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1. Introduction

Evidence is accumulating that innovative and technological activities are more productive when firms are located in regional clusters. Celebrated examples such as the Silicon Valley (Teece, 1992; Saxenian, 1994), Cambridge (Keeble et. al., 1999), Bangalore (Fromhold-Eisebith, 1995), and others all suggest that technological learning among firms is positively correlated to their location in technology clusters. The benefits of technology clusters are related to the economies of externalities and local embeddedness that arise from firms' ability to exploit network and knowledge capital within regions. This encourages the formation of backward and forward interfirm linkages that facilitate knowledge flows between firms (Malecki and Oinas, 1999). The geographical stickiness of knowledge, particularly tacit or uncodifiable knowledge, in combination with the benefits of collective learning from intraregional research and development (R&D) spillovers among firms, research institutions and universities, all point to the potential high costs of the spatial transmission of knowledge. An important implication is that it is more advantageous for firms to locate in technology clusters if they are interested in technology development and acquisition.

In light of a growing regional perspective on technology relations, this paper has two main objectives. First, we examine the factors that contribute to industrializing Asian firms' choice patterns in technology clusters as opposed to non-technology areas. South Korean (henceforth Korean) and Taiwanese manufacturing firms in the United States were surveyed for this purpose. These two countries are late technology-comers and have in the last two decades progressed from being producers of standardized mature products (e.g. apparel and shoes) to more technology-intensive products such as wafers in semiconductors and LCDs in computers (Mathews and Cho, 2000). In locating their operations in U.S. technology clusters, it is expected that Korean and Taiwanese firms will benefit from technological spillovers that enable them to upgrade their own product development and engineering processes. Second, we examine the relationship between technology clusters and the level of technology acquisition and development among the Asian firms. Empirical evidence on cluster productivity in terms of the translation of cluster-related advantages to firms' development of technology is largely missing so that cluster advantages remain largely unclarified (Martin and Sunley, 2003). Indeed firms' propensity for technological acquisition and thereby growth is automatically assumed in regional clusters among researchers because "of the superior ability of such spatial configurations to enhance learning, creativity and innovations…" (Malmberg et al., 1996: 89).

This paper is organized as follows. Section 2 provides a brief overview of the recent literature on the spatial clustering of industry. Section 3 introduces our model and data, while Section 4 discusses our main empirical results. The paper concludes with a discussion of the significance of our findings in terms of recent theoretical positions on the role of industrial clustering in technology development.

2 Clustering, Technology and Firms

2.1 Spillovers, knowledge and embeddedness

The benefits of geographical clustering among firms in "technology districts" may be explained by three major dimensions (Storper, 1992). These include the spatial limits to knowledge and R&D spillovers, the nature of knowledge, and the local embeddedness of firm linkages and exchanges.

A major element of endogenous growth models is the contribution of knowledge and R&D spillovers to firm growth, both of which also drive the agglomeration economies of innovating activities (Audretsch and Feldman, 1996; Krugman, 1991; Romer, 1990). The interaction of actors within clusters allows people or firms to learn or acquire knowledge without having to pay for it. That is to say, spillovers create externalities because knowledge embodies some properties of public goods that cannot be completely appropriated by the innovating firm. The magnitude of externalities is positively correlated to geographical proximity: the more proximate are firms or people, the larger the externalities. The existence of externalities and knowledge spillovers implies that geographical concentration favors the internalization of knowledge spillovers, and such internalization is greater for technology-related activities (Glaeser et. al. 1992, Malmberg et al, 1996).

To understand why knowledge tends to be geographically and locally-concentrated, it is necessary to understand the nature of knowledge itself. It is widely accepted that there are two major types of knowledge. First, knowledge that can be easily codified (e.g. manuals, blueprints, reverse engineering) is associated with the development of public technology since such knowledge is more easily transmitted and reproduced. Second, there is also less codifiable or tacit knowledge that is not easily articulated or encoded. In this case, the extent to which knowledge may be acquired by non-innovating firms will depend on, among other things, the level of codifiability, teachability and complexity (Zander and Kogut, 1995).

The tacit component of technology is typically embodied in routines, expertise and skills (Nelson and Winter, 1982) and is largely transformed or acquired by learning-by-doing or learning-by-interacting (Vertova, 2002). The know-how of knowledge is, however, an accumulated skill or expertise that must be learned or acquired (von Hippel, 1988).[1] Learning-by-doing is facilitated when firms are geographically proximate because it allows developers/producers and learners/users to articulate and solve problems mutually (Gertler, 1995). Similarly, learning-by-interacting is a social process and requires the transformation of knowledge from an individual, firm or organization to other individuals, firms or organizations. The transmission of both tacit knowledge and know-how in particular requires frequent interactions between actors or firms, and communicability tends to increase with geographic proximity.

Since learning and technology acquisition is a social process, a third dimension of firm clusters relates to the embeddedness of social networks. As noted by Lissoni (2001), the site in which knowledge is formed, developed and transmitted is the scientific community. Knowledge may be local, such that information and know-how are accumulated and acquired through imitation, observation and exchanges between individuals or firms in proximity. Whereas codified knowledge need not require a common social background, the acquisition and transmission of tacit knowledge on the other hand, is facilitated by people with shared cognitive capacities and experiences (Lissori, 2001). This is because codified knowledge is more locationally transferable, since knowledge here is organized around properties or codes that may be followed or

[1] Kogut and Zander (1992) suggest that knowledge may also be information or know-how oriented. Information-based knowledge is much more codifiable and includes facts, axiomatic propositions and symbols. On the other hand, know-how embodies the knowledge of how to develop or do something. In many cases, individuals know more than they can explain (Polanyi, 1966), hence know-how embraces knowledge that is more than what may be described in a recipe, blueprint, manual or computer program.

replicated. This does not mean that codified knowledge is more easily learned, as dissemination depends on the level of complexity of the codification. However, because codified knowledge is more declarative involving facts and propositions, it is also more readily communicated (Zander and Kogut, 1995). Tacit knowledge, on the other hand, is a more geographically sticky resource because it is difficult to redeploy. Tacit knowledge resides in individuals. Shared or common experiences and language facilitates its transformation. Because social relationships in which tacit knowledge is embedded tend to be locally organized or contextually-based, this creates spatial barriers that impede the spread and thereby acquisition of knowledge.

The local embeddedness of social networks and scientific and business communities is implicit in Porter's cluster theory (1998) which emphasizes the nature of linkages holding firms and institutions together in a cluster. These linkages could be vertical, that is, from suppliers to customers or horizontal between firms and institutions (e.g. universities) (Padmore and Gibson, 1998). The linkages could also be collaborative as is observed of social production relations in industrial districts, or, competitive as in Silicon Valley (Field, 1998). In aggregate, however, innovations are a product of the social structure that shapes the density and intensity of vertical and horizontal linkages in a cluster.

While the literature points to the theoretical benefits of clustering and technology development among firms, it is also relatively short on empirical evidence. Krugman's (2000) criticism that economists believe in "agglomeration economies because of agglomeration economies" appears to be true for technology clusters as well. In examining the semiconductor industry, McCann and his colleagues (2002) found little support for knowledge and information spillovers between individuals and firms in technology clusters because large firms, particularly multinational firms, are unwilling to externalize their information transactions. Indeed, the opposite is true for some large firms that they had studied which tend to locate their activities in clusters to internalize information and maintain control of their activities. Rather, much of the empirical work on the relationship between technology acquisition and clusters has focused on the diffusion of innovations, with the conclusion that technology adoption is greater at regional than global scales (Baptista, 2000). This literature, however, falls short of clarifying the relationship between firms' capacity to translate or transform such adoptions into technology development, and the role of clusters. On the other hand, the literature is empirically richer in terms of operationalizing and explaining both the sources and locational processes driving firms in technology clusters. These are discussed in the next section.

2.2 Locational factors and technology acquisition

Interest in the role of knowledge spillovers and local embeddedness has resulted in a relatively large body of empirical work that attempts to unpack the processes and mechanisms driving firms' technological capacity. First, because knowledge transfers are a social process, understanding knowledge, particularly technology-related knowledge, requires high educational levels. In other words, a high level of human capital or skilled labor constitutes the fundamental unit by which technology know-how and information is transmitted (Audretsch and Feldman, 1996). The importance of regional cluster is that geographical proximity facilitates the frequency and intensity of contacts and communication between skilled individuals and firms that become locally embedded over time.

Second, as noted by Glaeser and his colleagues (1992), the imitation of the innovator's technology by other firms in the area is a source of disincentive to the innovator and this tends to slow down the pace of innovations. Imitation, however, is not necessarily a bad thing. In Porter's model, imitation by competitors frequently involves improvements over the innovator's products and processes. So while the innovating firm may not be able to appropriate a large rent because of local competition, the presence of competitors nonetheless results in more innovative activities within the region as a whole.

Third, close proximity to suppliers and customers provides yet another set of advantages to firms that locate in clusters (Porter, 1990). The theoretical basis for this goes as far back as Marshall's (1920) seminal work on industrial districts. If a firm is located close to its key input suppliers, then transaction costs can be minimized. Perhaps more important, however, is the fact that frequent and/or intensive interaction between suppliers and buyers can support the process of incremental product innovation (Rothwell, 1986). As just-in-time (JIT) inventory management becomes more prevalent across the manufacturing sector as a whole, the importance of operating with a spatially proximate supply network tends to increase. This is especially true in cases where trust-based network relations prevail (Dyer, 1996; Nishiguchi, 1994). A classic and oft-cited example of this concerns Japanese auto-parts suppliers, a majority of whom locate within a 40 mile radius of their customers (assembly plants) in order to minimize inventory and transportation costs or to facilitate ease of face-to-face interaction for bilateral product development (Dyer, 1996). Although buyers may not *need* to locate close to their suppliers (or vice versa), there is growing evidence that they *prefer* close proximity.

The logic surrounding supplier/buyer proximity can be extended to the case of firms that supply final products to end users. Again, there is evidence that close proximity between manufacturing firms and their main customers can facilitate a variety of efficiencies, including user feedback (e.g. face-to-face contacts for product evaluation), reduced transportation costs, faster product delivery, quicker post-sales support (e.g. product maintenance or repair), and better inventory management. Again, however, some of the most powerful evidence pertaining to the importance of producer/buyer proximity relates to the role of users in the process of incremental product innovation (von Hippel, 1988; Rothwell, 1989). Given that this relationship is typically characterized by a need for frequent face-to-face meetings and/or on-site development work, proximity is clearly an important advantage.

Fourth, by locating within an established industry cluster, firms can access distribution channels that might otherwise be difficult to penetrate. In several markets for technology-intensive goods, for example, distributors act as gatekeepers to the market. In the case of the medical devices industry, for example, producer generally must operate via distributors because customers rarely buy directly from the original manufacturer (MacPherson, 2002). Other things being equal, the process of establishing a trust-based relationship with a distributor is likely to be easier when the producer is located close to the main distribution channels for the product in question. Again, however, there is substantial evidence that an even stronger potential benefit of producer/distributor proximity lies in the facilitation of incremental innovation. Specifically, distributors can supply feedback to producers, suggest product improvements, or assist with marketing initiatives.

A final advantage associated with cluster-based production is that cluster residents tend to have access to the latest information on market and industry trends. While this information can be rapidly diffused via electronic means, cluster residents are likely to have faster access to 'hot news' than their non-clustered counterparts.

On this note, the question thus arises: does a cluster-based location convey these types of benefits to foreign Asian companies that have established production facilities inside the United States?

3. Data and Model

Data for this research was obtained from a phone and interview survey of Korean and Taiwanese firms in the U.S. that was conducted by the authors in the winter of 2003. Fieldwork was conducted in three stages. First, a pilot survey of some 15 firms was conducted to help develop and fine-tune the survey instrument. During this stage of the survey, it was found that contrary to prevailing literature, proximity to suppliers is not important and therefore was dropped from the analysis because firms rely on suppliers in Asia rather than in the U.S. since manufacturing costs are much lower in Asia. Second, 50 Korean and 70 Taiwanese managers (typically with a college degree in engineering) were then interviewed on the phone. These samples constitute a response rate of 44 and 34% respectively over the population base. Each interview lasted between 45 to 60 minutes, and consisted of a series of both structured and unstructured questions. The structured questions involved a common questionnaire that elicited firms' responses on locational choice and technological acquisition patterns. This questionnaire was developed from stage 1 of the fieldwork. Unstructured questions focused on the company's history and firm operations and are useful for contextualizing the research (see section 4.0 below). Finally, post-survey phone interviews were also conducted that sought to clarify responses and results.

Based on the discussion in section 2 and the pilot survey, several variables were hypothesized to be important in determining the locational choices of industrializing Asian firms in technology clusters;

(i) to take advantage of skilled labor

(ii) to expand sales

(iii) to collect market information

(iv) to develop distribution channels

(v) to be near competitors

(vi) to be near customers

(vii) to develop new process and technology systems

To model locational choices, we use the conditional logit model (CLM). CLM has been used to test individual locational decision about a set of specified choices (Coughlin et al., 1991; Wu and Strange, 2000). For this study, the choices facing firms are technology and non-technology areas. Because the addresses of each firm were geocoded, it is possible to locate firms at a highly disaggregated zipcode or postal scale level. We classified and matched the zipcodes of firms with those of technology clusters (for identification of technology clusters, see section 4 below). Firms that fall outside of these areas are assigned to "non-technology areas". CLM assumes that firms seek to locate where they are because it will lead to maximization of profits. That is to say:

$$P_{ij} = c + X_j\boldsymbol{\beta} + \varepsilon_{ij}$$

Where P_{ij} = profit, c is the constant and X is a vector of observable characteristics in location j, **β** is a vector of estimated parameters, and ε_{ij} is the random error reflecting specification errors. The probability of selecting a specific location depends on the attributes of that region relative to the attributes of other regions or areas in the choice set. Following McFadden (1974) and assuming that the ε_{ij}'s are independently distributed and that they follow a Weibull distribution, the probability of locating in j may be expressed as:

$$\text{Prob}\,(Y_i=j) = \exp[\boldsymbol{\beta}X_j] / \sum_{k=1}^{2} \exp[\boldsymbol{\beta}X_k]$$

Estimates of **β** are obtained through a maximum likelihood estimation.

4. Technology clusters, locational determinants and technology acquisition

Before reporting the CLM results, the geographical distribution of Korean and Taiwanese manufacturing firms in the U.S is first discussed. This distribution is based on the population data although the sample data follows a similar pattern reflecting little sampling bias geographically. Distinct locational differences may be detected among firms from the two countries (Figure 1). Whereas 70% of Taiwanese firms are found in California, only one third of Korean firms are located in California. Meanwhile, nearly

50% of Korean firms may be found in the states of New York and New Jersey compared to less than 10% for Taiwanese manufacturing firms. Despite these differences, California, New Jersey and New York are still the top three destinations for firms from both countries. Further, the firms are highly concentrated in three areas within the three states, that is, technology clusters such as Silicon Valley (San Jose, Santa Clara, Milpitas in Figure 2a) and the New Jersey-New York (NJ-NY) corridor, and, the Los Angeles area in Southern California (Figures 2a and 2b). Outside of the Silicon Valley and NJ-NY clusters, Asian firms may also be found in two other major technology clusters, namely Austin-Texas and the Research Triangle Park in Raleigh, North Carolina. However, Figure 1 also shows that not all firms are located in technology clusters. One-third or more of firms may also be found in non-technology areas in the states of Iowa, Georgia, Missouri, Arizona, South Dakota and Michigan. Similarly, within more technology-rich states such as California, some Asian firms may be found outside of technology areas.

All of the firms surveyed are in the manufacturing sector, particularly in electronics, computers and semiconductors which is consistent with their national comparative advantages (Dicken, 1998; Mathews and Cho, 2000). Ninety percent of the surveyed firms are in one of the latter three industries. Basic firm characteristics, namely age and size (worldwide sales in millions of US$) are shown in Tables 1 and 2. The two tables reveal that besides the aforementioned locational differences between the two nationalities, over half of Taiwanese firms are also fairly young, that is, less than ten years in age. In contrast, 78% of Korean firms have been operating in the U.S. for more than ten years. The relative youth of Taiwanese firms is explained by the fact that many of these firms were first established in the 1990s as linkages between the country's own technology industrial area, Hsinchiu Park, and, the Silicon Valley increased (Saxenian, 1999). In terms of firm size, 66% of the surveyed Taiwanese firms are small, with worldside sales of less than $50 million. This contrasts with Korean firms, where only one-fifth are small (with at least 40% reporting worldwide sales of more than $1 billion). Such a difference in size is consistent with the literature and reflects national characteristics. Much of Taiwan's post-war industrial development is driven by small and medium-sized firms whereas the Korean government has favored the creation and rise of large chaebol firms. Until its recent membership in the World Trade Organization which prohibits subsidies, Korea's economic development was premised on the protection and development of strategic industries such as the electronics and semiconductor industries that has seen the concentration of financial, technological and export resources in the hands of chaebols (Mathews and Cho, 2000).

Table 3 reports the results of the conditional logit model. The overall model fits for Korea and Taiwan are reasonable according to the likelihood ratios. It is apparent from the table that proximity or "being near to customers" is positive and significant for firms from both countries. This is consistent with the co-location hypothesis suggested by Dyer (1996), whereby firms that operate in technologically advanced and/or rapidly changing product markets seek proximity to their customers in order to facilitate interaction, feedback, efficient JIT management, and/or trust-based relationships. This result is also consistent with Porter's (1990) proposition that close proximity to technologically demanding customers promotes innovation and/or growth among responsive suppliers.

In addition to being near customers, two other factors are also significant determinants of Taiwanese firms' locational choices: the availability of skilled labor and the development of new process technology. The importance of human resources among Taiwanese firms contrasts with the non-significance of skilled labor for Korean companies. Such a contrast was particularly conspicuous during the telephone interviews. Consistent with Saxenian's observation, many of our interviewees from Taiwan had received part of their education in a U.S. college, were relatively comfortable speaking English though Mandarin facilitated the interviews, and complained much less about cultural differences in the U.S. Indeed, Taiwanese firms in technology clusters report that on the average, at least 30% of their Asian personnel have a Masters degree or higher from a U.S. university. Most Korean managers whom we interviewed, on the other hand, received their education from a Korean university and spoke almost exclusively in Korean. When asked to estimate the share of Asian employees in their U.S. operations, the average share is less than 10% in technology clusters. This is because Korean firms tend to rely on skilled personnel from back home whereas Taiwanese firms in technology clusters are more inclined to tap into their Asian social networks that have accumulated expertise in the U.S. Rather interesting, there is a marginally significant negative relationship ($p=0.10$) between the development of new process technology to locational choices in technology clusters. This implies that whereas the locational choices of firms in non-technology areas are motivated by the need to develop new process technology, this is not true for firms in technology clusters. While this relationship requires further investigation, it is possible that we have captured a product life cycle effect. Specifically, firms that produce mature goods tend to emphasize new process development more strongly than firms that operate toward the front end of the product cycle. Taiwanese firms in Silicon Valley, for example, are predominantly involved in the production of more technologically sophisticated products such as LCDs, wafers, modems and network cards. In contrast, firms in non-technology areas tend to specialize in PCBs, cable assembly, and home appliances.

The conditional logit model only explains the factors that influence or determine firms' location choices in technology clusters. To examine tangible locational benefits in technology development and acquisition terms, we ran logistic regressions that attempt to establish the relationship between technological acquisition and development, and, locational factors. We measured technological development in terms of firms' "introduction of new process technology". More specifically, respondents were asked to rank on a scale of 1 to 7 if the introduction of new process technology has been significant since their firm was established in the U.S., with 1 being not significant at all and 7 being critically significant. This variable was treated as a dichotomous variable with scores above 4.0 being 1 and those below 0. Results of the logistic regressions are shown in Table 4. The chi-squares of the two overall models as reflected in the log-likelihood ratios indicate highly significant fits at the 1 percent level. Table 4 reveals some common relationships among firms from the two countries. First, the availability of skilled labor negatively affects new process technology introduction while proximity to customers positively affects new process technology introduction. In the case of the former, the negative estimates suggest that while firms, particularly Taiwanese firms, may be attracted to skilled labor availability in technology clusters as observed in Table 3, this does not translate into direct technology acquisition and development. A major explanation for the negative estimates, particularly with Korean firms, lies in the fact that most of the firms' R&D tends to be conducted back home rather than in the U.S. largely because parent companies control the R&D activities, and because transformation of knowledge into technological assets is less costly in Korea and Taiwan where wages of engineers are much lower. Furthermore, interviewees reported that skilled personnel are cheaper back home and therefore it is less costly to transform knowledge into technological assets in Korea and Taiwan. On the other hand, the regressions also indicate that being near customers translates into positive technology development and the high odds ratios of 33 and 10 respectively for Korea and Taiwan support this. In the second case, positive estimates for proximity to customers are consistent with findings in the literature. Again, this is suggestive of feedback effects that work more efficiently when producers are located close to technologically sophisticated clients.

In addition to the two above factors, Korean firms also reveal a significantly negative relationship between the introduction of new process technology, and, firms' expansion in sales, but positive estimates are associated with proximity to customers and the development of distribution channels. As noted earlier, distributors can act as gatekeepers to specific markets. Further, both gatekeepers and competitors can act as sources of ideas for technology development (see Glasmeier, 1992).

Overall the results provide some support for cluster benefits in terms of firms' technology development, largely as a result of producer-customer interactions, local competition and the development of distribution networks.

In the final stage of the analysis, we examine further potential sources of technology acquisition among firms (Table 5). In particular, we focus on more codifiable forms of technology transfer and acquisition. The literature in section 2 suggests that codified knowledge and information are more explicit because they are more transferable by mediums such as blueprints or manuals, seminars and training, or, industrial quality certification. In addition, firms' technological deficits may be mediated through intermediaries like engineering or consulting firms and industry trade shows, or, through forging strategic alliances with other firms with technological ownership advantages. Finally, because Korean and Taiwanese firms are late technology-comers, much of their technological upgrading and development is centered on imitation and improvements upon existing products. Firms were asked to relate the importance of all the above factors to their ability to acquire and develop technology with 1 being not important at all and 7 being critically important. The overall means of the variables are reported in Table 5. We also performed t-tests on firms in both technology and non-technology areas.

The overall means of Korean firms indicate that only one source, namely strong local relationships with firms, is ranked highly at 5.6. The t-statistics confirms that this factor is equally important among firms in technology and non-technology areas. It also corroborates with the earlier logistic regression results about the importance of close interactions with customers in technology clusters since many of these relationships are with customers rather than suppliers. However, Korean firms in non-technology areas also ranked "following prototypes in the U.S." slightly above neutral (4.2) and this is significantly higher for firms in non-technology than technology areas. Among Taiwanese firms, four variables have means that are above 4.0, that is, industry trade shows, following prototypes in the U.S., strong local relationships with firms, and industrial quality certification. The t-tests further reveal that while no significant differences may be found for the former three variables, firms in non-technology areas tend to rely on industrial quality certification more that those in technology areas. That firms in non-technology areas tend to rely on more codifiable forms of technology transfer and acquisition may be reasonably explained by the general lack of more tacit forms of knowledge spillovers in these non-technology areas. It may also explain why Korean firms outside of technology clusters tend to follow or imitate more embodied forms of technology, hence realizing technology acquisition and upgrading through reverse technology engineering. Indeed, the only variable representing tacit information and knowledge in Table 5 is that associated with "strong local relationships with firms" which, as noted earlier, has high mean values of nearly 6.0 for firms from both countries. Table 5 thereby corroborates with the results from Tables 3 and 4 on the importance of being near customers for industrializing Asian firms. It appears that this variable not only explains locational choice in technology clusters but also is a common factor influencing both Korean and Taiwanese firms in technology acquisition and development.

5 Conclusion

The spatial containment of technology production relations has increased interdisciplinary interest on the role of the region as an incubator for innovation among firms. A technology cluster provides the milieu for collective learning that thickens interfirm and extrafirm linkages. It is also the environment for which knowledge capital accumulates over time with positive externalities for firms embedded within the environment. Taken together, there is reason to expect that foreign firms facing technological deficits will be attracted to technology clusters in order to exploit regional knowledge spillovers. This research has sought to clarify the relationship between technology acquisition and development, and location in technology clusters of Korean and Taiwanese firms in the US.

Using data from recently conducted phone surveys of firms from both countries, we provide some evidence to support the hypothesis that firms are attracted to particular dimensions of innovation-related advantages in technology clusters. Specifically, proximity to customers emerged as the most significant locational factor for both countries although the availability of skilled labor is also important for Taiwanese firms. The importance of producer-customer interactions further translates into positive technology acquisition and development since our empirical results indicate both Korean and Taiwanese firms have been able to introduce new process technology as a result of this locational benefit in technology clusters. On the other hand, contrary to expectations, both countries showed a significantly negative relationship between the introduction of new process technology and the availability of skilled labor in technology clusters. Post-survey interviews suggest that skilled labor in the US may help facilitate knowledge transfers within the company, but transformation of such knowledge into technological assets tends to be undertaken back home where wages are significantly lower even for skilled personnel. Korean firms also found distribution networks and local competition in technology clusters to be positive for their technology development.

In examining the sources of technology acquisition, the results reveal that strong local relationships with firms are very significant thereby supporting the role of customers in technological learning since many of these relationships are with customers than suppliers. In general, Taiwanese firms also rely more on codifed forms of knowledge acquisition than Korean firms, but firms in non technology areas seem to rely on such forms of knowledge transfers much more than those in technology clusters. In particular, non-technology area firms use standards set in industrial quality certification to improve their technology more significantly those in technology clusters.

In conclusion, the study here support to some extent the dynamic knowledge accumulation and spillovers that underlie technology clusters, but it would seem that the most significant source of innovation is derived from Asian firm's exchanges with customers. Not all cluster advantages however may be directly translated into technology acquisition and development, for example, the availability of skilled labor. Porter's point of local competition is also only important for Korean but not for Taiwanese firms. Further, firms outside of technology clusters have also been able to develop process technology. Overall, this research points to a more cautious conclusion about the benefits of locating in technology clusters for foreign firms.

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Table 1. Distribution of age of firms

Age (years)	**Korean Firms (%)**	**Taiwanese Firms (%)**
1-5	8.0	20.0
6-10	14.0	32.9
11-20	44.0	41.4
> 20	34.0	5.7

Based on n=70 and n=50 for Taiwanese and Korean firms respectively

Table 2. Distribution of size of firms

Worldwide sales (US$)	**Taiwanese (%)**	**Korean (%)**
< 50 mi	26.5	66.2
51-250 mi	20.6	27.7
251-500 mi	5.9	1.5
501 mi – 1 bi	5.9	3.1
1.1-5 bi	26.4	1.5
> **5 bi**	14.7	0.0

Based on n=70 and n=50 for Taiwanese and Korean firms respectively

Table 3. Results of conditional logit model:
Locational factors and technology clusters

Locational Variable	**Korean Firms**		**Taiwanese Firms**	
	Parameter estimate	χ^2	**Parameter Estimate**	χ^2
1. Skilled labor availability	0.301	0.310	0.285	4.015***
2. Expand sales	0.337	1.370	-0.194	0.225
3. Collect market information	-0.242	0.832	-0.060	0.075
4. Develop distribution	-0.106	0.147	-0.209	0.673
5. Near competitors	-0.223	0.459	-0.037	0.059
6. Near Customers	0.694	6.356***	0.731	3.725**
7. Develop new technology process	-0.053	0.033	-0.349	4.222**
	Likelihood ratio: 15.072*		Likelihood ratio: 11.937*	

*, **, * are 1, 5 and 10% significance levels respectively. Chisquare statistics are in parentheses.

Table 4. Results of logistic regression:
Introduction of new process technology and locational factors in technology clusters

Locational Factor	***Korean Firms***		***Taiwanese Firms***	
	Parameter Estimate	*Odds-Ratio*	*Parameter Estimate*	*Odds-Ratio*
1. Skilled labor availability	-1.62 (8.13)***	0.20	-0.50 (0.52)**	0.61
2. Expand sales	-5.35 (11.22)***	0.01	-1.01 (1.66)	0.36
3. Collect market information	-0.21 (0.43)	0.81	0.07 (0.05)	1.07
4. Develop distribution	1.71 (7.85)***	5054	0.34 (0.83)	1.41
5. Near competitors	2.07 (5.12)**	7.90	0.30 (1.44)	1.34
6. Near Customers	3.50 (10.59)***	32.81	2.31 (7.97)***	10.11
7. Develop new technology process	-1.59 (3.13)*	0.20	-0.39)	0.68
	Likelihood ratio: 20.81***		Likelihood ratio: 18.52***	

***, **, * are 1, 5 and 10% significance levels respectively. Chisquare statistics are in parentheses.

Table 5: T-TEST Results: Sources of Technology Acquisition

Sources	**Korean Firms**				**Taiwanese Firms**			
	All firms' mean	*Non-tech area mean*	*Tech cluster mean*	*T-statistic*	*All firms' mean*	*Non-tech area mean*	*Tech cluster mean*	*T-statistic*
1. Engineering/consulting services	2.1	2.0	2.1	0.13	3.4	3.2	3.8	1.18
2. Industry trade shows	3.8	3.4	4.1	1.12	4.5	4.7	4.1	1.23
3. Blueprints/manuals/publications in the U.S.	3.2	3.2	3.2	0.07	3.5	4.0	3.0	2.07**
4. Following prototypes in U.S.	3.5	4.2	3.0	2.1**	4.2	4.3	4.2	0.28
5. Industrial/quality certification in U.S.	2.3	2.1	2.4	0.53	4.4	4.8	3.5	2.51**
6. Strategic alliance with firms in U.S.	2.5	2.6	2.4	0.23	4.3	4.5	4.0	0.99
7. Strong local relationship with firms in the U.S.	5.6	5.5	5.6	0.02	5.9	6.0	5.7	0.83
8. Seminars/training programs in U.S.	2.6	2.7	2.4	0.54	4.0	4.0	4.0	0.08

Based on a scale 1=not important at all and 7=critically important

***, **, * are 1, 5 and 10% significance levels respectively

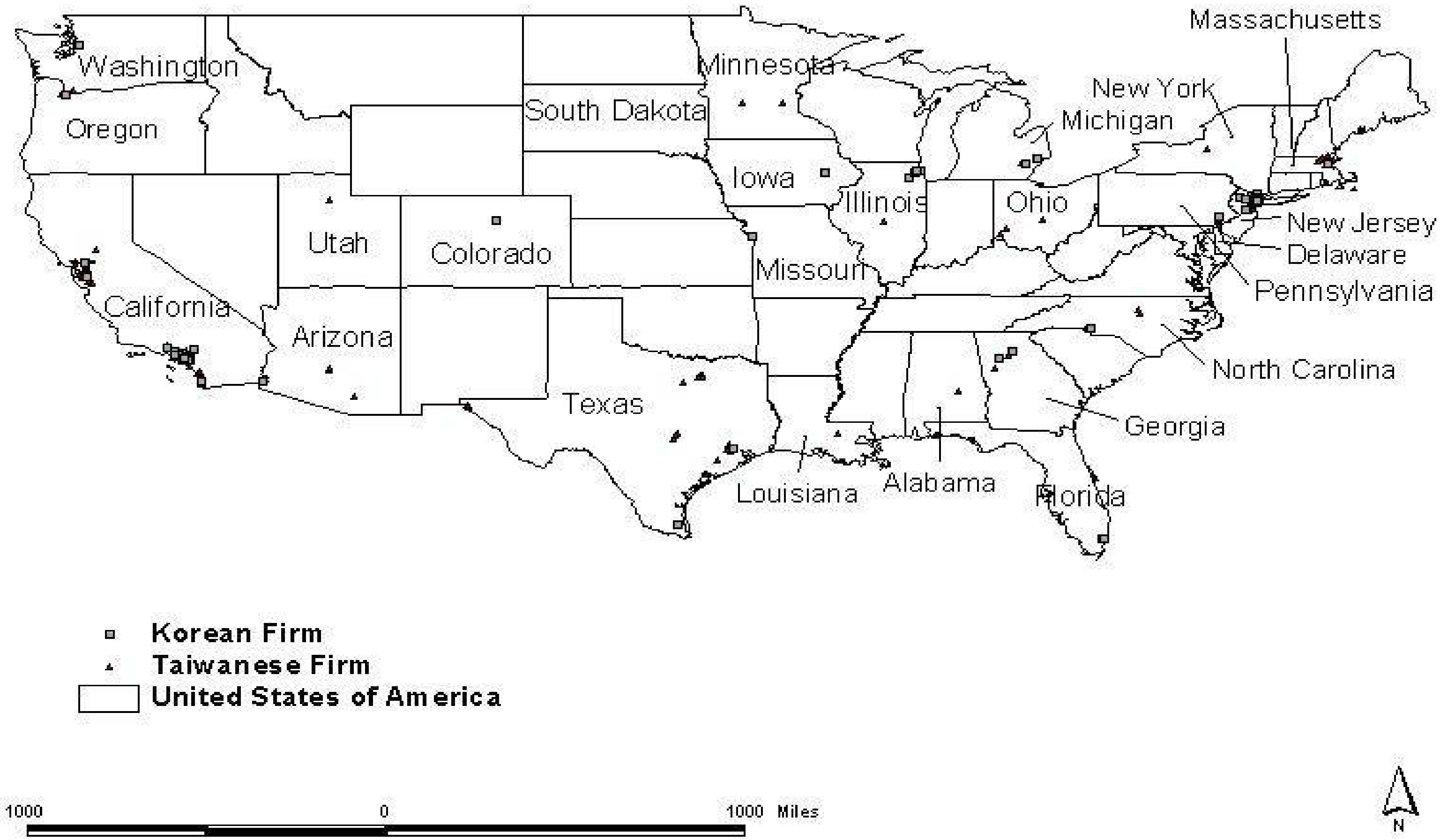

Washington
Oregon
California
Utah
Arizona
Colorado
South Dakota
Texas
Minnesota
Iowa
Missouri
Illinois
Louisiana
Alabama
Ohio
Michigan
New York
Massachusetts
New Jersey
Delaware
Pennsylvania
North Carolina
Georgia
Florida
Korean Firm
Taiwanese Firm
United States of America
1000
0
1000 Miles
N

Figure 1

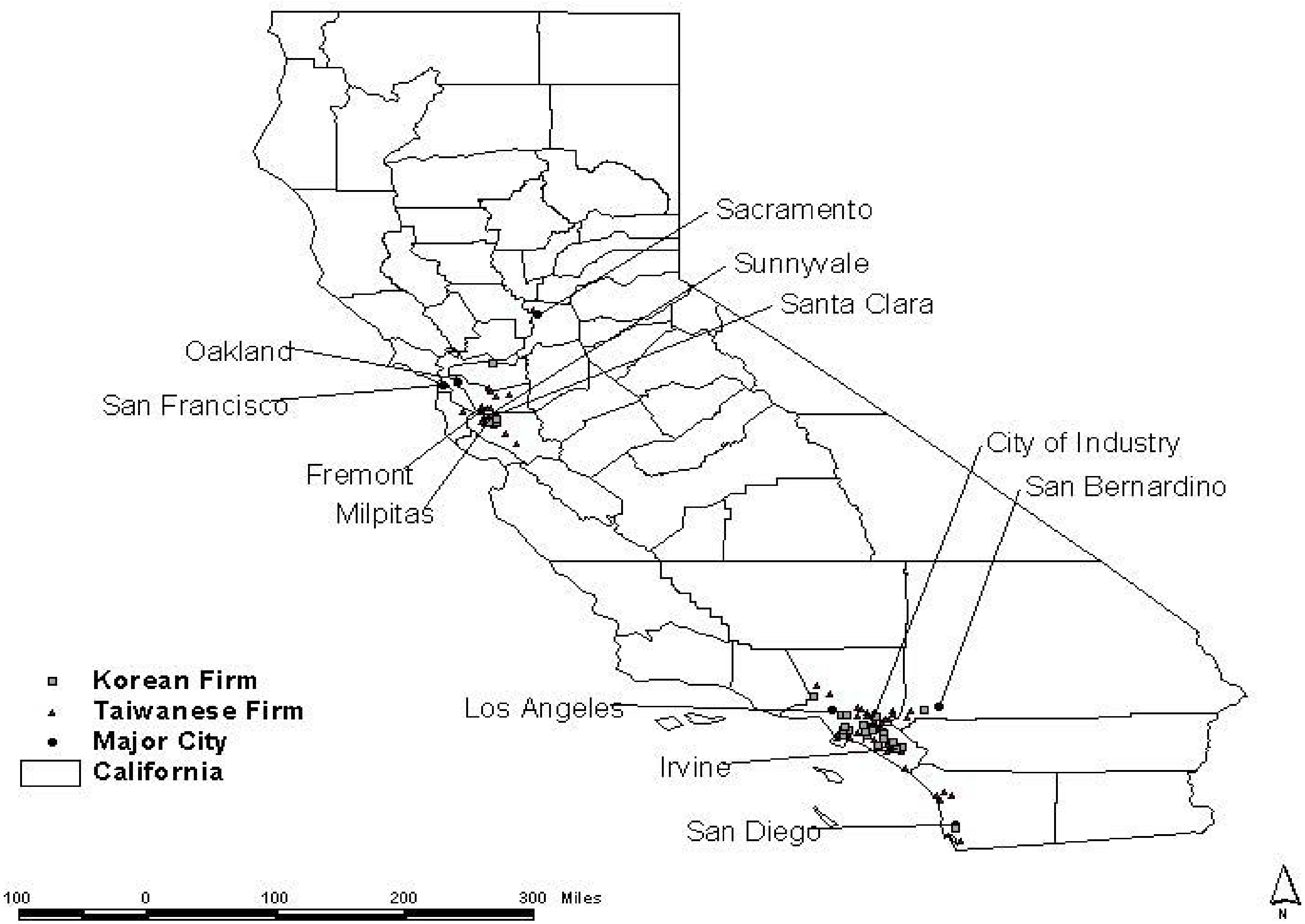
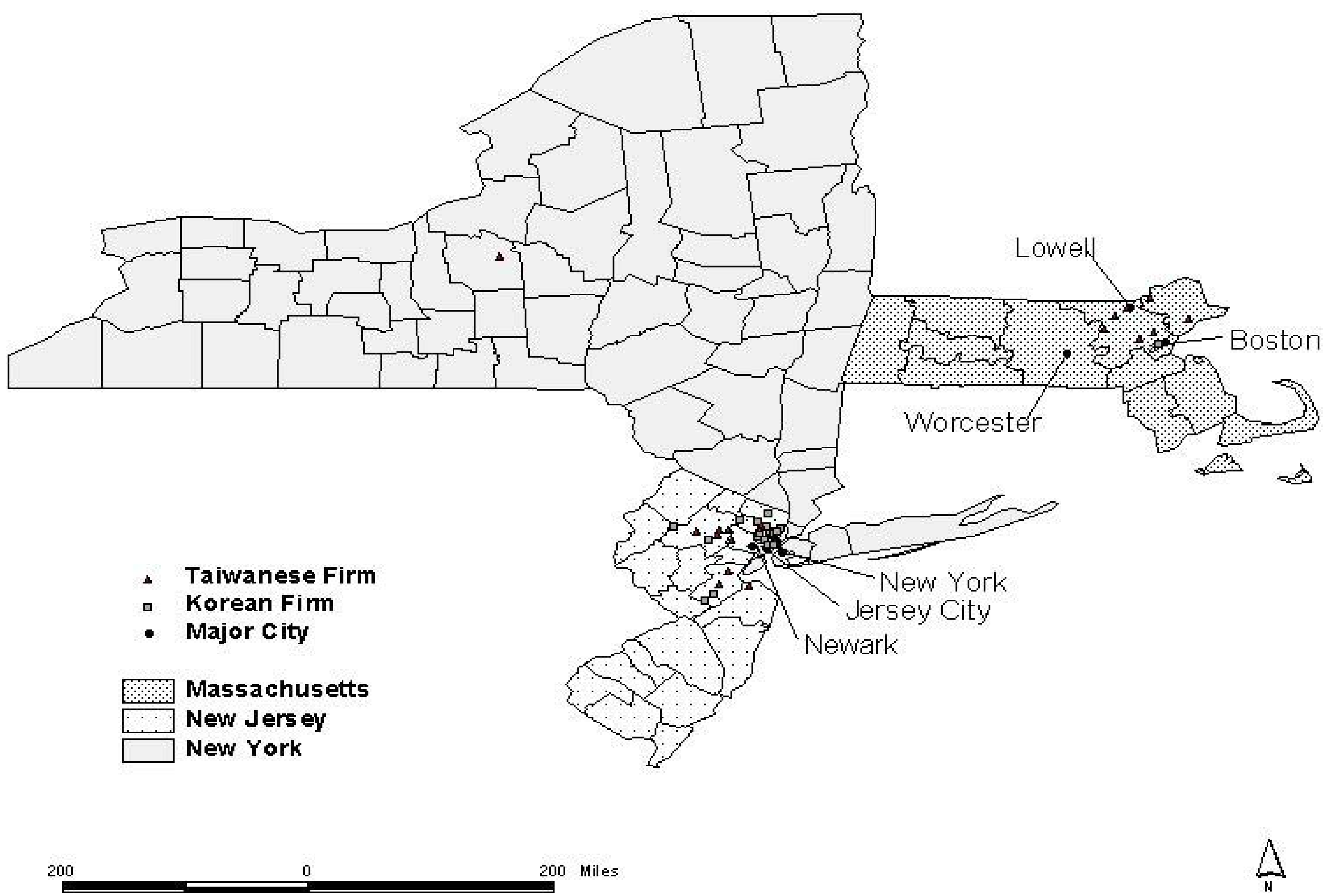

Sacramento
Sunnyvale
Santa Clara
Oakland
San Francisco
Fremont
Milpitas
City of Industry
San Bernardino
Korean Firm
Taiwanese Firm
Major City
California
Los Angeles
Irvine
San Diego
100
0
100
200
300 Miles
N

Figure 2a



Lowell
Boston
Worcester
New York
Jersey City
Newark
Taiwanese Firm
Korean Firm
Major City
Massachusetts
New Jersey
New York
200
0
200 Miles
N

Figure 2b