

# Airing Your Dirty Laundry: Vertical Integration, Reputational Capital and Social Networks

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October 2006

## Abstract

This paper explores the relationship between an ethnic-based social network and vertical integration decisions in the laundry services industry. We find that stores in the social network are significantly less likely to vertically integrate than non-member stores. This has three primary implications. First, the embeddedness of these economic decisions in a social network may be lowering the costs of using the market more than facilitating in-house production. This implies better outsourcing opportunities in a social network and may therefore help explain a documented relationship between social networks and the economic performance of firms. Second, institutional details of our empirical example and the estimated relationship suggest a role for opportunism and reputation as determinants of the boundaries of the firm in a setting without asset specificity. Finally, while much of the existing social network literature has focused on the network's ability to increase access to credit in developing countries, our evidence suggests this is not a dominant factor in this developed country context.

*Key words:* vertical integration; reputation; social networks

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# I. Introduction

The relationship between ethnic concentration and economic performance has become a well-documented fact.<sup>1</sup> One possible explanation for why ethnic membership may increase the performance of firms is the existence of gains from social networks operating within a specific ethnic group. We explore a potential mechanism by considering the relationship between membership in an ethnic-based social network and the make-or-buy decisions of firms. If a social network can decrease the costs of vertical integration or outsourcing, greater profits and survival rates should result.

Ethnic networks, and social networks more generally, are typically associated with characteristics such as enhanced communication, reputation or trust. Reputations have also been recognized as important determinants of the boundaries of the firm. We therefore outline a framework that considers how social networks can shift reputational capital and consequently affect make-or-buy decisions of firms. In this framework we explicitly analyze two channels through which social networks can affect vertical integration: one involves access to credit and the other solutions to agency problems. Both channels can either favor or discourage use of the market relative to in-house production, so we analyze the question empirically.

The context of our analysis is the laundry services industry because it is well suited for analyzing both vertical integration and social networks. Each store makes two make-or-buy decisions: one for drycleaning and another for laundry. These are the primary services offered by a store, and whether or not they are produced in-house can easily be revealed. Furthermore, the industry has long been associated with ethnic concentration,<sup>2</sup> such that in the southern California region where we focus our analysis, Koreans currently own more than 2,000 cleaners.

While there clearly is a social network of Koreans in the laundry services industry in southern California, our empirical strategy requires variation in network membership to identify the relationship with make-or-buy decisions. However, the specific network relationships within the industry are

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<sup>1</sup> Alesina and La Ferrara (2005) review the literature that links ethnicity and economic performance.

<sup>2</sup> Ong (1981) documents the concentration of Chinese workers and business owners in wash-houses in northern California in the late 1800s.

unobservable, and would be difficult to account for econometrically even if they were observable, so we follow Bertrand, Luttmer and Mullainathan (2000) by using local demographics and cleaners' Korean speaking abilities to identify network membership. We define the network geographically to be a particular region in which the communication and trust within the network should be at its greatest: Koreatown. We define network membership to constitute Korean firms in Koreatown, while non-members may be Koreans elsewhere, or non-Koreans located in or out of Koreatown. This allows us to control for Korean specific factors that may affect make-or-buy decisions, and Koreatown specific factors that may affect make-or-buy decisions.

It is useful to reflect briefly on exactly how this defined social network may operate and affect vertical integration decisions. The greater concentration of Koreans in Koreatown and the communication between them suggests that "word-of-mouth" (or reputation effects) will spread faster within this area.<sup>3</sup> An upstream cleaner supplying a Korean cleaner in Koreatown recognizes that their conduct can affect their reputation with their other Korean customers in Koreatown. Furthermore, if the upstream cleaner is also run by a Korean, its conduct also has the potential to affect their reputation within the Korean community more broadly. The fact that there are more Korean cultural institutions such as churches, restaurants or bars, in Koreatown should facilitate communication and enhance these reputation effects. Therefore, while a network of Korean cleaners outside Koreatown could yield some network effects, we expect these to be smaller. Our analysis therefore concentrates on the network effects of Koreatown relative to other small networks of Korean cleaners or the lack of networks.

Our estimates find that Korean stores located in Koreatown are between 50 to 70 percentage points more likely to outsource than Korean stores outside Koreatown or non-Koreans in or out of Koreatown. Of four potential relationships between vertical integration and social networks that our framework outlines, this finding is consistent with the network either resolving an agency problem

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<sup>3</sup> While some within network outlets may compete with one another, there are still many local outlets that are unlikely to be direct competitors. For instance, we find as many as 18 other outlets within a half-mile of a cleaner. We therefore expect outlets to compete over very small geographic areas such that some of these outlets within a half mile may not be direct competitors. Furthermore, this density of outlets suggests there are many other slightly more distant outlets that may share the same supplier, but not directly compete.

between laundry outlets and their suppliers, or social network members having inferior access to formal credit. These findings contribute to the existing literature in four ways.

First, the ability of a social network to help resolve an agency problem between firms may be one mechanism that can explain a positive relationship between social networks and the performance of firms.<sup>4</sup> For example, Kalnins and Chung (2004) find that Gujarati immigrant-owned hotels have greater survival rates when located near a branded hotel owned by a member of their immigrant group. Their analysis cannot identify the exact sources of the social network advantage, so they rely on interviews suggesting factors such as access to credit and free or cheaper furniture. A finding of better outsourcing opportunities in social networks provides a potential mechanism that could easily transfer to the example of hotels which also face significant laundry costs.

Second, the mitigation of agency problems in social networks suggests a role for opportunism and reputation in make-or-buy decisions, even in the absence of firm-specific investments.<sup>5</sup> The unique feature of laundry services is that assets are not specific and buyers typically do not have contracts with their suppliers. This suggests that ex-post bargaining problems should not be part of the rationale for vertical integration in our analysis. Our paper therefore also contributes to a growing empirical literature analyzing integration and contracting decisions in the absence of specific investments (e.g. Masten and LaFontaine (2002)).

Opportunism can also arise when firms do not have the correct incentives to deliver expected quality (Klein and Leffler (1981)). The dry cleaning industry ranks first in customer complaints about quality. Downstream stores cannot monitor the quality of every garment cleaned at a plant, so they must rely on the reputation of their supplier. The ability of a social network to enhance communication and

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<sup>4</sup> Robinson and Stuart (2005) find evidence similar to ours. They document how scientific networks in the biotechnology sector serve as a substitute for other governance mechanisms in inter-firm transactions.

<sup>5</sup> The economics literature on the determinants of the boundaries of the firm is extensive. It first started with Coase (1937) and followed with Williamson (1975 and 1985) and Klein, Crawford and Alchian (1978) who tied vertical integration and opportunism by arguing that vertical integration could avoid the ex-post bargaining problems associated with asset specificity. Grossman and Hart (1986) developed the property rights theory of the firm, which also relies on contractual incompleteness and asset specificity. Some notable empirical tests of these theories include, among others, Monteverde and Teece (1982), Masten (1984), Joskow (1985 and 1987) and Baker and Hubbard (2003).

spread bad “word-of-mouth” may lead a social network member to be more willing to trust another member, and therefore buy the service rather than make it. While such a finding has not been estimated elsewhere, it is consistent with Greif (1993), which models and documents how a coalition of Maghribi traders used an ethnic information/communication channel to establish a reputation mechanism that helped prevent opportunistic behavior. Greif (1993) does not consider the make-or-buy decision margin, but the mechanism did facilitate contractual enforcement.

Third, the ability of a social network to build trust and enhance reputations of transacting agents also provides support for the sociological literature highlighting the importance of interpersonal relations in economic transactions (Granovetter, 1985). Our findings suggest that ignoring the social environment that Korean cleaners are embedded in would inaccurately characterize their incentives to make or buy laundry services. Furthermore, the role of Korean immigration in the emergence and culture of Koreatown links our analysis to the work of Portes and Sensenbrenner (1993) and Light and Bonacich (1988).

Fourth, our findings have direct relevance for the literature suggesting that local ethnic networks help open access to credit. Most of the empirical work in this area has been conducted in the context of developing countries.<sup>6</sup> Credit constraints clearly can be a problem in these examples. However, when we consider the case of a developed country, our findings suggest that the credit effects of the network may not be as important.

Our framework suggests that easier access to credit should favor vertical integration. However, we find the social network to be associated with less vertical integration. There may be a few explanations for this. The formal credit markets in the United States may be sufficient, such that ethnic/network ties are not necessary to gain access to credit. Alternatively, social networks may be facilitating access to credit, but these effects are less important relative to the networks ability to resolve an agency problem between a store and its suppliers.

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<sup>6</sup> See for example McMillan and Woodruff (1999), Fafchamps (2000) or Fisman (2003).

One interpretation of our results may be that the Koreans in Koreatown have less access to formal credit. This could imply that they are more credit constrained and less able to invest in the equipment that would allow them to integrate services in-house. We do not observe these factors to test for them. However, we place less weight on this credit based explanation because changes in borrowing rates only marginally affect the costs of integrating laundry and dry cleaning services.

The paper is organized as follows. The following section lays out the framework for how social networks may affect vertical integration. Section III, describes the institutional details of the laundry services industry, outlining both the capital costs of integrating and the outsourcing costs of not integrating. Section IV describes the data. Section V describes the empirical specification and the results and section VI concludes.

## II. Social Networks and Vertical Integration in Laundry Services

In this section we outline a framework for analyzing how membership in a social network may affect vertical integration decisions. We approach the analysis from our empirical application of laundry service outlets, but the approach could be generalized to other outlets deciding between vertically integrating or outsourcing a good or service.

Social networks have the ability to affect vertical integration decisions through their enhancement of reputations. We therefore begin by expressing the vertical integration decision as a function of reputations. A laundry service outlet will choose to vertically integrate a service (e.g. dry cleaning) if the per-period profit of vertically integrating is greater than the per-period profit of outsourcing:

$$\begin{aligned} & \pi\left(\left\{\left(p-c\left(vi,r^w,e,\eta^1\right)\right)q\left(p,z\left(vi,r^w,e\right),\xi\right)\right\}-f\left(vi,d\left(r^b,\kappa\right)\right)\mid vi=1\right) > \\ & \pi\left(\left\{\left(p-c\left(vi,r^u,e,\eta^0\right)\right)q\left(p,z\left(vi,r^u,e\right),\xi\right)\right\}-f\left(vi,d\left(r^b,\kappa\right)\right)\mid vi=0\right) \end{aligned} \quad (1)$$

To avoid unnecessary complications of a dynamic decision, we treat the per-period profits to be a function of fixed costs,  $f$ , that include rental rates of capital equipment.<sup>7</sup>  $f$  is therefore determined by the vertical integration decision, which can increase rental costs of capital, and credit  $d$  which is determined by reputation with local financiers or bankers  $r^b$  and/or a credit worthiness,  $\kappa$ , unobservable to the econometrician.  $p$  is the price charged.  $q$  is demand, which is determined by the price, quality,  $z$ , and a vector of outlet-specific demand shocks,  $\xi$ . Quality is a function of the decision to vertically integrate,  $vi$ , because the integration decision affects the turnaround time. Quality is also a function of reputation  $r$  with either an upstream firm  $u$  or workers  $w$ , and  $e$  the effort of the owner or operator. The marginal costs of cleaning clothes,  $c$ , are a function of whether or not the firm is vertically integrated, the reputation and effort which determines quality, and a vector of firm specific marginal cost shocks that depend on whether the firm is vertically integrated,  $\eta$ .

Given the above specification, there are four potential findings about the relationship between social networks and vertical integration. First, social networks could increase the incidence of vertical integration through lower capital costs. This follows from the findings in the development literature that membership in a social network can increase access to credit. In Equation (1), a social network would increase  $r^b$ , which would lower the rental rate of capital. Lower capital costs disproportionately favor the decision to vertically integrate, all else equal, because vertical integration involves greater capital costs. So, if the findings of the development literature carry over to a developed country, we should expect to find more vertical integration in the presence of social networks.

Second, it is also possible that members of ethnic social networks in developed countries may vertically integrate less due to inferior access to formal credit markets. In a developed country such as the United States, ethnic communities such as Koreatowns, Chinatowns, etc., may have residents that are

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<sup>7</sup> While it is possible that the decision to vertically integrate may actually be a decision of whether to buyout the business of an integrated or non-integrated cleaner, this should not alter the analysis. Specifically, the reputation incentives we describe below will still affect the per-period profits of the firm and the rental costs of capital will still reflect the value of any cleaning equipment that may have already existed in the store.

more likely to be immigrants. Their relatively short tenures in the country could lead to a lack of an established credit history (i.e. a smaller value of  $\kappa$ ) which could lead to greater monthly interest payments on loans used to finance vertical integration. Therefore, while the social network may enhance  $r^b$ , it may not be enough to offset the disadvantages network members face due to shorter credit histories.

Third, outlets that are members of social networks may have advantages in hiring good workers, thereby making it easier to expand the workforce to the size necessary to operate a vertically integrated establishment. The ability of a social network to build and enforce reputations can help employers within the network get a better performance out of workers because workers need to maintain good reputations if they will ever seek employment within the network again. The social network therefore works to increase  $r^w$ , which can either increase the quality or lower the costs when vertically integrated. The prediction is therefore a positive relationship between social network membership and vertical integration, holding all else equal.

Fourth, outlets that are members of social networks may have a greater ability to affect the reputations of their upstream suppliers, which would provide them better quality or lower input prices than out-of-network outlets. While a repeat purchase mechanism is a primary determinant of an upstream supplier's reputational capital with an outlet,  $r''$ , the presence of a social network also increases  $r''$  by increasing the potential penalty against an upstream firm for undersupplying quality. This can occur through two channels. The first channel is independent of whether or not the supplier is a member of the social network. It operates if the outlet spreads bad word-of-mouth to other within-network buyers (both present outlets and potential entrants). This increases the penalty that can be imposed on an upstream supplier to include lost future sales from all within network outlets that are aware that quality was undersupplied.

The second channel through which an outlet can affect the reputation of the upstream firm is only available if the supplier is also a member of the social network. A within network supplier can be penalized up to the entire value of the social capital made available to it by network membership. In other

words, the outlet can communicate the problem to any or all members of the social network. So, the second channel does not require that the outlet has any relationship with the supplier's other customers.

It is possible that both or just one of these two channels determines the reputational capital of the upstream firm. However, the common theme between these channels is that the social network increases the reputational capital of the supplier by expanding the potential penalty for undersupplied quality beyond just the lost future sales of the affected outlet. In the first channel, the penalty includes lost future sales from other customers, in the latter, it includes social network benefits from many potential network members outside of the industry as well. Upstream suppliers with more reputational capital at stake in a relationship should provide better quality or lower prices, implying that social network members may have an outsourcing advantage relative to non-members whose suppliers have less reputational capital at stake. This suggests that, all else equal, social network membership should be negatively correlated with the decision to vertically integrate.

To summarize, a social network may either increase or decrease the incidence of vertical integration. If it increases the incidence of vertical integration it can arise through better access to credit or stronger worker reputations. If it decreases the incidence of vertical integration, it arises through reputational effects between the firm and its upstream supplier. The alternative explanation for a negative correlation arises if social network members' access to formal credit markets is sufficiently inferior to more than offset any access to credit benefits of the network.

Now that we have outlined the potential effects of social network membership on the decision to vertically integrate, we will (i) use institutional details about the laundry services industry to explore the viability of some of these potential effects, and (ii) estimate the empirical relationship between membership in a language-based social network and the decision to vertically integrate both laundry and dry cleaning services.

### **III. Laundry Services and the Social Network**

Laundry services include two primary types of cleaning: regular laundering and drycleaning.<sup>8</sup> In studying vertical integration, we will consider the decision of storefronts to perform each of these services on site, as opposed to outsourcing the cleaning.<sup>9</sup> In this section, we will briefly describe the types of inter-firm relationships that can exist in this industry. We will also show that the capital costs of vertically integrating laundry services are small, such that access to credit may not be an important determinant of vertical integration. Then we will discuss the important role of quality in this industry, arguing that reputations of suppliers or workers could be an important channel for social networks to affect vertical integration decisions.

#### ***A. Types of Establishments***

In the mid-1900s, the efficient scale to launder or dryclean clothes was quite large and typically performed in a factory. These factories cleaned clothes for drop-off locations, the majority of which were jointly owned with a factory (Shaw, 1973). Shortly thereafter, small cleaning machines that could be located on premises were invented and consequently reduced the minimum efficient scale of cleaning. This changed the industry structure in two ways. It allowed firms to start doing some of the cleaning in their satellite stores and it allowed many entrepreneurs to enter the market through one-store firms.

Currently, laundry service entrepreneurs have a few options for the type of store they want to operate. They can operate a pure drop location in which they outsource both laundry and drycleaning, or they can operate a store that integrates either or both services. Each storefront therefore faces a separate make-or-buy decision for laundry and drycleaning. While these stores may purchase their cleaning

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<sup>8</sup> It is believed that drycleaning was discovered by accident when a petroleum based liquid spilled onto a dirty piece of fabric; the liquid quickly evaporated and the fabric was left free of stains (IFI, 2002). Ever since then, petroleum based solvents, as well as other types, have been used to clean fabrics which are too delicate for regular laundering.

<sup>9</sup> It is possible that store could outsource its cleaning to another jointly owned store. We account for this possibility in our empirical analysis by observing whether or not the store is part of a chain.

services from either a stand-alone plant that only cleans clothes or another store-front that launders and/or drycleans on premises, we focus only on whether or not the cleaning is performed on premises.<sup>10</sup>

### ***B. The Role of Credit in Laundry Services***

To provide a context for the ease of entry and vertical integration in laundry services, we have summarized the financial costs for a store ranging from 800 to 2,000 square feet in Table 1. The figures indicate that these businesses can be started quite cheaply (only a \$49,900 total investment for a drop-off location). Fully integrating into both laundry and dry-cleaning imposes an additional cost of approximately \$130,000. Down payments are 20%, so fully integrating only requires an additional \$26,000 of startup capital. In terms of monthly payments, vertically integrating requires an additional \$1,433 per month.

As we outlined above, access to credit can be an important issue in social networks. If social networks facilitate relationships between outlets and local financiers, the borrowing rate could be lower. To provide a benchmark for the magnitude of such an effect, we consider the effect of lowering the interest rate down to the prime rate. This implies savings of approximately \$157 per month. This is certainly not a substantial savings for a laundry outlet with monthly revenue expected to reach roughly \$26,000 by the end of the first year of operation.<sup>11</sup>

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<sup>10</sup> Other papers documenting aspects of the drycleaning industry are Simester (1995) and Bracker and Pearson (1986).

<sup>11</sup> The \$26,000 per month is based on predictions by Americlean. However, in LA county, the average sales of a laundry service outlet are just over \$53,000 per month according to the 2002 Economic census.

Table 1

**Approximate Investments and Expenses by Type of Laundry Service Firm**

	<b>Drop-off Location</b>	<b>Fully Integrated</b>	<b>Difference</b>
<b>Fixed Costs Analysis</b>			
<b>Typical Outlet</b>			
Total Investment	\$49,900	\$179,900	\$130,000
Required Downpayment	20%	20%	20%
Interest Rate (Prime +2.75%)	11.00%	11.00%	11.00%
Term (in years)	10	10	10
Appx. Monthly Loan Payments	\$550	\$1,982	\$1,433
<b>Better Access to Credit</b>			
Interest Rate (Prime)	8.25%	8.25%	8.25%
Appx. Monthly Loan Payments	\$490	\$1,765	\$1,276
Difference from Typical Outlet	-\$60	-\$217	-\$157
<b>Poor Access to Credit</b>			
Interest Rate (2 x Prime)	16.50%	16.50%	16.50%
Appx. Monthly Loan Payments	\$681	\$2,456	\$1,775
Difference from Typical Outlet	\$131	\$473	\$342
<b>Marginal Costs Analysis</b>			
<b>Typical Outlet</b>			
Monthly Sales	\$26,000	\$26,000	\$0
Cost of Operating Supplies (% of Sales)	0%	5%	5%
Outsourcing Expenses (Percent of Sales)	50%	0%	-50%
Monthly Marginal Costs (Total)	\$13,000	\$1,300	-\$11,700
<b>Better Relationship with Upstream Supplier</b>			
Cost of Operating Supplies (% of Sales)	0%	5%	5%
Outsourcing Expenses (Percent of Sales)	45%	0%	-45%
Monthly Marginal Costs (Total)	\$11,700	\$1,300	-\$10,400
Difference from Typical Outlet	-\$1,300	0	\$1,300

The above reported estimates come from business package descriptions reported at <http://www.americleancorp.com/business.cfm> on October 9, 2006

The other potential access to credit issue arising in social networks is that social network members themselves may have worse access to formal credit markets. This could imply a much higher interest rate.<sup>12</sup> To benchmark this effect, we consider raising the interest rate to double the prime rate. In

<sup>12</sup> Because we consider the margin between vertically integrating or not, as opposed to the entry decision, it is reasonable to assume owners with worse access to credit in fact do have access to credit, just at a higher rate.

this case, poor access to credit raises the cost of vertically integrating by \$342 per month: still not a substantial difference in fixed costs.

The fact that vertically integrating in laundry services does not require incredibly large increases in investments keeps the effects of access to credit to be relatively small. It is possible that these amounts could affect some cleaners on the margin of vertically integrating, but that would imply a fairly small effect of the social network on vertically integrating, whether increasing it due to better credit or decreasing it due to worse credit.

One factor excluded in this analysis is the notion of credit limits. It is possible that a creditor, whether formal or informal, may only be willing to lend enough to open a drop location. For this to be true, the creditor must not know the reputational advantages available to the entrant, because, if they did know these advantages, they would not impose a constraint that eliminated a comparative advantage for integrating. Informal lenders are much more likely to know whether these network advantages exist and we therefore expect to be less likely to impose an inefficient constraint. On the other hand, if the entrant has access to formal credit, it is not clear why they would impose such a constraint when they can raise the interest rate to the appropriate risk level and use the equipment as collateral for the loan.

### ***C. The Role of Quality and Reputation in Laundry Services***

An institutional detail of laundry services that relates to vertical integration and social networks is the fact that quality is both a critical determinant of customer satisfaction and is sufficiently variable that it creates tensions between buyers and sellers. For example, a study by Saint Louis University's school of business titled "Customer Complaints: Closing the Gap" identified drycleaning (likely referring to laundry service stores providing drycleaning) as number 7 in a list of the top 10 in industry complaints.<sup>13</sup>

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<sup>13</sup> The other industries in the top 10 for complaints included: (1) franchised auto dealers, (2) used auto dealers, (3) home remodeling contractors, (4) auto repair shops, (5) home furnishing stores, (6) mail order product sales, (8) roofing contractors, (9) telephone companies, and (10) floor covering stores.

Furthermore, 72% of all complaints in drycleaning had a root cause being product or service quality, which ranked the industry first in quality related complaints.

While these tensions are between store-fronts and their customers, there are likely similar tensions between store-fronts and their suppliers. The primary reason being that those end-users complaining about quality are complaining about quality provided by the upstream supplier in cases where the cleaning was outsourced. End-user dissatisfaction likely leads to store-front dissatisfaction with suppliers. This is an agency problem between the storefront and its agent contracted to clean the clothes.

A storefront has two primary options for assuring that it receives the necessary quality to satisfy its end-users. First, the storefront may choose to incur the costs detailed above to integrate and clean clothes on-site. While at first glance this may just appear to shift the agency problem to within the firm, this problem should be much less important as monitoring is less costly within the firm. Specifically, when the agency problem exists between a storefront and its suppliers, the manager can only monitor by inspecting clothes after they have been cleaned. Within the firm, the manager may personally clean clothes or observe the input of its employees and indirectly monitor while performing managerial tasks.

The second option for assuring quality is by outsourcing to suppliers that have the proper incentives to deliver expected quality. Klein and Leffler (1981) provide a framework for understanding how such quality provision is achieved. In their model a supplier provides quality to avoid losing quasi-rents derived from future sales. In the case of laundry services, the quasi-rents would be a premium a storefront pays when outsourcing. The greater the future quasi-rents an outlet can potentially withhold, the lower this premium needs to be. In our outline of the vertical integration decision in laundry services in Equation (1), this is captured by the reputation between the outlet and the upstream firm,  $r^u$ , on marginal costs,  $c$ , and/or quality,  $z$ .

The Klein and Leffler (1981) model makes the probably unrealistic assumption that a buyer can costly communicate with all other buyers. Our implementation of their theory in the context of social networks recognizes that communication will be more concentrated within the network. In other words, a given buyer's ability to affect the upstream firm's reputation is a function of whether the buyer is a member of the social network.

Highlighting the role of the network in such interactions relates to Granovetter's (1985) argument that "most behavior is closely embedded in networks of interpersonal relations." The network enhances the reputation which is at stake in an implicit contract between a buyer and seller. While this utilizes the concept of embeddedness, acceptance of this idea from the Granovetter perspective may depend more on how the network itself operates. For instance, Granovetter would likely reject the notion that the social network enhancing the reputations of the agents is itself a result of a complex web of economic incentives and implicit contracts. This would likely be an undersocialized view from his perspective. The basis for network cohesion is however beyond the scope of this paper. We merely want to establish empirically that membership in a social network (which is treated itself as primarily exogenous) does enhance the relationships between agents and therefore facilitates implicit or explicit contracting between downstream firms and their upstream suppliers.

To this goal of evaluating social network membership on the strength of relationships between firms and their suppliers, an upstream firm may also have more at stake if it is a member of the same social network as the buyer. In this case, the penalty associated with cheating a fellow network member can be imposed by any agent in the network. From an economic perspective following Klein and Leffler, the implication is not just that other network member buyers will withhold future sales from the upstream firm, but that network members outside the industry may also withhold the future stream of social capital benefits the upstream firm may realize in either professional or personal interactions within the network.

Through these channels, a social network member may therefore be able to increase the sanctions beyond its own repeat-purchase mechanism by spreading bad word-of-mouth within the network. This additional threat of a social network member outlet could decrease the outsourcing expenses required to assure expected quality.

As we did with the access to credit effects, we benchmark the potential magnitude of the social network effect on monthly costs as a percent of sales. In Table 1, outsourcing costs for the typical outlet are expected to be 50 percent of sales. We therefore evaluate how much these costs would decrease if a social network helped an outlet obtain outsourcing costs of only 45 percent of sales. We see that monthly costs drop by \$1,300 from \$13,000 to \$11,700 for an outlet with monthly revenue of \$26,000. This is nearly four times greater than the largest potential effect of a social network on access to credit as outlined in the fixed cost analysis in Table 1. Furthermore, because the social network effect on outsourcing costs is a marginal effect, the sales volume of the outlet could increase this substantially. For instance, the average cleaner in the geographic location we study below, Los Angeles county, has monthly sales of \$53,000, implying that a social network lowering outsourcing costs to 45 percent would lower monthly costs by \$2,650.

We have considered both access to credit and quality effects for a firm fully-integrating into both dry-cleaning and laundry, but it is important to note that the quality concerns leading to potential agency problems are more severe for drycleaning than laundry. There are a couple of reasons for this. First, the clothes that are drycleaned are typically more expensive and have fabrics that are much more prone to damage. Second, the drycleaning process is fairly complex, using chemicals that are extracted from fabrics, filtered, and then reused.<sup>14</sup> Inappropriate chemicals or poorly filtered chemicals are obvious potential sources of quality concerns. In addition, if garments are removed from the dryer prematurely,

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<sup>14</sup> Fabrics are pre-treated for stains and then put through a machine which uses liquid solvents. These solvents do not completely saturate the fibers of the garment, reducing the swelling and shrinking which can be harmful to some fabrics when cleaned with water. The most common solvents are perchloroethylene (PCE) and petroleum-based solvents. PCE is more commonly used by commercial drycleaners. After going through the cleaning process, the fabric is then dried and pressed (EPA 1995).

the garments can retain a scent of the chemicals. We therefore expect that options for resolving agency problems may be more important for drycleaning than laundry. We find empirical evidence consistent with this in section V.

#### ***D. The Definition of the Social Network***

We now turn to how we define the social network for the purposes of our empirical analysis. It is important to note that we cannot observe the exact social network relationships outlined in section II, so we will be agnostic about the exact manner in which the social network functions in the empirical specification. In the case of access to credit, the social network likely involves laundry service stores and financiers within the social network. In the case of resolving the agency problem, the network involves current storefronts and past and future storefronts that provide or receive referrals, as well as other community members that communicate or care about bad word of mouth.<sup>15</sup> However, other network members such as end-customers or acquaintances could also facilitate this communication.

While observing all of the potential relationships described above is unmanageable, we rely on an indicator for whether or not a firm is more likely to have these valuable social ties. In southern California, there are more than 2,000 Korean cleaners, suggesting there may likely be a Korean network. The stores defined in this paper to be in the social network are Korean owned or operated stores located in an area defined to be Koreatown (see Appendix 2 for our definition of Koreatown). Koreatown itself defines a language and ethnic based social network. It is therefore reasonable to assume that Koreans in Koreatown would be most likely to receive benefits of Korean social ties. This is not to say that Korean networks do not exist outside Koreatown. Other Korean networks could exist and also help to provide access to credit or reduce a quality related agency problem, but in Koreatown, these networks should be

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<sup>15</sup> One might ask why laundries would communicate if they presumably compete with one another. The dense geographic concentration of these firms suggests there are local convenience aspects, such that a given cleaner may only compete with those cleaners located very close. For instance, in Koreatown, we have sampled 38 cleaners. It is very unlikely that each cleaner competes with all 37 other cleaners. The social ties can act as a substitute for the incentives of subsets of the firms to merge.

stronger. To the extent that these networks exist, our empirical approach is to evaluate the incremental effect of being a Korean located in Koreatown.

Testing for the presence of networks outside Koreatown is beyond the scope of this paper due to a data and a modeling issue. First, we would need to observe all of the laundry service stores (or at least a much greater sample) to identify networks elsewhere. Second, we would have to deal with the endogenous formation of the network. By focusing on the Koreatown network in this paper, we can safely assume the formation of Koreatown is exogenous to laundry services.

## **IV. Data**

Our empirical approach involves relating the propensity to integrate services on premises to membership in a language-based social network. We chose the laundry services industry because of the variation in make-or-buy decisions with respect to their two primary services and the important role of quality provision, which the reputation within a social network could help assure. We chose the Los Angeles area because of its proximity and familiarity to the authors and a large concentrated community of Korean speaking individuals, who operate roughly 2,000 cleaners in southern California. We conducted a survey to find out their make-or-buy decisions with respect to laundry and drycleaning, the languages spoken, the prices and turnaround times for each service, and other services offered by the firm. We also conducted some follow-up interviews to try to learn about some features of the upstream.

### ***A. Downstream Survey Details***

During the weeks of March 21<sup>st</sup>- 25<sup>th</sup> and April 25<sup>th</sup>-30<sup>th</sup> 2005, we collected survey data from cleaners in four roughly defined areas of Los Angeles: Koreatown, Chinatown/Downtown, Century City, and Santa Monica. It is important to note that stores sampled in the Koreatown region may be either within or outside the Koreatown boundaries used to define the social network. Thirty surveys were completed in each area for a total sample of 120. A copy of the eight-question survey can be found in Appendix 1.

Two days were needed to collect data from each area. The drycleaners were randomly selected from 80 online yellow-page listings per area. A research assistant drove to each of the randomly selected locations and administered the survey in person. In the Koreatown area, 43 drycleaners were visited and 30 successful surveys were collected. The research assistant believes that the refusal to fill out the survey was related to the English speaking ability. We therefore conducted a follow-up telephone survey to account for these non-responses and increase our overall sampling in the Koreatown area. For this survey we had a Korean-speaking research assistant ask an additional 18 cleaners whether they were outsourcing each service, which price they charged, whether or not they spoke Korean and whether or not they were a chain. Our response rate for this telephone survey was 100 percent.<sup>16</sup> While this paragraph has discussed a broad area including and surrounding Koreatown, all future references to Koreatown will refer specifically to the census tracts used to define the social network.

We also administered surveys in the vicinity of Chinatown. None of the randomly selected cleaners were located in Chinatown proper and, when driving through it, our research assistant was unable to locate any.<sup>17</sup> Many of the cleaners in this area were in predominantly Hispanic neighborhoods or in downtown Los Angeles. In this area, 35 cleaners were visited with 30 surveys successfully completed. The primary reason for incomplete surveys in this area was a drycleaner that was closed or no longer existed.

We surveyed the areas of Century City and Santa Monica to locate Korean cleaners operating outside the social network defined by Koreatown and to locate controls to identify Koreatown specific effects. 77 cleaners were visited with a success rate of 60. The primary reason for incomplete surveys in these areas seemed to be that they were either busy or felt the survey was not worth their time.

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<sup>16</sup> One number dialed was no longer a laundry service firm.

<sup>17</sup> There may be a Chinese network in the Monterrey Park area of Los Angeles county, but we have focused on the Korean network because of the dominance of Koreans in laundry services in southern California.

In general the survey was well received, though some people became defensive and/or refused to answer certain questions. Such behavior was rarely experienced before the fifth question, which asks for price information. When it came to this question, many people would suddenly want to know more information about why we were doing this survey, and why we wanted to know their prices.

## ***B. Summary Statistics***

Table 2 summarizes the variables used in our statistical analysis below. We have divided the variables into those describing the drycleaning decisions of the stores, the laundering decisions of the stores, the store characteristics, and census tract characteristics where the stores are located.

**Table 2. Summary Statistics**

	<b>Mean</b>	<b>Std. Dev.</b>	<b>Count</b>	<b>Min</b>	<b>Max</b>
<b>Dry Cleaning</b>					
<b>Integration</b>	0.70	0.46	138	0	1
<b>Price</b>	7.21	5.68	131	1.99	50
<b>Turnaround Time</b>	0.95	0.88	113	0	3
<b>Laundering</b>					
<b>Integration</b>	0.54	0.50	138	0	1
<b>Price</b>	1.78	0.97	130	0.99	10
<b>Turnaround Time</b>	1.00	0.92	113	0	4
<b>Store Characteristics</b>					
<b>Korean Speaking</b>	0.43	0.50	138	0	1
<b>Located in Koreatown</b>	0.28	0.45	138	0	1
<b>Chain</b>	0.15	0.36	138	0	1
<b>Stores within 1/2 mile</b>	6.99	4.01	138	1	19
<b>Census Tract Characteristics by Store</b>					
<b>% Korean Speakers</b>	0.09	0.12	138	0	0.42
<b>Median Income</b>	38768	17162	138	8125	96691
<b>Apparel Expenditure per Capita</b>	572	206	138	136	1031
<b>Textile Expenditures per Capita</b>	38	18	138	6	139
<b>Emp. By Ethn Firm</b>	1264	953	138	0	3921
<b>Fem Emp by Ethn Firm</b>	584	459	138	0	1801

This table presents summary statistics of the variables used in our statistical analysis.

Integration (as opposed to outsourcing) refers to whether or not laundry and drycleaning are done on the premises. Laundry and drycleaning each have an integration dummy equal to one if the process is done on-site. As we can see from the summary statistics table, 54% of the stores launder on their premises and 70% of them dryclean on their premises.

The variable titled Korean Speaking is an indicator for whether or not the store is Korean-speaking. 43 percent of the cleaners are Korean speaking. These cleaners located within the boundaries of Koreatown as described above are considered to be in the social network. The percent of stores in the Koreatown social network boundaries are 28 percent of our sample. The census tracts in our data set had an average of 9 percent Korean speakers, with a maximum of 41.8 percent in a tract in Koreatown.

We also asked the stores whether or not they were part of a chain. This allows us to account for the fact that some store-fronts may be owned by their suppliers. Just over 15 percent of stores in our sample were classified as chains.

The number of stores within a half mile of the address of each outlet ranges from 1 to 19. The minimum is 1 because we include the store itself so that we can take the log of this variable in estimation. On average there are 7 stores within this small area. This suggests competition is intense, but it also suggests that geographic location may be critical. In other words, customers highly value the convenience of an outlet's location. This can also help explain why network stores might communicate with one another. An outlet might not compete with all the others in this small area and if we expand beyond a half mile there are potentially many more outlets that it may share suppliers with, but not compete directly with.

In our empirical analysis below, we use a few variables to account for local market characteristics. One is the number of local competitors. We also include the median income of the census tract to account for those tracts that may have a greater taste for quality. Similarly, we also use some imputed measures for the apparel and textile expenditures per capita. These were obtained from the

University of Wisconsin, Milwaukee Purchasing Power Profiles. They combine Consumer Expenditure Survey information by income group and geography with income groups in the census tract to obtain the estimates.<sup>18</sup>

We also included employment levels of the census tracts to control for demand differences. The overall employment and the female employment levels are used to account for differences between laundry and drycleaning, in that laundry services are used predominantly by men, and drycleaning services predominantly by women. We also entered the employment numbers according to whether or not the cleaner was Korean-speaking. Specifically, for Korean-owned stores we used the number of employed Asians, while for non-Korean-owned stores we used the number of employed non-Asians. The purpose of this is to account for the fact that network members may have faced demand characteristics specific to their ethnic group. Employment in a census tract is about 1,264 on average, while female employment is 584 on average.<sup>19</sup>

To document prices for laundry and drycleaning, the survey asks for the prices of two standard items: a long-sleeved, collared, button-down shirt (laundry) and a full-length dress (drycleaning). The average prices charged for laundering and drycleaning are \$1.78 and \$7.21 respectively.<sup>20</sup> Similarly, the minimum turnaround time for laundering a shirt and drycleaning a dress are 1 day and 0.95 days respectively.

### ***C. Upstream Survey Details and Implications***

While our primary focus and later empirical analysis concentrates on the outsourcing decisions of downstream cleaners, pieces of our analysis described above could be linked to characteristics of the

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<sup>18</sup> Visit <http://www.uwm.edu/Dept/ETI/PurchasingPower/ETImethodology.htm> for a more detailed description of these variables.

<sup>19</sup> Instances of zero employment correspond to a Korean speaking store located in area the Census reports having no employed male or female Asians.

<sup>20</sup> The cleaner charging \$50 for dry-cleaning is a “French Laundry” in the Santa Monica area. As assurance that such an outlier does not affect our results, it was one of 17 stores in the Santa Monica and Century City areas that were excluded in a robustness check requiring that each store have an overlapping support in the probability of being located in Koreatown. See section V.B for more details.

upstream firms. We excluded such questions from the initial survey because we wanted to assure a high response rate and recognized that respondents will be less compliant with more specific questions. However, we conducted a follow-up survey to try to learn as much as possible about the upstream. As expected, response rates were poor and too selective to include in our data analysis<sup>21</sup>, but we provide some of the information here to at least document some of the data points in the support of the distribution of upstream characteristics. We discuss our findings here in the context of their implications for our overall empirical strategy described above and estimated below.

First, as we describe above, there are additional reputation effects at stake if the upstream supplier is also a network member. In such instances, a downstream cleaner does not need to be able to communicate with other actual or potential customers of the upstream supplier, if it can damage the upstream owner's reputation with other network members external to the industry. Consistent with this possibility, we find that most of the responding non-integrated Korean cleaners in Koreatown do outsource to other Koreans. This suggests that social network effects beyond the industry could be at play.

However, there are also some non-Korean upstream cleaners that do reportedly supply Korean cleaners in Koreatown. Reputations here may be more likely to be founded on communication between the Korean customers of a given supplier. To assess whether such communication exists, we asked outsourcing Korean cleaners in Koreatown whether they knew any other customers of their suppliers. Five of eight responding cleaners said they did and three of these identified the other customers as Koreans. The other two did not answer whether or not the other cleaners were Korean. We therefore conclude that there is at least anecdotal support that reputation effects may be working through both groups of network member customers and community members outside the industry.

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<sup>21</sup> Of the 75 stores in our sample that we had a Korean speaking research assistant contact, only 39 of them provided any information about the upstream and most stopped answering questions at some point.

Second, the number of local suppliers is important because we need to be sure that downstream cleaners have a credible alternative upstream supplier. We therefore asked each of the integrated Korean cleaners in Koreatown whether or not they were a supplier. Though our follow-up survey is not representative, 70 percent of the responding integrated Korean cleaners in Koreatown are suppliers. While some only provide one service, we observe multiple suppliers of both dry cleaning and laundry services. This fact is also important because it assures us that a downstream cleaner's decision to outsource only one service is not due to limited local upstream availability of that service.

Finally, while we were unable to ask directly about the size of upstream suppliers, we were able to get an idea of how many downstream cleaners some of the upstream cleaners supplied. Most supplied just two or three downstream cleaners, but one indicated a larger number, though it would not be specific. This suggests that the upstream is fairly competitive in that many integrated cleaners can easily leverage their underutilized capacity to become a supplier. Furthermore, those upstream cleaners located in Koreatown seemed to be predominantly supplying other Koreatown cleaners. This suggests that proximity is important. This helps assure that networks of buyers in this industry are local enough to be confined to a region such as Koreatown.

The calls also provided information about Korean networks outside of Koreatown. We found that most Korean stores outside of Koreatown do all their cleaning in-house and they do not supply to other stores (14 out of 19 stores). In our sample, four fully integrated Korean stores located outside of Koreatown supply dry-cleaning to other stores that are all located outside of Koreatown. The customers of these stores are 30 to 100 percent Korean, depending on the specific store. When these customers are predominantly Korean, there may be social network reputation effects enforced by the buyers. However, we still expect these reputation effects to be smaller because there is not as large of a Korean community external to the industry to provide additional sanctions or spread bad word of mouth.

These findings have three main implications regarding the role of upstream suppliers and the mechanisms through which social networks affect make-or-buy decisions in this industry. First, the fact that many stores act as suppliers for other stores suggest that it is difficult to separate whether information about reputation flows among downstream firms that share an upstream supplier or through the social network that is common to both the upstream and downstream firms. Second, the more intensive interaction between Korean upstream and downstream firms inside Koreatown than outside of Koreatown suggests that social networks are better able to enforce contracts in Koreatown than elsewhere even though the evidence suggests that a Korean network outside of Koreatown may exist. Finally, the fact that outsourcing cleaners in Koreatown know their supplier's other customers supports the network enforced reputation effects outlined above.

#### ***D. Analysis of Vertical Integration Using Differences in Means***

**Table 3. Integration Statistics by Social Network Status**

	<b>Dry Cleaning</b>	<b>Laundering</b>
<b>Korea Town</b>		
<i>Korean</i>	0.5000 (0.1000)	0.3846 (0.0973)
<i>Non Korean</i>	0.8462 (0.1042)	0.8462 (0.1042)
<b>Elsewhere</b>		
<i>Korean</i>	0.7353 (0.0768)	0.5882 (0.0857)
<i>Non Korean</i>	0.7231 (0.0559)	0.5231 (0.0624)
<b>Difference in Differences</b>	-0.3584 (0.1728)	-0.5267 (0.1776)

The table describes average integration incidence by service (dry cleaning or laundering), location (korea town or elsewhere) and language (korean or non-korean). Standard Errors are in parenthesis.

In Table 3, we report summary statistics of integration decisions by service (laundry or drycleaning) and by location (in Koreatown versus outside Koreatown). Outside Koreatown, Koreans and non-Koreans are not significantly different in their incidence of vertical integration. They integrate both services at about the same rate (just over 70% for drycleaning and between 50 and 60 percent for laundry). However, in Koreatown, Koreans are much less likely to integrate than non-Koreans. In drycleaning, Koreans are 34 percentage points less likely to integrate and in laundry, Koreans are almost 50 percentage points less likely to integrate. Both of these differences are statistically significant, as are the differences in differences from comparing stores in and out of Koreatown as reported in the table. This is the primary empirical finding of our paper which we will explore with regression analysis in the next section.

Another relevant fact revealed in Table 3 that we also evaluate in our regressions is that stores tend to integrate drycleaning more than laundering. There is an 11 to 20 percentage point difference for all of the store language combinations except non-Korean in Koreatown. The fact that drycleaning is more likely to be integrated is consistent with the notion that quality concerns may be an important feature for the make-or-buy decision in this industry.

**Table 4. Prices and turnaround time by integration**

	<b>Price Dry Cleaning</b>	<b>Price Laundering</b>	<b>Time Dry Cleaning</b>	<b>Time Laundering</b>
<b>In Premises</b>	7.7538 (6.6893)	1.9311 (1.2057)	0.8675 (0.8803)	0.9091 (0.9237)
<b>Out of Premises</b>	6.0254 (1.8091)	1.5802 (0.4025)	1.1667 (0.8743)	1.1277 (0.8997)

This table presents summary statistics of prices and turnaround times for dry cleaning and laundering services by whether services are taking place in or out of premises. Numbers in parenthesis are standard deviations.

While the focus of this paper is not investigating the effects of vertical integration, but rather the determinants of vertical integration, it is useful to quantify some related outcomes to motivate the importance of the make-or-buy decision. By integrating a service on premises, it should be easier for a cleaner to turnaround an item on the same day. We do see evidence of this in the summary statistics reported in Table 4. Cleaners that provide these services on premises turn around both laundry and drycleaning in less than a day, while non-integrated cleaners take more than a day on average. We see prices for integrated cleaners to be higher for a couple of potential reasons. First, a shorter turnaround time is greater quality and cleaners may be able to capture some of this value in their price. Second, integrated cleaners probably have not been able to find a reputable cleaner with a premium low enough to allow it to purchase services. If all cleaners face the same costs of producing the services in-house, then

those unable to find a reputable cleaner likely have greater costs. While the market is competitive, the geographic differentiation could allow the costs to affect prices.

## V. Results

In this section we show results from investigating the relationship between the social network and make-or-buy decisions controlling for neighborhood fixed effects, and other local demand characteristics.

Our empirical approach follows the specification of Equation (1). However, we are unable to observe the relationships and reputational capital between agents,  $r$ , and therefore we cannot evaluate directly the impact of the social network on vertical integration decisions. Bertrand, Luttmer and Mullainathan (2000) face this same problem when they investigate the effect of social networks on welfare use. They argue that even if the network itself was observed and somehow measured, the analysis would still suffer from severe measurement and omitted variable problems. They address this issue by interacting ethnicity membership and network availability by neighborhood.

For the same reason, we follow a similar indirect approach. Group membership is defined by whether an outlet has a defining characteristic,  $K \in \{0,1\}$  (i.e. is it owned and/or operated by a Korean), and whether or not workers, suppliers, or financiers in the outlet's geographic proximity are very likely to have that characteristic,  $KT \in \{0,1\}$  (i.e. is the outlet located in Koreatown).<sup>22</sup>

Given this specification for our social network analysis, the relationship between a social network and vertical integration is described by the correlation between  $vi$  and the interaction of  $K$  and  $KT$ ,  $K \times KT$ . The relationship between  $vi$  and  $K$  will pick up factors common to Korean speaking outlets located in either Koreatown or elsewhere. The relationship between  $vi$  and  $KT$  will pick up factors

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<sup>22</sup> An alternative specification would be to use the distance to the center of Koreatown to measure the strength of the social network. We cannot however do this because there is not a well-defined center of Koreatown. For instance, in Figure 1 in the appendix, there is large Korean share on some census tracts on the border of Koreatown and also a small share of Koreans in some census tracts on the interior of Koreatown. We therefore do not expect the Korean network to be more accessible in the geographic center of the region we have defined to be Koreatown.

common to outlets in Koreatown, whether operated by a Korean or non-Korean. The relationship between  $vi$  and  $K \times KT$  will therefore explain all systematic differences of Korean speaking outlets in Koreatown relative to non-Koreans located anywhere and Koreans located outside Koreatown. This will specifically estimate the social network effect if none of the other variables in Equation (1) are correlated with  $K \times KT$ . Marginal cost determinants,  $\eta$ , will not likely differ for Koreans and non-Koreans in Koreatown, but it is possible some demand characteristics,  $\xi$ , will. We therefore extend our empirical specifications to include an extensive set of demand characteristics,  $Z$ . Our estimating equation is therefore a differences-in-differences as follows:

$$vi = \alpha K \times KT + \delta_K K + \delta_{KT} KT + \beta X + \gamma Z + \varepsilon \quad (2)$$

The variable  $X$  includes other explanatory variables such as fixed effects, whether or not the service of interest is dry cleaning or laundry as well as its interaction with  $K$  and  $KT$ . We begin our analysis with linear regression, but then estimate probit specifications, where  $vi$  in Equation (2) can be interpreted as a latent value of vertically integrating.

If we make the common difference-in-differences assumption of selection on observables (also referred to as unconfoundedness)<sup>23</sup>,  $E[\varepsilon \times (K \times KT) | K, KT, X, Z] = 0$ , estimates of  $\alpha$  will measure the average treatment effect of a Korean speaking store being in Koreatown. There are two reasons why we may want to relax this assumption, but either case still allows  $\alpha$  to inform us about the way social networks affect vertical integration. First, as we suggested previously, it is possible that Korean speakers in Koreatown may have less access to formal credit, which would imply the unobservable  $\kappa$  is in  $\varepsilon$  and is correlated with  $K \times KT$ . Such cases provide support for the fact that social network members do not get enough extra access to informal credit to offset their inherent disadvantages in acquiring formal credit.

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<sup>23</sup> See Imbens (2003) for a useful discussion of these assumptions.

Second, we may want to relax the assumption of selection on observables if not all Korean speakers have the same ability to take advantage of social network benefits. Our social network measure of  $K \times KT$  only proxies for relationships,  $r$ , being stronger. If  $r$  varies within Korean speakers, those operating stores in Koreatown may select into Koreatown, such that

$E[r | K = 1, KT = 1] > E[r | K = 1, KT = 0]$ .<sup>24</sup> In such cases, selection on unobservable differences in  $r$  will prevent  $\alpha$  from measuring the average effect of shifting a Korean speaking cleaner into Koreatown. However, if selection on unobservables only includes selection on unobservable differences in  $r$ , the sign of  $\alpha$  will still identify the sign of the relationship between the social network and vertical integration decisions.

### ***A. OLS Regressions***

We begin by running simple OLS regressions to estimate a linear probability model. While these models can certainly predict outside the desirable range, they are useful for establishing the sign of the effects and relating the estimation to the difference in differences reported in Table 3. Table 5 shows results from OLS regressions of combining observations from both laundry and drycleaning services. The coefficient on **Korean\*Koreatown** shows a negative relationship between vertical integration and social network membership. We run these regressions with and without chain stores included (controlling for them when included) and fixed effects at the neighborhood level. The fixed effects tend to make the results stronger.<sup>25</sup>

Of the four potential effects of a social network discussed in section II, this provides support for one of two potential effects: either a social network helps resolve a quality related agency problem

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<sup>24</sup> Along these lines, one possibility is that Koreans select whether to locate in Koreatown based on whether or not they plan to integrate or not. While a network effect favoring outsourcing over integration would certainly create such an incentive, it is not clear why a Korean with access to the Koreatown social network would not want to locate an integrated store in Koreatown. A customer with network benefits specifically for outsourcing laundry will likely have other network benefits as well.

<sup>25</sup> It is not reasonable to include finer geographic fixed effects such as zip-codes, because if the fixed effect is at a smaller level than the size of Koreatown, identification will focus only on zip-codes that have census tracts both in and out of Koreatown.

between an outlet and its supplier or social network members have inferior access to formal credit. This relationship will hold through the rest of our specifications. As we control for more factors through fixed effects, demand characteristics, and correlations in unobservables across services, the estimates tend to provide greater support for the agency effects.

In addition, the results reported in Table 5 show that stores are less likely to integrate laundering services than drycleaning services. This finding is consistent with our prediction that the service more sensitive to quality (drycleaning) should be the service also with a higher propensity to experience integration and be provided in-house. As expected, stores that belong to chains are also less likely to conduct services on their premises.

Table 6 shows results from OLS regressions that are very similar to those reported in Table 5. In this table, we include controls for census tract specific measures of median income, per capita expenditures on apparels and textiles, and the size of the labor force inside the network (Asian and non-Asian employment and female Asian and non-Asian employment)<sup>26</sup>. We also control for local competition by including the log of the number of stores within a half mile of the store's address. The previous results are robust to these new variables: cleaners in Koreatown are more likely to integrate than if located elsewhere, Korean cleaners in Koreatown are less likely to integrate than non-Korean in Koreatown and Korean elsewhere and drycleaning services are always more likely to take place on the store premises than laundering services.

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<sup>26</sup> We use Asian census tract employment when the store speaks Korean and non-Asian census tract employment when the store does not speak Korean.

**Table 5. OLS regressions with and without fixed effects**

<b>Dependent Variable: Integrate or Not</b>				
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
<b>Korean*Korea Town</b>	-0.5063 (0.1774)***	-0.5806 (0.1809)***	-0.5010 (0.1888)***	-0.5637 (0.1928)***
<b>Dry Cleaning</b>	0.2000 (0.0505)***	0.2000 (0.0508)***	0.2157 (0.0587)***	0.2157 (0.0591)***
<b>Chain?</b>	-0.2083 (0.1072)*	-0.1608 (0.1026)		
<b>Korean</b>	0.0448 (0.1055)	0.1130 (0.1061)	0.0843 (0.1144)	0.1446 (0.1133)
<b>Korea Town</b>	0.2942 (0.1233)**	0.5113 (0.1352)***	0.2843 (0.1307)**	0.4838 (0.1447)***
<b>Korean*Korea Town*Dry Cleaning</b>	0.1683 (0.1965)	0.1683 (0.1976)	0.1324 (0.2123)	0.1324 (0.2137)
<b>Korean*Dry Cleaning</b>	-0.0529 (0.0999)	-0.0529 (0.1004)	-0.0490 (0.1135)	-0.0490 (0.1143)
<b>Korea Town*Dry Cleaning</b>	-0.2000 (0.1646)	-0.2000 (0.1656)	-0.2157 (0.1798)	-0.2157 (0.1810)
<b>Constant</b>	0.5680 (0.0661)***	0.4837 (0.0676)***	0.5490 (0.0711)***	0.4727 (0.0718)***
<b>Fixed Effects</b>	No	Neighborhood	No	Neighborhood
<b>Observations</b>	276	276	234	234
<b>R-squared</b>	0.1	0.17	0.09	0.14

Columns 3 and 4 drop all stores that belong to chains.

Robust standard errors, clustered at the store level, in parentheses.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 6. OLS regressions controlling for local demand characteristics**

<b>Dependent Variable: Integrate or Not</b>				
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
<b>Korean*Korea Town</b>	-0.5822 (0.2189)***	-0.5763 (0.2142)***	-0.4762 (0.2339)**	-0.5139 (0.2299)**
<b>Dry Cleaning</b>	0.2000 (0.0511)***	0.2000 (0.0514)***	0.2157 (0.0595)***	0.2157 (0.0599)***
<b>Chain?</b>	-0.2034 (0.1022)**	-0.1437 (0.1101)		
<b>Korean</b>	0.0538 (0.1452)	0.1135 (0.1366)	0.0306 (0.1543)	0.0996 (0.1459)
<b>Korea Town</b>	0.4824 (0.1619)***	0.5874 (0.1535)***	0.4034 (0.1684)**	0.5486 (0.1669)***
<b>Korean*Korea Town*Dry Cleaning</b>	0.1683 (0.1987)	0.1683 (0.1999)	0.1324 (0.2152)	0.1324 (0.2167)
<b>Korean*Dry Cleaning</b>	-0.0529 (0.1010)	-0.0529 (0.1016)	-0.0490 (0.1150)	-0.0490 (0.1158)
<b>Korea Town*Dry Cleaning</b>	-0.2000 (0.1665)	-0.2000 (0.1675)	-0.2157 (0.1823)	-0.2157 (0.1835)
<b>Log Apparel Expenditures per capita</b>	-0.3433 (0.1217)***	-0.4816 (0.1016)***	-0.3425 (0.1235)***	-0.5105 (0.1079)***
<b>Log Textile Expenditures per capita</b>	0.2912 (0.0556)***	0.3065 (0.0526)***	0.2723 (0.0577)***	0.2974 (0.0579)***
<b>Log Median Income</b>	0.2028 (0.1098)*	0.1759 (0.1035)*	0.2341 (0.1086)**	0.2021 (0.1025)**
<b>Log Local Competition</b>	-0.0028 (0.0644)	-0.0494 (0.0728)	0.0012 (0.0689)	-0.0496 (0.0812)
<b>Emp. By Firm Ethnicity</b>	-0.0004 (0.0002)	-0.0002 (0.0003)	-0.0003 (0.0003)	-0.0002 (0.0003)
<b>Fem. Emp. By Firm Ethnicity</b>	0.0008 (0.0005)	0.0005 (0.0005)	0.0005 (0.0006)	0.0004 (0.0006)
<b>Constant</b>	-0.4609 (0.8934)	0.6535 (1.0353)	-0.6804 (0.9303)	0.6350 (1.1127)
<b>Fixed Effects</b>	No	Neighborhood	No	Neighborhood
<b>Observations</b>	276	276	234	234
<b>R-squared</b>	0.17	0.2	0.14	0.18

Columns 3 and 4 drop observations from all stores that belong to chains.

Robust standard errors, clustered at the store level, in parentheses.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

## ***B. Probit and BiProbit Specifications***

Table 7 reports results from probit regressions. Most of the results reported in this table are coefficients of these regressions (marginal effects are reported for the three top variables only). Results are equally robust to the probit specification since we still see a strong effect of the social network (Korean cleaners in Koreatown) on the make-or-buy decision. Similar to results in other tables, cleaners in Koreatown are less likely to outsource services, drycleaning services are more likely to take place inside store premises and stores belonging to chains are also less likely to integrate services.

Table 7 also reports the marginal effects of three main variables of interest. The social network effect ranges between 0.52 and 0.62. In other words, Korean cleaners in Koreatown are 52 to 62 percentage points less likely to dryclean or launder on their premises than Korean cleaners elsewhere or non-Korean cleaners located anywhere. We also find drycleaning services are always 22 to 24 percentage points more likely to take place on the premises of the store than elsewhere and we find a similar effect (around 20 percentage points) of chain membership on the probability to undertake services within the premises of the store.

Finally, Table 8 shows results from using a biprobit specification. This allows us to examine both outsourcing decisions (drycleaning and laundering services) independently at each store while controlling for unobservable factors (to the econometrician) that may drive both decisions simultaneously. We find a strong positive correlation in the unobservable errors (87% to 94%). In addition, we again find that Korean cleaners are less likely to dryclean and launder on their premises when located in Koreatown than non-Korean stores are anywhere or Korean stores located outside of Koreatown. Similar to results reported in previous tables, stores belonging to chains are also less likely to integrate services on their premises. Results are robust when dropping observations of stores belonging to chains and the inclusion of neighborhood fixed effects.

The correlations in the unobservable factors between vertically integrating dry-cleaning and laundry yield a very interesting feature of the social network effect. In all previous specifications, the variable **Korean\*KoreaTown\*DryCleaning** measuring the difference between the social network effect on dry cleaning and laundry, indicated that the network had a greater effect for laundry services. However, once we control for the fact that there are likely unobservable complementarities between these services, the effect on dry cleaning becomes greater. For instance in Table 6, the social network effect was 13 to 17 percentage points weaker for dry cleaning, though never statistically significant. However, in Table 8, the social network effect is 16 to 42 percentage points stronger for dry cleaning, with statistical significance ranging from the 71<sup>st</sup> to 95<sup>th</sup> percent confidence level. The estimates in Table 8 and their stark contrast to estimates in previous tables indicate that unobservables in the dry cleaning vertical integration decisions are spilling over to laundry. There is certainly a spillover effect into laundry, but in some cases it appears that the social network still has a direct effect on laundry as it is very significant in specifications (1), (2) and mildly significant in specification (3). Because dry cleaning is the more quality-sensitive service, this finding, together with the finding that dry cleaning is always more likely to be vertically integrated, provides strong support for the social network helping to assure that upstream firms deliver expected quality.

**Table 7. Probit Regressions**

<b>Dependent Variable: Integrate or Not</b>				
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
<b>Korean*Korea Town</b>	-1.8016	-1.7126	-1.4347	-1.5137
<i>Marginal Effect</i>	<i>-0.6252</i>	<i>-0.6029</i>	<i>-0.5259</i>	<i>-0.5504</i>
	(0.1928)***	(0.1870)***	(0.2547)**	(0.2304)**
<b>Dry Cleaning</b>	0.6033	0.6356	0.6389	0.6799
<i>Marginal Effect</i>	<i>0.2203</i>	<i>0.2321</i>	<i>0.2235</i>	<i>0.237</i>
	(0.0538)***	(0.0564)***	(0.0597)***	(0.0623)***
<b>Chain?</b>	-0.6012	-0.4562		
<i>Marginal Effect</i>	<i>-0.2326</i>	<i>-0.1759</i>		
	(0.1102)**	(0.1235)		
<b>Korean</b>	0.1301	0.327	0.047	0.261
	(0.3948)	(0.3983)	(0.4178)	(0.4259)
<b>Korea Town</b>	1.6057	1.7511	1.2924	1.6226
	(0.7627)**	(0.6458)***	(0.7478)*	(0.6578)**
<b>Korean*Korea Town*Dry Cleaning</b>	0.1885	0.3057	0.0792	0.1765
	(0.8424)	(0.7825)	(0.8774)	(0.8294)
<b>Korean*Dry Cleaning</b>	-0.1689	-0.1869	-0.1214	-0.1335
	(0.2915)	(0.3042)	(0.3438)	(0.3638)
<b>Korea Town*Dry Cleaning</b>	-0.3173	-0.4485	-0.3786	-0.5043
	(0.7878)	(0.7191)	(0.8123)	(0.7530)
<b>Log Apparel Expenditures per capita</b>	-2.4421	-3.1807	-3.1053	-3.6992
	(3.3811)	(3.8242)	(4.3483)	(4.4599)
<b>Log Textile Expenditures per capita</b>	1.9501	2.2906	2.4397	2.5651
	(2.7268)	(3.1110)	(3.4781)	(3.5971)
<b>Log Median Income</b>	0.7260	0.5851	0.7641	0.6416
	(0.3964)*	(0.3692)	(0.3966)*	(0.3712)*
<b>Log Local Competition</b>	0.0062	-0.1100	0.0412	-0.0880
	(0.1865)	(0.2160)	(0.2071)	(0.2469)
<b>Emp. By Firm Ethn.</b>	-0.0013	-0.0008	-0.0009	-0.0007
	(0.0007)*	(0.0008)	(0.0008)	(0.0009)
<b>Fem. Emp. By Firm Ethn.</b>	0.0027	0.0016	0.0017	0.0012
	(0.0015)*	(0.0017)	(0.0017)	(0.0019)
<b>Constant</b>	0.9334	6.2873	3.0836	8.1771
	(12.2094)	(14.2459)	(15.6883)	(16.7425)
<b>Fixed Effects</b>	No	Neighborhood	No	Neighborhood
<b>Observations</b>	276	276	234	234

Columns 3 and 4 drop observations from stores that belong to chains. Marginal effects reported in *italics* for variables of interest. Robust standard errors, clustered at the store level, in parentheses.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 8. Biprobit regressions**

	(1)		(2)		(3)		(4)	
	Dry Clean In	Launder In	Dry Clean In	Launder In	Dry Clean In	Launder In	Dry Clean In	Launder In
<b>Korean*Korea Town</b>	-1.9113	-1.4054	-2.1802	-1.259	-1.953	-1.0162	-2.4836	-0.9572
<i>Marginal Effect</i>	-0.6600	-0.4984	-0.7243	-0.4560	-0.6607	-0.3876	-0.7827	-0.3670
	(.1762)***	(0.1813)***	(0.1479)***	(0.1734)***	(0.2022)***	(0.2348)*	(0.1441)***	(0.2338)
<b>Difference Between Marginal Effects</b>	-0.1616		-0.2683		-0.2730		-0.4157	
<i>Wald Test P-Value</i>	(0.2886)		(0.1398)		(0.1814)		(0.0495)**	
<b>Chain</b>	-0.6393	-0.5467	-0.5148	-0.4				
	(0.3474)*	(0.3174)*	(0.3819)	(0.3504)				
<b>Korean</b>	0.0228	-0.1277	0.3327	0.0096	0.0758	-0.2962	0.4626	-0.1443
	(0.4649)	(0.4192)	(0.4359)	(0.4039)	(0.5130)	(0.4455)	(0.4598)	(0.4353)
<b>Korea Town</b>	1.6499	1.1897	1.9968	1.4633	1.381	0.9471	1.9368	1.3779
	(0.5688)***	(0.6213)*	(0.5897)***	(0.5319)***	(0.6195)**	(0.6093)	(0.6358)***	(0.5337)***
<b>Log Apparel Expenditures per capita</b>	-2.3872	-2.4954	-4.378	-2.2723	-4.4872	-2.0038	-7.4043	-1.9932
	(1.3649)*	(3.3588)	(4.5328)	(3.8202)	(4.8819)	(4.5779)	(4.7550)	(2.4350)
<b>Log Textile Expenditures per capita</b>	1.3475	2.3377	2.5855	1.8085	2.6597	1.9728	4.3747	1.5449
	(1.0336)	(2.7131)	(3.5505)	(3.1097)	(3.9155)	(3.6625)	(3.7254)	(1.9740)
<b>Log Median Income</b>	1.2485	0.3124	1.2198	0.3135	1.3527	0.3632	1.3293	0.4062
	(0.4603)***	(0.4457)	(0.5205)**	(0.4023)	(0.4789)***	(0.4601)	(0.5178)**	(0.4115)
<b>Log Local Competition</b>	0.0225	0.0042	-0.1523	-0.1174	0.1426	0.0099	-0.0459	-0.1141
	(0.2252)	(0.2071)	(0.2707)	(0.2272)	(0.2551)	(0.2262)	(0.2941)	(0.2473)
<b>Emp. By Ethn. Firm</b>	-0.0017	-0.0013	-0.0007	-0.0011	-0.0014	-0.001	-0.0007	-0.0012
	(0.0009)*	(0.0008)	(0.0012)	(0.0009)	(0.0011)	(0.0009)	(0.0014)	(0.0009)
<b>Fem. Emp. By Ethn. Firm</b>	0.0039	0.0023	0.002	0.0019	0.0033	0.0015	0.0019	0.0017
	(0.0020)**	(0.0016)	(0.0025)	(0.0018)	(0.0024)	(0.0018)	(0.0029)	(0.0020)
<b>Constant</b>	-2.4079	4.5688	6.3417	5.5701	4.952	2.4944	17.8731	4.0536
	(5.6480)	(11.9670)	(15.7246)	(14.4345)	(17.8204)	(16.5268)	(16.6510)	(9.6516)
<b>Correlation</b>	0.8904		0.9256		0.8761		0.9382	
	(0.0511)		(0.0461)		(0.0592)		(0.0742)	
<b>Fixed Effects</b>	No	No	Neighborhood	Neighborhood	No	No	Neighborhood	Neighborhood
<b>Observations</b>	138	138	138	138	117	117	117	117

Groups 3 and 4 drop observations of stores that belong to chains.

Robust standard errors in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Specifications were also estimated dropping 17 additional stores that did not have overlapping support in the propensity to be in Koreatown. Results were substantively unchanged.

Though not reported here, we have also run these analyses excluding observations that do not have overlapping support with the two variables determining treatment: Korean and Koreatown. This is useful because, for instance, there are some systematic differences in the explanatory variables between Koreans and non-Koreans in Koreatown. While these explanatory variables are accounted for on the right-hand side of the regressions, the overlapping support check allows these variables to enter the analysis in a more flexible, and less parametric fashion. We find that there are 17 stores outside of Koreatown that are dropped because they are systematically different from stores in Koreatown and there are 4 Korean stores in Koreatown that are dropped because they are systematically different from non-Korean stores in Koreatown. Our results are robust to these specifications.

To summarize the results from Table 5 to Table 8, we find a strong robust negative relationship between social network membership and providing services in-house. We also find that drycleaning services are always more likely to take place within the store premises than laundering services. We also find that much of the social network effect on laundry services is attributable to spillovers from the social network's effect on dry cleaning. As described above, this is mostly because drycleaning services are more sensitive to quality consideration than laundering services (more delicate fabrics and different type of clothing). Finally, consistent with common sense, we find robust evidence that chain stores are less likely to clean on premises. When we exclude chain stores from the analysis, all results hold.

It is useful to consider our empirical findings in the context of the institutional details of the laundry services industry and the existing literature. We find that there is a negative relationship between integration and membership in an ethnic based social network. This suggests that either the network reduces the costs of using the market or the social network effects on access to credit do not offset network members' inferior access to formal credit. Our analysis in section III.B above demonstrated that very poor access to credit would only cost outlets an additional \$342 per month. For outlets in LA county that average over \$50,000 in revenue per month, it is unlikely that this could explain the social network reducing vertical integration by 42 to 78 percentage points.

This leads us to believe that significant factors explaining this relationship are more likely to involve reputations affecting marginal costs. An obvious marginal factor for an outsourced cleaner is whether or not the supplier delivers expected quality and how much must be paid for this. In section III.C we documented the role of quality in this industry. There is an existing literature suggesting that reputation affects the delivery of difficult-to-measure quality and/or the price that must be paid to receive it (e.g. Klein and Leffler (1981)). Furthermore, Greif (1993) has linked the role of reputation in using the market to communication and information within a coalition of buyers. Alternatively, in the sociology literature, Granovetter (1985), Portes and Sensenbrenner (1993), and Portes (1998) suggest that when transactions are embedded in interpersonal relations that this can support trust between agents. Our paper therefore provides empirical evidence consistent with the suggestions of Greif (1993) and the sociology literature and consequently links the literature on the effects of social networks and ethnic membership to the economic literature on the boundaries of the firm.

## **VI. Conclusions**

This paper documents the relationship between an ethnic-based social network and make or buy decisions. We find that stores which are members of a social network in the laundry services industry are significantly less likely to integrate than non-members. This suggests that one channel through which ethnic-based social networks affect firm performance may be by lowering the costs of using the market. Furthermore, the common association between social networks and attributes such as enhanced communication and reputation provide support for these factors in determining the boundaries of the firm.

Social networks shift reputational capital and hence the relational contracting regime faced by firms. In our empirical setting, social networks do this by expanding the upstream firm's reputation that is at stake in any bilateral transaction to include two other types of agents: the firm's other customers that are in the network and network members external to the industry that may provide social benefits to the upstream firm. Our evidence suggests that these social network members that are external to a given

transaction are effective in deterring upstream firms from reneging on the implicit agreement between a cleaner and its supplier. This evidence is consistent with relational contracting acting as a substitute for organizational form. Evidence that buying laundry services is more common than in drycleaning also supports the idea that services that are more quality sensitive are also more difficult to purchase in the market, hence opportunism is likely a factor in the make-or-buy decisions. The unique feature of our empirical example is that, while opportunism appears to be an important factor, there are not specific assets locking a buyer to a seller. This suggests that theories of the firm based on ex-post bargaining rationales, such as the asset specificity theories of Williamson (1975, 1985) and Klein, Crawford and Alchian (1978), and the property rights approach following Grossman and Hart (1986), cannot explain vertical integration in this industry. In future work, we plan to use this feature of this industry to explore other determinants of the boundaries of the firm that may not be affected by the presence of a social network.

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## APPENDIX 1: Survey

Name of Cleaners:

Address of Cleaners:

I'm doing a study analyzing how family businesses operate relative to non-family businesses. This is a project conducted by Professors Wesley Hartmann from Stanford University and Ricard Gil from University of California at Santa Cruz.

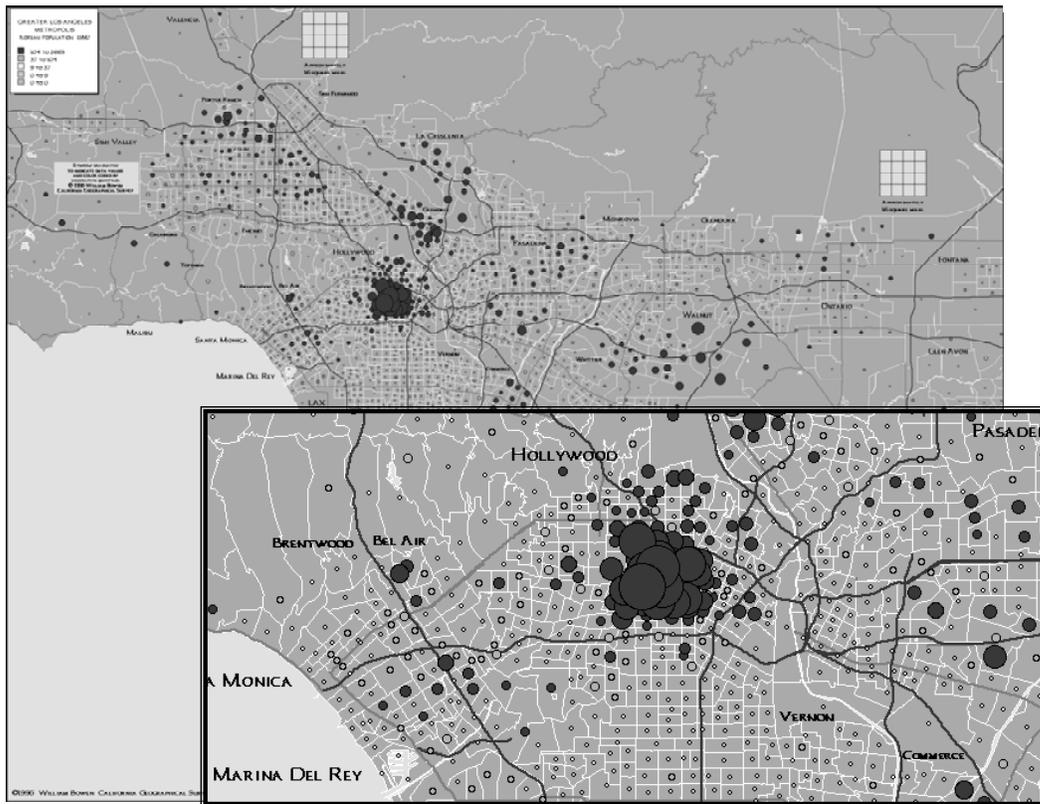
I would really appreciate it if you could take five minutes to answer some questions.

1. Do you launder the clothes here? Yes No
2. Do you dryclean the clothes here? Yes No
3. Do you have any family in the business? Yes No
  - a. Do they provide either of those services?
    - i. Laundry Yes No
    - ii. Drycleaning Yes No
4. Are you part of a chain or not? Yes No
5. Prices
  - a. Laundered Shirt? \_\_\_\_\_
  - b. Drycleaned dress \_\_\_\_\_
6. Turnaround times?
  - a. Laundry \_\_\_\_\_
  - b. Drycleaning \_\_\_\_\_
7. What languages do you speak?
8. Other services displayed
  - a. Tailoring
  - b. Wash and Fold laundry
  - c. Other \_\_\_\_\_

## APPENDIX 2: Definition of Koreatown

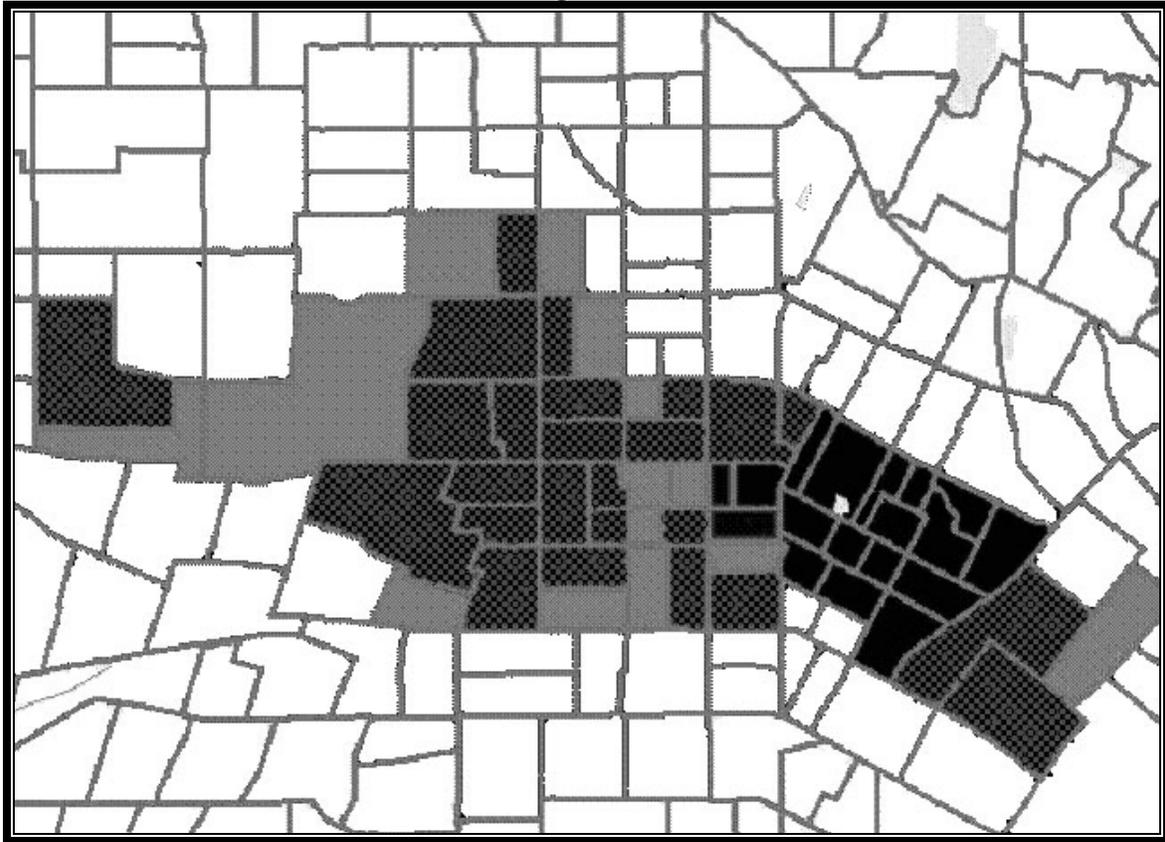
Koreatown is a small area within southern California which can be recognized by the large cluster of dots in Map 1 (William Bowen California Geographical Survey, 1996). There are not however, clear borders defining Koreatown and there is debate even within the community about the actual boundaries as they have been changing over time (Kim, 1994). We therefore analyze 2000 Census tract data on the population of Korean speakers to define a region that can reasonably be regarded as Koreatown. We also construct alternate definitions of Koreatown, which we used to verify the robustness of our main results.

Map 1



To define Koreatown, we therefore include all census tracts near this area with at least fifteen percent Korean speakers. These tracts are checked in Figure 1. One obvious feature is that there are holes, apparently within the center of Koreatown with fewer Korean speakers. Some of these tracts have less than five percent Korean speakers. It is also important to note that some of the tracts with over thirty percent Korean speakers are divided by as many as five other census tracts. We address these gaps as follows.

**Figure 1**



Our first definition of Koreatown seeks to unite all these tracts with fifteen percent or more Korean speakers. We therefore add all tracts which are bordered by a checkered tract on at least two sides. These result in the tracts shaded in gray. Then, to connect the two divided regions of Koreatown we include the tracts shaded in black. We use two alternate definitions of Koreatown as robustness checks on this latter assumption. The first excludes the tracts in black from Koreatown and the second restricts Koreatown to only the checkered tracts. The definition used throughout the paper uses the checkered, gray and black tracts, but the results have been validated for these other definitions.