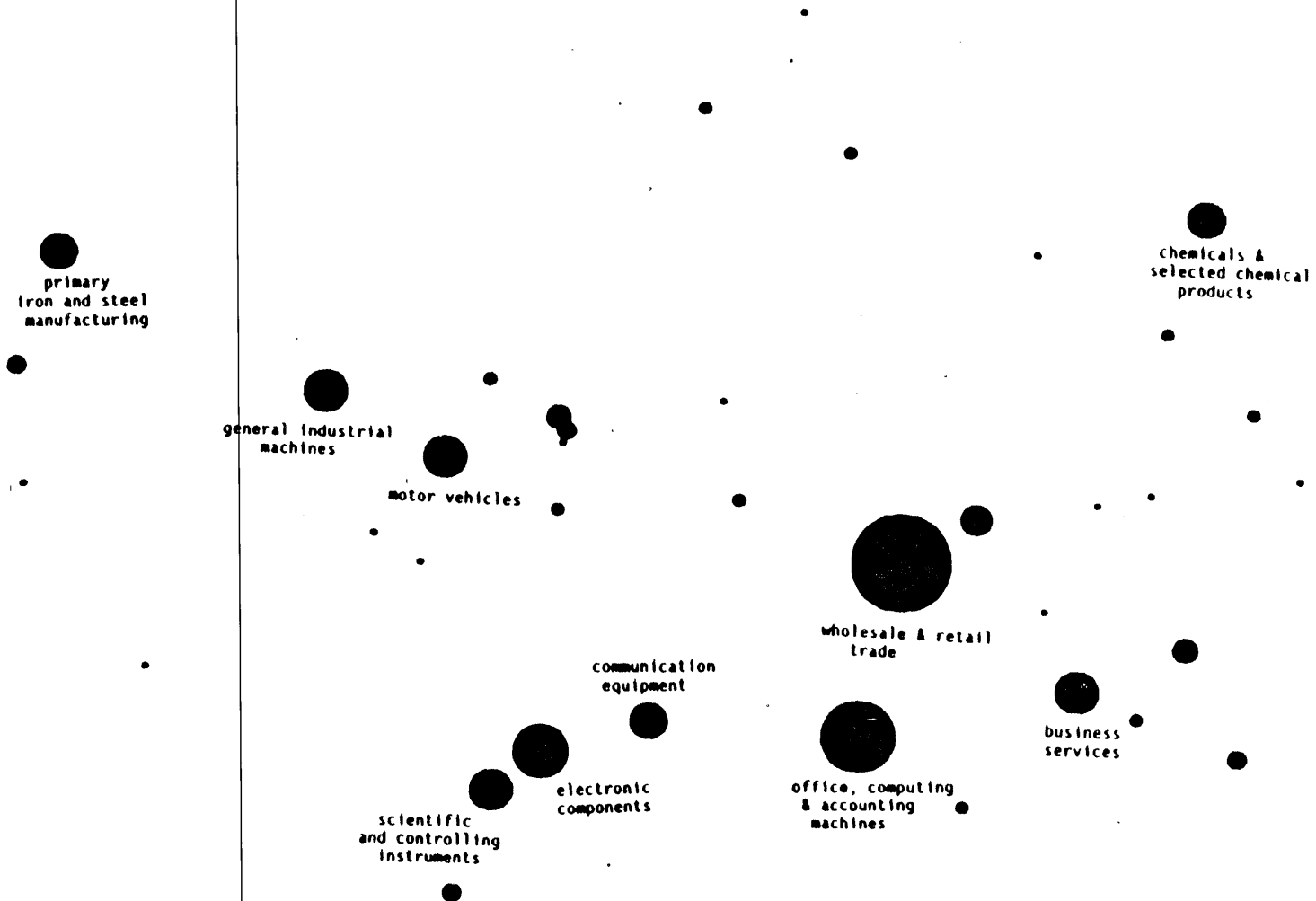


FIGURE 3

Joint Ventures Across the U.S. Economy

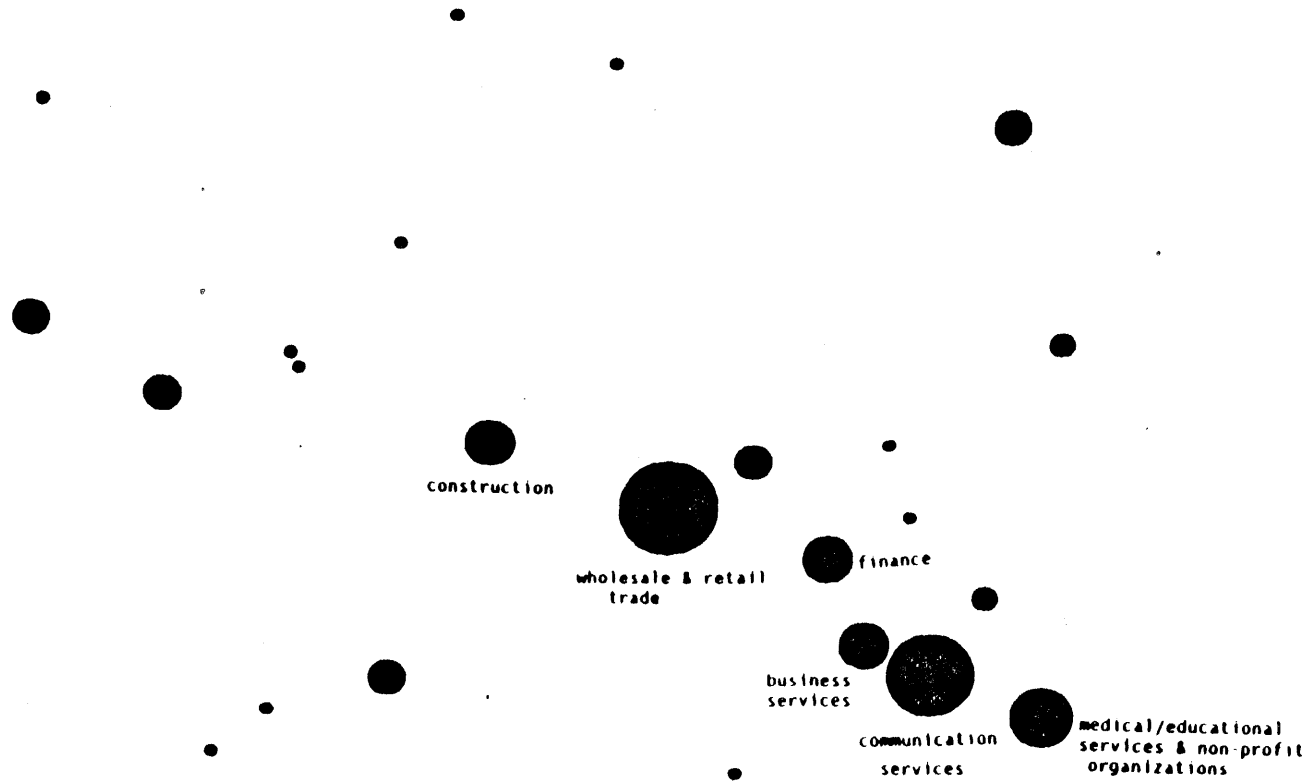


FIGURE 4

Direct Investments Across the U.S. Economy

