GRIPS Discussion Paper 11-08

Virtual Incubation in Industrial Clusters: A Case Study in Pakistan

By

Babur Wasim Arif
Tetsushi Sonobe

August 2011

National Graduate Institute for Policy Studies
7-22-1 Roppongi, Minato-ku,
Tokyo, Japan 106-8677

Virtual Incubation in Industrial Clusters: A Case Study in Pakistan

Babur Wasim Arif
Federal Bureau of Statistics, Pakistan

Tetsushi Sonobe
National Graduate Institute for Policy Studies, Japan

August 4, 2011

Abstract

In industrial clusters, transaction costs are kept low and free riding is discouraged by a community mechanism developed through dense and repeated interactions among entrepreneurs. In such environments, new entrants without established reputations and connections are put at a distinct disadvantage. This negative effect on new entry must be neutralized for an industrial cluster to expand. Using enterprise level data from Pakistan, this study finds that personal networks are indeed important for successful enterprise operation, which works to the advantage of incumbents, but that subcontracting plays the role of virtual incubation in nurturing new enterprises, reinforcing the cluster's dynamism.

JEL classification: O14, O53

Key words: South Asia, Pakistan, industrial cluster, social capital, subcontracting

I. Introduction

Industrial clusters of micro- and small-sized enterprises (MSEs) producing similar and related products abound throughout the world. Traditional explanations for the advantages and ubiquity of industrial clusters center on Marshall's (1920) hypotheses on information spillovers, the division and specialization of labor, and labor pooling. Recent case studies on industrial development in developing countries offer additional explanations. For example, Ruan and Zhang (2009) describe how the division of labor in a cluster eases credit constraints faced by small enterprises. Sonobe *et al.* (2002) describe how clustering attracts traders, who bring trade links to larger markets, while Zhang et al (2011) show the importance of traders in providing trade credits and how the shared facilities in clusters can assist financially constrained entrepreneurs. Schmitz (1995), Nadvi (1999a), and Caniëls and Romijn (2003) find that collective actions by entrepreneurs in a cluster address the short supply of public goods, including knowledge for innovation.

Clusters have these advantages probably because the geographical proximity among entrepreneurs in a cluster helps them to build up trust and norms through dense social interactions and repeated transactions (e.g., Becker and Murphy, 1992; Schmitz, 1995, 1999; Weijland, 1999; Morosini, 2004; Sonobe and Otsuka, 2006). In other words, a kind of community mechanism is developed in clusters, not necessarily based on traditional village communities but on profit motives and proximity. The literature on social capital, however, points out that the community mechanism often has negative effects on outsiders (e.g., Putnam, 2000; Hayami, 2009). Biggs and Shah (2006) report this insider-outsider problem in the context of small indigenous enterprises in Africa. If the community mechanism in industrial clusters favors insiders, the question arises as to how industrial clusters can grow in

size by absorbing a number of new entrants. Some new entrants may have networks, connections, or abundant financial wealth from the beginning and may have no difficulty in starting their own businesses. However, what happens to new entrants who have entrepreneurial talent but little social and financial capital?

This paper is an attempt to contribute to this line of empirical research. While the community mechanism reduces transaction costs in a cluster, it may treat promising new entrepreneurs unfavorably, which will lead to the loss of dynamism. There may, however, be a grassroots response to this weakness of the community mechanism. By using primary data collected through face to face interviews with a large number of entrepreneurs producing electrical fittings in Pakistan, this paper argues that in industrial clusters, long-established manufacturers and traders provide talented start-ups with some type of virtual incubation services through a subcontracting system. It is known that subcontracting saves the start-ups' working capital (Caniëls and Romijn, 2003; Ruan and Zhang, 2009). We find that subcontracting also helps those start-ups with poor endowments of social capital and managerial human capital. Such start-ups acquire management and marketing skills, build up personal networks, and accumulate financial wealth through being 'incubated' while working as subcontractors.[1] Since their contractors, as virtual incubators, do not receive any subsidy from the public sector, they charge fees to their incubated subcontractor, which take the form of the spread between the former's buying price for the latter's output and its market price. This fee will motivate the latter to graduate from incubation as soon as they are ready to conduct business independently.

[1] In the economics literature, a business incubator is often defined as a venture providing start-up enterprises with physical facilities and business and technical services (Colombo and Delmastro, 2002; Hackett and Dilts, 2004). What we term virtual incubation involves the provision of the time and opportunity for learning by doing, building up personal networks, and accumulating financial wealth.

There is no shortage of anecdotes about these arrangements in industrial clusters.[2] Probably, the best known anecdotes are provided by economic historians working on the proto-industrialization in Western Europe (e.g., Landes, 1969), but they do not provide empirical evidence. The enterprise data that we assembled in the electric fittings cluster in Pakistan indicate that social capital is an important factor of successful enterprise operation, and that it affects new entrants' decisions of whether to start an independent enterprise or become a subcontractor. While not a few subcontractors in our sample become independent later, the time taken to achieve independence varies considerably. We examine the manner in which the choices of initial enterprise status and the time period of transition from subcontractor to independent company depend on connections, networks, general and specific human capital, kinship, and financial wealth.

The rest of the paper is organized as follows. The next section advances testable hypotheses. An overview of our study site and a descriptive analysis of the data are provided in Section 3. Section 4 attempts to test the hypotheses and checks the results for robustness. The summary of the findings is contained in Section 5.

II. Hypotheses

In general, communities play an important role in contract enforcement in societies in which contracts are not expected to be enforced easily in courts (e.g., Hayami, 2009). In such societies, those businessmen who have established good reputations and developed personal connections benefit from the community mechanism of contract enforcement, but those without good reputations and connections are prone to suffer from the mechanism. New

[2] Among examples are case studies of knitwear clusters in China (Ruan and Zhang, 2009), Vietnam (Nam *et al*., 2010), India (Cawthorne, 1999), and Bangladesh (Mottaleb and Sonobe, 2011), a work clothing cluster in Japan (Yamamura *et al*., 2003), a surgical instrument cluster (Nadvi, 1999b), and a soccer ball cluster (Boje and Khan, 2009) in Pakistan.

entrants to an industry lack good reputations and connections with their possible transaction partners unless they have parents, siblings, or relatives already successful in the industry. Thus, most new entrants have difficulty in marketing their products and in buying materials on credit, whereas long-established entrepreneurs do not.

The question arises as to whether new entrants in industrial clusters are insiders or outsiders. They seem to be insiders because they are located near the incumbent enterprises, but they also seem to be outsiders because they have not established reputations or developed connections. When an industrial cluster is being formed, there are a swarm of new entrants, as the case studies of clusters in Taiwan, Brazil, China and many other countries attest to (e.g., Amsden, 1977; Schmitz, 1999; Sonobe and Otsuka, 2006). Such a massive entry of new enterprises would not take place if the new entrants were to really face a disadvantage in market competition. Thus, it may well be that industrial clusters tend to have an institution that helps new entrants with scarce endowments of social capital. These considerations lead us to a hypothesis that subcontracting, which is observed in a wide range of clusters of different industrial sectors in different countries, plays the role of such an institution in mitigating the disadvantages of new entrants.

Probably, this benefit of the mitigated disadvantage would induce subcontractors to carefully observe the product quality and delivery date requirements made by their contractors. Because of this incentive given to the subcontractors, the contractors can trust them, even if they are new entrepreneurs with no reputation yet to ruin and no connections yet to damage. Similarly, new entrepreneurs with a scarce endowment of general human capital (or education), specific human capital (or expertise), or fixed and working capital (or access to finance) may face a disadvantage in market competition. If subcontracting mitigates such a disadvantage, subcontractors will be motivated to observe the relational

contract with the contractors so as not to lose the benefit of the mitigated disadvantage. Thus, as part of the broader hypothesis above, we would like to test the following hypothesis:

Hypothesis 1: In industrial clusters, entrepreneurs with unfavorable endowments of social capital, human capital, and financial capital are more likely to become subcontractors than other prospective entrepreneurs.

To test this hypothesis, we estimate discrete choice models in which the status of an enterprise is associated with indicators of the human, financial and social capital of entrepreneurs. In the literature, there is no general consensus about good indicators of social capital. For example, personal networks may be gained at school (Montgomery, 1991; Simon and Warner, 1992) or the workplace (Kajisa, 2007), and personal networks of entrepreneurs may help them gain access to technical information (Barr, 2000) or to credit (Akoten *et al*., 2006). Extended families and friendships may or may not be critically important for business performance (Nabi, 1988; Nadvi, 1999b; Fafchamps and Minten, 1999; Caniëls and Romijn, 2003). Thus, our empirical model will include variables related to schooling, personal networks, and family ties, even though schooling should reflect general human capital as well.

If a subcontractor acquires expertise through learning by doing and develops personal connections with material suppliers and potential customers, he will become less dependent on the contractor. If he can also manage to accumulate sufficient financial wealth or gain access to credit, he may stop being a subcontractor altogether and start being an independent enterprise. Such a transformation is observed in a wide range of industrial clusters (e.g.,

Watanabe, 1970; Amsden, 1977; Sonobe and Otsuka, 2006). In this sense, we consider subcontracting to be akin to incubation. Of course, gaining independence is not necessarily accompanied by a discrete change in status from a subcontractor to a contractor. Even after a subcontractor becomes independent of the contractor in terms of social capital and financial capital, they may continue to transact with each other on an equal footing. Such a relationship may be termed outsourcing rather than subcontracting.

In many industrial clusters in developing countries, where neither high technology nor large investment is required, discrete changes in enterprise status may take place more easily. If such a change occurs frequently, one can use it in an empirical study as a proxy for a new entrant's achievement of independence. With this proxy, we would like to ask what affects the time to become independent. Under our hypothesis of virtual incubation, subcontracting helps new entrants to acquire expertise, connections, and access to finance while working as subcontractors. As these resources are accumulated, the probability with which they become independent will increase. This probability, however, will not depend strongly on the initial endowments of these resources but rather on general human capital of the entrepreneur as measured by their education level:

Hypothesis 2: How soon a subcontractor becomes independent depends less on his initial endowments of specific human capital, social capital, and financial capital than on that of general human capital.

More resourceful enterprises or entrepreneurs would have better business results. If subcontractors are under incubation, however, their performance may not be affected by the resources as much as independent enterprises' performance. To substantiate our argument

that subcontracting has an aspect akin to business incubation, we would like to test the following hypothesis:

Hypothesis 3: The performance of an enterprise is more closely associated with the entrepreneur's initial endowment of human capital, personal connections, and financial wealth if the enterprise is independent than if it is a subcontractor.

III. Descriptive analysis

Data collection

Our study site is a city in Punjab province, 170 km from Lahore, the provincial capital, 260 km from Islamabad, the country's capital, and about 50 km from a few interchanges of the 347km long Islamabad-Lahore motorway. Sargodha is not far from the well-known industrial districts, Sialkot, Gujrat, and Gujranwara, in Punjab province.[3] The electrical fittings produced in Sargodha include electrical switches, dimmer switch for ceiling fan, multi-pin sockets, TV and phone sockets, bell pushes, power plugs, pin shoes, bulb holders, wire extensions, and related items. According to UNIDO (2006), Sargodha has about 1,200 producers and accounts for about 70 per cent of the domestic production of electrical fittings in Pakistan. Other major production sites are Lahore and Karachi, the capital of Sindh province and the centre of commerce and manufacturing of the country.

We conducted a survey of enterprises producing electric fittings in Sargodha from August to October 2008. Neither the Sargodha regional offices of the Federal Bureau of Statistics (FBS) nor the Small and Medium-sized Enterprises Development Authority

[3] Sialkot is known as a major producer of surgical instruments and soccer balls (Nadvi, 1999a,b, 2008). Gujrat and Gujranwara are clusters of enterprises producing plastic products, metal products, machines, and electric appliances (Nabi 1988; Caniëls and Romijn, 2003).

(SMEDA) had a reliable list of electrical fitting enterprises.[4] The FBS regional office, however, could identify where electrical fittings enterprises were the most densely concentrated. In that area, the union councilors introduced us to 249 electrical fittings enterprises. We conducted personal interviews with 242 entrepreneurs (seven entrepreneurs refused to give us information) and obtained reliable data from 232 entrepreneurs on their educational and occupational backgrounds, their families, and their enterprises' history, marketing channels, and employment in 2004, 2006, and 2008. We revisited the same enterprises in October and November 2009 and found that 18 enterprises had left the industry between the two surveys.

Supply Chain

According to the respondents, the production of electrical fittings in Sargodha began in the late 1960s, when a trader returned from Karachi after acquiring production skills there.[5] He built the first factory of electrical fittings in Sargodha, which was followed by a factory built by his relative, who is now the leader of the industry.[6] From these pioneering enterprises, a number of spin-off entrepreneurs emerged by establishing their own factories or workshops and copying what they had learned from the pioneers. The increasing number of enterprises attracted not only traders of finished products but also suppliers of parts and raw materials to Sargodha. In this way, the electrical fittings cluster was formed.

The cluster has three types of producers and two types of buyers, as shown in Figure 1. The solid arrows indicate the flows of the subcontracting orders. Companies and local traders subcontract the production of finished products to subcontracting workshops.

[4] FBS had no list. SMEDA had a list of only 31 enterprises.
[5] There was a large factory in Karachi named PPI established before the partition. It supplied electrical fittings to government offices (UNIDO, 2006).
[6] The first factory was closed in the late 1970s when the son of the pioneer emigrated from Pakistan.

Subcontracting workshops and some companies subcontract the assembly of parts to household subcontractors. These subcontracting orders are usually accompanied by the provision of raw materials and parts in kind and, hence, can be called putting-out contracts.

Both subcontracting workshops and companies produce finished products. Hence, the division of labor between them is not motivated by the comparative advantage arising from the difference in technical expertise but by something else. Here we note some of the apparent differences between them. The companies are relatively large in size, produce a variety of products, and engage in both quantitative aspects such as machine and labor management and qualitative aspects of production such as the development of designs and samples, setting specifications, and product quality. Companies use brand names to facilitate the marketing of their products. By contrast, subcontracting workshops are small in size, specialize in the production of one or two particular products simply following the specifications set by their contractors, and do not have their own brand names. The status of an enterprise, however, is not fixed. Many companies were established initially as subcontracting workshops and later upgraded into companies.

The materials and parts are usually put out to subcontractors; hence, the flow in the direction indicated by the solid arrows in Figure 1. The main bodies of the electrical fittings are made of Bakelite, a synthetic material, which is electrically nonconductive and heat-resistant. Bakelite powder is heated and melted in a die and pressed into the shape of the die cavity by using, in this cluster, a manual pressing machine. This is the most capital- and skill-intensive process. A small miscalculation in the heating and pressing leads to disfigured products with sub-standard strength. Many companies and subcontracting workshops subcontract household subcontractors to fit metal parts, such as tiny pins and springs, in a

Bakelite shell manually. The assembled products are returned to the contractors (that is, the companies or the subcontracting workshops) for inspection and packing.

The dashed arrows in Figure 1 indicate the flow of products from companies and local traders to outside traders. The buyers of finished products are classified into local and outside traders, even though the ultimate buyers are consumers. Local traders maintain retail or wholesale shops in the marketplace in Sargodha. Outside traders buy electrical fittings from the local buyers or directly from the companies. Although the companies are independent in that they produce their own products and sell under their own brand names, they are not generally independent on the marketing side. Many of them are dependent on the local traders for the marketing of their products.

Institutional environment

In Pakistan, the entire system of law enforcement is inefficient and corrupt. According to the World Bank's (2000) World Business Environment Survey, Pakistan ranked 163rd in the world for contract enforcement, and it took 880 days on average to enforce a commercial contract in this country. As a result, trust-based personal ties act as the critical element in successful business in Pakistani society (e.g., Ghani and Ashraf, 2005; Zhu, Bhat, and Nel, 2005). According to our respondents in Sargodha, traders supplying raw materials do not hesitate to give trade credit to customers (that is, electrical fittings manufacturers) with whom they have established a trust relationship, whereas material suppliers ask a customer for immediate cash payment if the customer is a new entrepreneur with no introduction from the suppliers' friends. Also on the marketing side, new entrepreneurs without good references are at a disadvantage. Whom you know, or 'jan pehchan' in the local language, matters to every businessman in this society.

In this cluster, however, even a new unknown person can easily start an electrical fittings business by becoming a subcontractor as raw materials are provided by the contractor. A subcontractor is required to visit the contractor frequently and discuss the specifications, such as design, strength, and weight of products. If he does so, he can receive orders and materials, and moreover, he receives payment usually at the end of every month. Such punctual payment is noteworthy in the light of the generally weak contract enforcement in Pakistani society. The quantity of provided materials as well as the size of production commissioned to the subcontractor is small initially, but it increases as a trust relationship is established based on repeated transactions. Moreover, the contractor may give the subcontractor a 'parchi', a card with the signature of the contractor specifying the type and amount of raw materials, with which the subcontractor can procure the specified raw materials directly from a material supplier. Such direct transactions with a material supplier provide the subcontractor with an opportunity to be recognized by the supplier and win his confidence, which will in turn help the subcontractor to transform into a company.

Basic Statistics

Among the 232 enterprises visited during the 2008 survey, 76 started as companies and 156 started as subcontracting workshops, as shown in Table 1. Our sample does not include household subcontractors. The number of new entrants per decade increased gradually. The table also shows that the initial investment required of a company is much larger than that required of a subcontractor. Table 2 shows that 50 of the 156 enterprises that had started as subcontractors became companies. In 2008, these subcontractor-turned-companies had operated for 12.2 years on average since their establishment as subcontractors. It took them

6.6 years on average to become companies. The other subcontracting workshops were only 6.0 years old on average, so they still had ample time to become companies.[7]

At small enterprises, financial management is often unsound (de Mel *et al*., 2009). If they do keep records meticulously, many of them are reluctant to show the records to strangers for fear of information leakage to tax authorities. Our respondents in Sargodha were extreme in this respect. They were reluctant to disclose even the prices of their products. Thus, we failed to obtain data on sales revenues, value added, and any sorts of profits. Although the number of pressing machines by type is easy to count, in fact, many machines are not fully used and the type and number of machines are not good indicators of enterprise size. Instead, we find that the average number of workers over busy and slack months is a better proxy for enterprise size. The number of workers, however, captures only the size of operation within the enterprise; operations contracted out to subcontractors cannot be captured by employment size. As a supplement, we also use the percentage of production value contracted out to subcontractors. Our respondents agreed to answer questions about percentages but not absolute values. The upper part of Table 2 shows that the subcontractor-turned-companies are smaller than the companies but larger than the subcontracting workshops in terms of these rough indicators of enterprise size.

During the period under study, the GDP of the Pakistani economy grew at six per cent per year, and electrification was making headway. The demand for electrical fittings grew fast, but the production in the Sargodha cluster grew even faster (UNIDO, 2006). Tables 1 and 2 indicate that the expansion of the cluster was driven by the entry of new enterprises and the increase in subcontracting. The companies' average employment size remained constant over time, suggesting that in-house production did not increase. Instead, their subcontracting

[7] In 2009, five subcontracting workshops upgraded into companies and they had operated for 6.5 years on average before their transformation into companies.

ratio increased substantially. It was traders outside the cluster that marketed the cluster's products in remote areas. While established companies dealt directly with these outside traders, younger companies depended on local traders for marketing to outside traders. On average, direct transactions with outside traders accounted for about 70 per cent of total sales.

Data on the entrepreneurs' background attributes are presented in Table 3 by enterprise status. Some enterprises are operated as partnerships. In such cases, we collected data on the most important decision maker among the partners. The number of years of schooling is our measure of general human capital. The entrepreneurs running companies are the most highly educated, followed by the entrepreneurs running subcontracting workshops.[8] The next three variables are intended to capture specific human capital: the number of years in which the entrepreneur had engaged in marketing before starting his own business (entrepreneurs running companies have significantly richer experience in marketing); the number of years in which the entrepreneur had engaged in electrical fittings production prior to his current business (the vast majority of the owners of the subcontracting workshops and the subcontractor-turned-companies used to work as production workers at electrical fittings factories or as household subcontractors for several years); and the years of operation, which is used as an indicator of management experience.

Two variables are intended to capture personal connections. The first is a dummy variable that takes a value of one if the entrepreneur's father is or was in the electrical fittings industry and zero otherwise. The second is the number of the entrepreneur's friends and relatives who were in the electrical fittings industry when the entrepreneur established his enterprise. The company owners have the highest averages of these two variables, followed by subcontractor-turned-company owners.

[8] Production workers are much less educated. Less than 40 per cent of them completed primary school, and only 10 per cent completed middle school.

Because of the respondents' reluctance to divulge financial information, we do not have direct measures of their financial wealth. Based on the information on the father's occupation, we constructed a dummy variable that is one if the father was a business owner in trading or manufacturing, a landlord, a relatively high-ranked government official, or a policeman, and zero otherwise. Persons in these occupations are generally considered to be associated with high incomes in Pakistan. We refer to this dummy variable as the father's occupation dummy and expect it to serve as a proxy for favorable access to finance. According to our interviews with the respondents, relatively wealthy entrepreneurs finance their initial investments with their own saving and their fathers' contribution. By contrast, less wealthy entrepreneurs tend to gather small contributions from relatives and friends. Thus, the entrepreneur and his father's shares of initial investment are expected to serve as a proxy for financial capital.

While we have introduced these variables as proxies of general human capital, specific human capital, social capital, or financial capital, it is obvious that they are related to more than one type of resource. For example, while the education level of an entrepreneur is a proxy for his general human capital, it is likely to be related also to his family's financial wealth and personal connections. Similarly, the years of operation may be related to personal connections as well as to management experience. We will pay due attention to this nature of the variables when we interpret the estimated coefficient on each variable in the regression analysis below. Although these variables are correlated, their correlation coefficients are far below the level that would pose a multicollinearity problem.[9]

In our sample of 232 entrepreneurs, 18 entrepreneurs left the industry between the 2008 and 2009 enterprise surveys. Two of them operated companies, four operated subcontractor-

[9] The highest correlation coefficient is 0.36, and the second highest is 0.30.

turned-companies, and 12 ran subcontracting workshops. As shown in the last column of Table 3, they had much lower education levels, worked as production workers or household subcontractors for longer periods before starting their enterprises, and had a smaller number of friends and relatives in the industry than the entrepreneurs remaining in the industry. Thus, their relatively rich experience in the production of electrical fittings did not compensate for their relatively poor endowments of general human capital and social capital.

IV. Regression Analyses

Estimation Results

In this section, we attempt to test the hypotheses advanced in Section 2. To test Hypothesis 1, we estimate discrete choice models in which the choice of enterprise status is associated with the entrepreneur's characteristics. The results are presented in Table 4. Column (1) reports the estimate of the probit model of the determination of the initial enterprise status, that is, whether an enterprise started as a company or as a subcontracting workshop. The estimation uses the cross section of enterprises at the outset of each enterprise. The estimated coefficients on the entrepreneur's schooling and prior experience in marketing are positive and significant, which indicates that a highly educated entrepreneur with marketing experience was more likely to start a company than a less educated entrepreneur without marketing experience. It is little wonder that the coefficient on the prior experience in electrical fittings production is insignificant, because persons with production experience are plentifully available in the cluster. These results concerning the association between human capital and the initial enterprise status are consistent with Hypothesis 1. The coefficients on the next two variables, which are proxies for social capital, are positive and significant. Moreover, the two proxies for access to finance have positive and significant

coefficients as well, and the significance level of the coefficient on the father's occupation variable is particularly high. These results are also consistent with Hypothesis 1.[10]

Columns (2) and (3) show similar results. In column (2), the probit model is applied to the enterprise status in 2008. In column (3), an ordered probit model is estimated by using pooled data including the four years under study. In the model in column (3), ordered responses take the values of 0 for the subcontracting workshops, 1 for the subcontractor-turned-companies, and 2 for the companies. The explanatory variables with significant coefficients in column (1) have generally significant coefficients in columns (2) and (3) as well. In addition, the years of operation, a variable related to specific human capital, has a positive and highly significant coefficient in columns (2) and (3). The overall results shown in Table 4 lend strong support to Hypothesis 1.

Hypothesis 2 concerns the process of a subcontracting workshop's transformation into a company. We use the Cox proportional hazard rate model to test this hypothesis. The hazard rate is the conditional probability with which a subcontracting workshop will become a company between time t and time $t + h$ for small h, given that it is not yet a company at time t. The model may be written as

$$h_i(t) = h_0(t)\exp(\beta X_i),$$

where $h_i(t)$ is the hazard rate for enterprise i, $h_0(t)$ is a baseline hazard function, β is a vector of the parameter to be estimated, and X_i is a vector of the explanatory variables. A major

[10] These results do not deny that entrepreneurs' socio-economic class, which is reflected in the years of schooling and the father's occupation, determines the enterprise status. The positive and significant coefficient on the schooling, however, is likely to reflect the effect of human capital, given that three variables are included in the equation to control for the father's influences and they have significant coefficients.

advantage of this model is that it can be estimated without specifying the distributional form of the baseline hazard, $h_0(t)$, which is assumed to take a common value to all units in the population. Thus, individuals' hazard rates are proportional to the baseline hazard, and the logarithm of $h_i(t)/h_0(t)$ is a linear function, βX_i. We assume that vector X_i is composed of the same explanatory variables as we have discussed above.

Table 5 presents the estimates of the hazard model.[11] In column (1), the estimation uses only the sub-sample consisting of the 156 enterprises that were established as subcontracting workshops. Out of these 156 subcontractors, 50 managed to upgrade into companies in their first to 19th year. Toward the bottom of this column, two dummy variables have positive and significant coefficients. This implies that those subcontractors founded in the 1990s and 2000s are more likely to become companies in the following years than the enterprises which were founded in the 1980s or earlier.

In column (2), the model is fitted on the entire sample including enterprises that have been companies from the beginning. In columns (1) and (2), the coefficient on schooling is positive and significant, indicating that subcontracting workshops run by highly educated entrepreneurs have a higher probability of upgrading than other subcontracting workshops. The coefficients on marketing experience, the father's occupation, and the father's involvement in the same industry are positive and highly significant in column (2) but either insignificant or only marginally significant in column (1). These differences between the two columns may come from the fact that the sample used in column (2) includes the 76 enterprises that were companies from the beginning. In other words, the higher significance levels of the coefficients on marketing experience, social capital, and access to finance in

[11] More specifically, we employ Efron's method to handle ties to obtain an accurate approximation of the exact marginal likelihood (Cameron and Trivedi, 2005). If an enterprise was founded as a company, we treat this as if its transformation to a company took place in the first year rather than at time 0.

column (2) suggest that these variables are important for the determination of initial status but not for subsequent upgrading. Instead, the major factor for upgrading is the entrepreneur's general human capital. These results are highly consistent with Hypothesis 2.

According to Hypothesis 3, enterprise size is more closely associated with the entrepreneur's human capital, personal connections, and financial wealth if the enterprise is a company than if the enterprise size is a subcontractor. To test this hypothesis, a function explaining the enterprise size is estimated separately for companies and subcontractors. This, however, poses the problem of self selection because whether an enterprise is a company or a subcontractor is endogenous. We thus employ the Heckman two-step estimator. The first step is the estimation of a discrete choice model of enterprise status, of which the results are shown in Table 4 above. The second step is the regression of enterprise size on the inverse Mills ratio and the same explanatory variables as in the regressions discussed above. Since the coefficients of the function may change over time, we first fitted the model to data from each of the four years separately. The estimated coefficients turn out to be stable so Table 6 reports only the estimates obtained from the pooled data for the four years.[12]

Table 6 classifies the enterprises into companies, subcontractor-turned-companies, and subcontracting workshops. The inverse Mills ratio is obtained from the estimates of the ordered probit model shown in column (3) of Table 4. The dependent variable is the log of the number of workers in the first three columns and the subcontracting ratio in the last three columns. Since the subcontracting ratio has a positive probability mass at zero, the tobit model is employed in the last three columns.

[12] Although the data set is of a panel, the fixed- or random-effects model is not applied because all the explanatory variables are essentially time invariant. Instead, we employ the cluster sandwich estimator of variance to allow for the within-group correlation.

For the companies, schooling, years of operation, the number of friends and relatives in the same industry, and the father's occupation have positive and significant coefficients, as shown in columns (1) and (4). The coefficients on these variables are smaller and less significant for the subcontractor-turned companies, as shown in columns (2) and (5), and even smaller or less significant for subcontractors, as shown in columns (3) and (6). Similarly, the association between subcontracting and marketing experience is much closer in column (4) than in column (6). These results lend support to Hypothesis 3.

While the coefficient on marketing experience is positive and significant in the subcontracting ratio function, it is negative and insignificant in the employment size function. A possible reason is that entrepreneurs with marketing experience are more extroverted and able to control subcontractors than other entrepreneurs. Interestingly, the dummy variable for father in high-income occupation has a negative and significant coefficient in the subcontracting ratio function. Also the coefficient on the own share of initial investment is negative and significant in columns (4) and (5). It seems that the initial access to finance does not help entrepreneurs to expand their employment size and tends to discourage them from the extensive use of subcontractors.

Robustness Checks

As noted earlier, many companies are dependent on local traders for marketing their products to outside traders. The proportion of direct sales to total sales may be used as a proxy for the degree of independence in terms of marketing. This proportion is expected to be higher if the company has a better reputation for producing good products. Hence, this proportion should be positively associated with social capital. To check the relevance of the social capital variables that we have used, we estimate a function explaining the direct sales proportion. We would also like to examine what factors are associated with enterprise

survival. Our discussion of enterprise performance has centered on enterprise size, and our measures of enterprise size are limited to the number of workers and the subcontracting ratio. Survival is another aspect of performance. Thus, the examination of survival is expected to serve as a robustness check.

The first two columns of Table 7 present the estimates of a two-limit tobit model explaining the direct sales proportion. The two-limit model is used because the direct sales proportion has positive probability mass at 0 and 1. The model is fit to the data of the companies. We first used separate cross sections in each of the four years and found that the estimates changed over time and that the estimates in 2006 and 2008 are intermediate between those in 2004 and 2009. Thus, we report only the latter two sets of estimates in columns (1) and (2). From these columns, it is clear that both human capital variables are closely related with the direct sales proportion and so is the dummy variable for father in a high-income occupation. More importantly, the coefficients on the social capital variables are positive and significant, especially in 2009. Thus, it is fair to say that our social capital variables do a good job.

Between the enterprise surveys in 2008 and 2009, 18 enterprises exited the industry. A probit model is applied to the whole sample obtained in 2008. The dependent variable is unity if the enterprise was closed in 2009 and zero if it was still operating in 2009. The estimation results are shown in columns (3) and (4) of Table 7. The two columns differ in that column (4) includes the logarithm of the number of workers in 2008. The negative and marginally significant coefficient on this variable indicates that larger enterprises are less likely to exit. In other respects, the two columns look similar. In both columns, the coefficients on the years of operation, marketing experience, and the number of friends and relatives in the same industry are negative and significant. These results are highly consistent

with the results shown in Tables 4, 5, and 6 as well as with the first two columns of Table 7. Hence, they increase our confidence in the results of our hypothesis testing.

V. Concluding Remarks

This study has found that while social capital is one of the major factors closely associated with the performance of independent enterprises in an industrial cluster, it is not as closely associated with the performance of subcontractors. It is also found that subcontractors have the same chance of transforming their businesses into independent enterprises, regardless of prior marketing experience, personal connections in the industry, and access to finance. These findings indicate that subcontracting provides an incubation period for new entrants with unfavorable endowments of special human capital, social capital, and financial capital.

A number of industrial clusters in developing countries have been stagnant. One might think that the stagnancy arises because either the rate of new entry or the rate of improvement in product quality and productivity is substantially below the socially optimal level. The findings of this paper suggest that the entry of new enterprises to industrial clusters is unlikely to be grossly suboptimal. In the Sargodha cluster, a few relatively large companies have been attempting to introduce advanced technologies from China and elsewhere, but it is too early to observe any effects. Many other clusters in Asia and Africa have faced similar problems of stagnancy after experiencing the entry of new enterprises. Policy efforts should thus be directed to improvements in product quality and productivity, such as the provision of training in production and quality management. Such training may be subsidized until entrepreneurs recognize the value management knowledge. Entrepreneurial investments may also be encouraged by strengthening formal market institutions, which would reduce market

transaction costs. Our findings, however, are suggestive rather than definite evidence. The difficulty with social capital lies in its invisibility. Our data do not clearly isolate the impacts of social capital from those of human capital and financial capital. Moreover, it is difficult to determine to what extent the findings of this study of the electrical fitting industry in Punjab can be applicable to other societies. However, the findings of this paper do warrant considerable further studies in these directions.

References

Akoten, J. E., Sawada, Y. and Otsuka, K. (2006) The determinants of credit access and its impacts on micro and small enterprises: The Case of Garment Producers in Kenya. *Economic Development and Cultural Change*, 54(4), pp. 927-944.

Amsden, A.H. (1977) The division of labor is limited by the type of market: the case of Taiwanese machine tool industry. *World Development*, 27 (9), 1693-1713.

Barr, A. (2000) Social capital and technical information flows in the Ghanaian manufacturing sector. *Oxford Economic Papers*, 52 (3), pp. 539-559.

Becker, G. S. and Murphy, K. M. (1992) The division of labor, coordination costs, and knowledge. *Quarterly Journal of Economics,* 107 (4), pp. 1137-1160.

Biggs, T. and Shah, M. (2006) African SMEs, networks, and manufacturing performance. *Journal of Banking and Finance,* 30 (11), pp. 3043-3066.

Boje, D. and Khan, F.R. (2009) Story-branding by empire entrepreneurs: Nike, child labour and Pakistan's soccer ball industry. *Journal of Small Business and Entrepreneurship,* 22(1), pp. 9-24.

Cameron, C. and Trivedi, P. (2005) *Microeconometrics: Methods and Applications* (Cambridge: Cambridge University Press).

Caniëls, C. J. and Romijn, H. A. (2003) Agglomeration advantages and capability building in industrial clusters: The missing link. *Journal of Development Studies*, 39(3), pp. 129-154.

Cawthorne, P. M. (1999) Of networks and markets: the rise of a south Indian town, the example of Triuppur's cotton knitwear industry. *World Development*, 23(1), pp. 43-56.

Colombo M., and Delmastro, M. (2002) The determinants of organizational change and structural inertia: technological and organizational factors. *Journal of Economics and Management Strategy*, 11(4), pp. 595-635.

de Mel, S., McKenzie, D., and Woodruff, C. (2009) Measuring microenterprise profits: must we ask how the sausage is made? *Journal of Development Economics,* 88 (1), pp. 19-31.

Fafchamps, M., and Minten, B. (1999) Relationships and traders in Madagascar. *Journal of Development Studies,* 35 (6), pp. 1–35.

Ghani, W.I., and Ashraf, J. (2005) Corporate governance, business group affiliation, and firm performance: descriptive evidence from Pakistan. CMER working paper, no. 05-35, Lahore University of Management Sciences**.**

Hackett, S. M., and Dilts, D. M. (2004) A systematic review of business incubation research. *Journal of Technology Transfer,* 29 (1), pp. 55-82.

Hayami, Yujiro. (2009) Social capital, human capital and the community mechanism: toward a conceptual framework for economists. *Journal of Development Studies*, 45(1), pp. 96-123.

Kajisa, K. (2007) Personal networks and nonagricultural employment: the case of a farming village in the Philippines. *Economic Development and Cultural Change*, 55 (4), pp. 669-707.

Landes, D. S. (1969) *The Unbound Prometheus* (Cambridge: Cambridge University Press).

Marshall, A. (1920) *Principles of Economics: An Introductory Volume* (London: Macmillan).

Montgomery, J. D. (1991) Social networks and labor market outcomes: towards an economic analysis. *American Economic Review,* 81 (5), pp. 1408-1418.

Morosini, P. (2004) Industrial clusters, knowledge integration and performance. *World Development,* 32 (2), pp. 305-326.

Mottaleb, K. A. and Sonobe, T. (2011) An inquiry into the rapid growth of the garment industry in Bangladesh. *Economic Development and Cultural Change*, 60 (1), forthcoming.

Nabi, E. (1988) *Entrepreneurs and Markets in Early Industrialization: A Case Study from Pakistan* (San Francisco, CA: ICS Press).

Nadvi, K. (1999a) The cutting edge: collective efficiency and international competitiveness in Pakistan. *Oxford Development Studies,* 27(1), pp. 81-107.

Nadvi, K. (1999b) Shifting ties: social networks in the surgical instrument cluster of Sialkot, Pakistan. *Development and Change,* 30(1), pp. 141-175.

Nadvi, K. (2008) Global standards, global governance and the organization of global value chains. *Journal of Economic Geography*, 8 (3), pp. 323-343.

Nam, V. H., Sonobe, T., and Otsuka, K. (2010) An inquiry into the development process of village industries: the case of a knitwear cluster in northern Vietnam. *Journal of Development Studies*, 46(2), pp. 312-330.

Putnam, R. D. (2000) *Bowling Alone: The Collapse and Revival of American Community* (New York: Simon and Schuster).

Ruan, J., and Zhang, X. (2009) Finance and cluster-based industrial development in China. *Economic Development and Cultural Change,* 58 (1), pp. 143–164.

Schmitz, H. (1995) Collective efficiency: growth path for small scale industry. *Journal of Development Studies*, 31(4), pp. 529-566.

Schmitz, H. (1999) Global competition and local cooperation: success and failure in the Sinos Valley, Brazil. *World Development*, 27(9), pp. 1627-1650.

Simon, C. and Warner, J. (1992) Matchmaker, matchmaker: the effect of old boy networks on job match quality, earnings, and tenure. *Journal of Labor Economics,* 10 (3), pp. 306-330.

Sonobe, T., Hu, D. and Otsuka, K. (2002) Process of cluster formation in China: a case study of a garment town. *Journal of Development Studies,* 39 (1), pp. 118-139.

Sonobe, T. and Otsuka, K. (2006) *Cluster-Based Industrial Development: An East Asian Model* (Basingstoke: Palgrave Macmillan).

UNIDO (2006) *Diagnostic Study of Electrical Fittings Cluster in Sargodha* (Islamabad: UNIDO, Pakistan).

Watanabe, S. (1970) Entrepreneurship in small enterprises in Japanese manufacturing. *International Labor Review*, 102 (6), pp.531-576.

Weijland, H. (1999) Micro-enterprises clusters in rural Indonesia: industrial seedbed and policy target. *World Development*, 27(9), pp. 1515-1530.

World Bank (2000) *World Business Environment Survey*, (Washington D.C.: World Bank).

Yamamura, E., Sonobe, T. and Otsuka, K. (2003) Human capital, cluster formation, and international relocation: the case of garment industry in Japan, 1968-1998. *Journal of Economic Geography,* 3 (1), pp. 37-56.

Zhang, X., Ayele, G. and Moorman, L. (2011), Infrastructure and Cluster Development: A Case Study of Handloom Weavers in Rural Ethiopia, *Journal of Development Studies,* forthcoming.

Zhu,Y., Bhat, R., and Nel, P. (2005) Building business relationships: a preliminary study of business executives' views. *Cross Cultural Management*, 12(3), pp. 63-85

Table 1. Number of new entrants and their initial capital by enterprise status

	Enterprises established as			
	Companies		Subcontracting workshops	
	No. of enterprises	Initial investment (1000 Rupees)	No. of enterprises	Initial investment (1000 Rupees)
Up to 1980	6	335	3	78
1981-1990	13	467	18	82
1991-2000	23	383	46	114
2001-2008	34	382	89	60
Total	76		156	

Table 2. Years of operation, employment, and subcontracting by enterprise status

	Companies	Subcontractor-turned-companies	Subcontracting workshops
Number of observations	76	50	106
Years of operation in 2008	11.0	12.2	6.0
Years spent as subcontractor before turning into companies	0	6.6	--
Number of workers in 2008	16.2	9.6	6.4
% production subcontracted in 2008	37.2	21.6	5.0

	Companies	Subcontracting workshops
Number of workers in 2004	14.6	6.2
Number of workers in 2008	14.5	6.4
% production subcontracted in 2004	21.2	3.0
% production subcontracted in 2008	31.0	5.0
% direct sales in 2004	68.5	
% direct sales in 2008	72.4	

Table 3. Mean characteristics of entrepreneurs by enterprise status

	Companies	Subcontractor-turned-companies	Subcontracting workshops	Exits between the surveys
Years of schooling	9.7	7.7	6.2	3.8
Years of prior experience in marketing	3.4	1.1	0.1	0.4
Years of prior experience in producing electrical fittings products	3.3	6.0	5.0	7.8
Dummy = 1 if father is or was in the same industry	0.11	0.02	0.01	0.06
Number of friends and relatives in same industry	4.1	1.9	0.8	0.4
Dummy = 1 if father is or was in high-income occupation	0.75	0.42	0.17	0.06
Entrepreneur's share of initial investment finance (%)	49.5	60.8	69.1	54.4
Father’s share of initial investment finance (%)	45.1	26.7	13.5	22.2
Age at time of entry	30.8	30.0	31.7	32.2

Table 4. Estimated discrete choice models of determination of enterprise status

	(1)	(2)	(3)
	Probit model for a company rather than a subcontractor when founded. Cross section	Probit model for a company rather than a subcontractor in 2008. Cross section	Ordered probit model for a company, a sub-con-turned-company, or a subcontractor. Pooled data
Years of schooling	0.027**	0.028**	0.040***
	(2.48)	(2.40)	(7.95)
Years of operation in 2008		0.022***	0.030***
		(3.24)	(5.10)
Prior marketing experience	0.300***	0.287***	0.252***
	(2.74)	(2.64)	(6.56)
Prior experience of electrical fittings production	-0.064	0.011	-0.012
	(-0.79)	(0.10)	(-1.28)
Number of friends and relatives in same industry	0.021*	0.036**	0.042***
	(1.87)	(2.11)	(5.22)
Father in same industry	0.496**	0.334***	0.577***
	(2.55)	(3.95)	(5.36)
Father in high-income occupation	0.346***	0.380***	0.383***
	(4.22)	(5.02)	(4.49)
Entrepreneur and his father's share of initial investment	0.003*	0.001	0.003**
	(1.75)	(1.07)	(2.07)
Entrepreneur's age at time of founding	0.006		
	(1.27)		
Entrepreneur's age		0.003	0.008
		(0.68)	(1.44)
Year 2006 dummy			-0.057
			(-0.42)
Year 2008 dummy			-0.501
			(-0.37)
Year 2009 dummy			-0.079
			(-0.58)
Dummy for establishment in the 1990s	-0.121		
	(-1.16)		
Dummy for establishment in the 2000s	-0.111		
	(-0.99)		
Intercept	-2.865***	-2.276***	
	(-3.55)	(-3.35)	
Chi-Square	116.25	128.01	487.86
Number of observations	232	232	822
% subcons correctly predicted	65.4	65.1	56.4
% companies correctly predicted	59.2	69.1	60.1
% subcon-companies correct			62.8
% total correct predictions	63.4	67.2	59.0

The marginal effect estimates are reported in columns (1) and (2), while the estimated coefficients are reported in (3). In the ordered probit model in (3), ordered response, y, is equal to 1 for a subcontracting workshop, $y = 2$ for a subcontractor-turned-company, and $y = 3$ for a company. While data in 2004, 2006, 2008, and 2009 are pooled in (3), neither fixed- nor random-effects specification is used because explanatory variables are time invariant. Numbers in parentheses are z-statistics. *, **, and *** indicate the 10%, 5%, and 1% levels of statistical significance, respectively.

Table 5. Estimated Cox proportional hazard models fitted on upgrading from subcontractors to independent enterprises

	(1)	(2)
	Enterprises established as subcontracting workshops	All sample enterprises
Years of schooling	0.118***	0.092***
	(2.58)	(3.11)
Prior marketing experience	0.641	0.778***
	(1.17)	(3.27)
Prior experience of electrical fittings production	0.368	0.037
	(0.78)	(0.17)
Number of friends and relatives in same industry	0.047	0.023*
	(0.97)	(1.70)
Father in same industry	1.864	1.075***
	(1.57)	(2.77)
Father in high-income occupation	0.610*	0.949***
	(1.69)	(4.20)
Entrepreneur and his father's share of initial investment	0.003	0.005
	(0.64)	(1.30)
Entrepreneur's age at time of founding	-0.013	-0.006
	(-0.67)	(-0.48)
Dummy for establishment in the 1990s	0.846*	0.229
	(1.74)	(0.79)
Dummy for establishment in the 2000s	1.107**	0.377
	(2.01)	(1.24)
Chi-square	23.31	108.83
Log likelihood	-188.54	-545.85
Number of observations	156	232

The dependent variable is the log hazard ratio. The reported estimates are not the marginal effect but the coefficients of the model. The model in column (1) uses the sample of enterprises that were established as subcontracting workshops, while the model in column (2) uses the entire sample. Numbers in parentheses are *z*-statistics. *, **, and *** indicate the 10%, 5%, and 1% levels of statistical significance, respectively.

Table 6. Estimated functions explaining employment size and subcontracting ratio

	Second-step OLS regression of ln(employment)			Second-step tobit regression of subcontracting ratio		
	Companies	Subcon-turned-companies	Subcon workshops	Companies	Subcon-turned-companies	Subcon workshops
	(1)	(2)	(3)	(4)	(5)	(6)
Years of schooling	0.044***	0.030*	0.003	0.460***	0.267**	0.218
	(2.70)	(1.78)	(0.58)	(2.70)	(2.43)	(1.27)
Years of operation	0.071***	0.041**	0.030**	1.763***	1.258**	0.715
	(5.20)	(2.25)	(2.53)	(3.01)	(2.47)	(1.53)
Prior experience in marketing	-0.398	-0.117	-0.010	19.179***	15.393***	7.219**
	(-1.60)	(-0.79)	(-1.59)	(2.81)	(2.75)	(2.07)
Prior experience in production	-0.072	-0.086	-0.627	-0.271	-0.304	-0.159
	(-0.68)	(-1.47)	(-0.84)	(-0.98)	(-0.82)	(-1.18)
No. friends and relatives in the same trade	0.020***	0.013*	0.003	0.804	0.712	0.082
	(3.02)	(1.74)	(0.31)	(0.79)	(0.71)	(0.45)
Father in same trade	0.240*	0.156*	0.144	0.889	0.761	0.175
	(1.81)	(1.73)	(0.72)	(1.63)	(0.51)	(1.35)
Father in high income occupation	0.029	0.023	-0.001	-6.152***	-4.169*	-1.238*
	(0.78)	(0.20)	(-0.06)	(-3.34)	(-1.94)	(-1.81)
Own share in initial investment	0.002	0.001	0.001	-0.190*	-0.113*	-0.052
	(0.73)	(1.19)	(0.88)	(-1.99)	(-1.70)	(-1.18)
Entrepreneur's age	0.012	0.000	-0.004	0.171	-0.269	0.067
	(1.02)	(0.05)	(-1.47)	(0.53)	(-0.73)	(1.35)
Inverse Mills ratio	0.716	0.311	0.208	0.823	0.698	0.946
	(1.58)	(0.84)	(0.52)	(1.47)	(0.95)	(1.13)
Year 2006 dummy	-0.061	-0.033	-0.018	3.347*	2.112	0.019
	(-0.42)	(-0.23)	(-0.28)	(1.73)	(1.37)	(0.04)
Year 2008 dummy	-0.218	-0.082	-0.051	5.231**	3.522*	3.258
	(-1.48)	(-0.60)	(-0.71)	(2.04)	(1.73)	(0.86)
Year 2009 dummy	-0.167	-0.052	-0.013	7.063***	3.249***	2.769*
	(-1.14)	(-0.39)	(-0.20)	(3.35)	(2.85)	(1.81)
Intercept	0.623**	0.518**	0.669*	-14.959	-10.436	-25.331
	(2.35)	(2.50)	(1.94)	(-0.58)	(-0.72)	(-1.50)
Number of obs.	281	172	369	281	172	369
left-censored obs.				61	60	251

In columns (4) to (6), the estimates of marginal effects are reported. Numbers in parentheses are *t*-statistics in column (1) to (3) and *z*-statistics in columns (4) and (6) based on standard errors corrected for clustering of the observations at the enterprise level. *, **, and *** indicate the 10%, 5%, and 1% levels of statistical significance, respectively.

Table 7. Estimated Tobit model of direct sales proportion and probit model of exits

	Direct sales (two limit tobit)		Exit (probit)	
	2004	2009		
	(1)	(2)	(3)	(4)
Years of schooling	0.492**	0.614***	-0.014**	-0.009*
	(2.31)	(2.88)	(-2.15)	(-1.89)
Years of operation	0.173*	0.228***	-0.064**	-0.017**
	(1.68)	(3.87)	(-1.98)	(-2.03)
Prior marketing experience	9.438***	7.121***	-0.108***	-0.101**
	(3.79)	(3.76)	(-2.94)	(-2.37)
Prior experience of electrical	0.422	0.875	0.027	0.001
fittings production	(0.28)	(0.33)	(0.88)	(1.16)
Number of friends & relatives	0.367*	0.405**	-0.009*	-0.006*
in same industry	(1.78)	(2.25)	(-1.93)	(-1.86)
Father in same industry	3.394	4.342**	0.055	0.037
	(1.27)	(2.39)	(0.44)	(0.95)
Father in high-income	1.056	1.989**	-0.029	0.003
occupation	(1.42)	(2.48)	(-0.86)	(1.03)
Entrepreneur and his father's	0.047	-0.005	-0.000	0.000
share in initial investment	(0.63)	(-0.44)	(-0.56)	(0.66)
Entrepreneur's age at the time of	0.031	0.000	-0.001	-0.000
founding	(0.37)	(0.10)	(-0.60)	(-0.49)
ln(the number of workers in 2008)				-0.068*
				(-1.70)
Intercept	-129.79	-93.22	0.260	0.371
	(-1.05)	(-1.12)	(0.28)	(0.89)
Pseudo *R*-square	0.1891	0.2098		
Chi-square for probit			18.2	26.6
Number of observations	91	125	232	232
Number of left censored obs.	17	14		
Number of right censored obs.	44	60		

In columns (1) and (2), the sample includes only the companies. In columns (3) and (4), the whole sample is used. The estimates reported are the marginal effects. Numbers in parentheses are *z*-statistics. *, **, and *** indicate the 10%, 5%, and 1% levels of statistical significance, respectively.

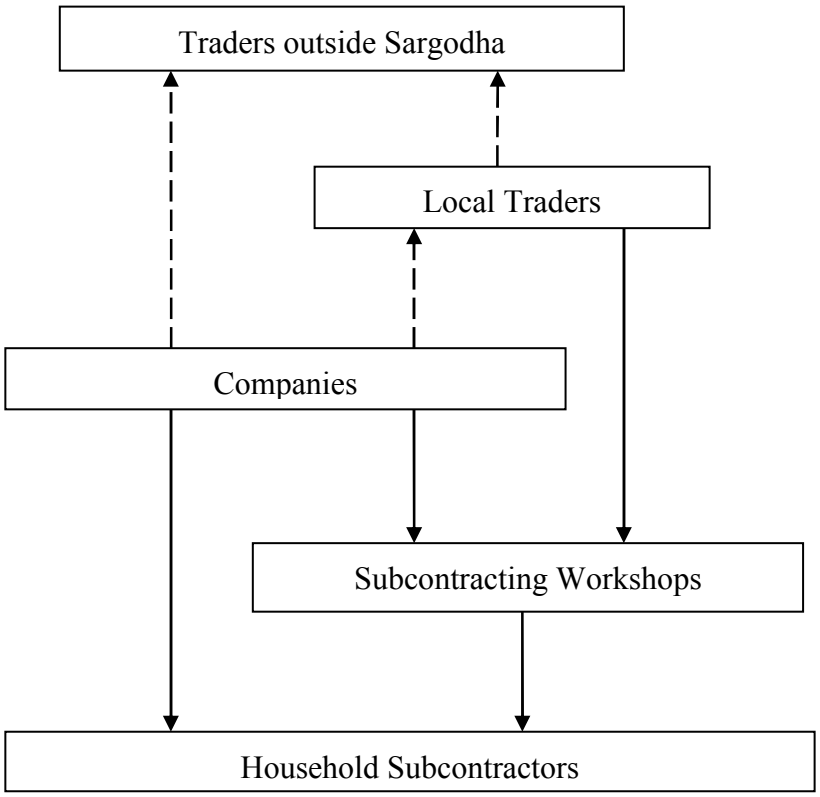

Figure 1. Subcontracting and marketing relationships

Notes:

⟶ indicates those who enter into putting-out contracts. A household subcontractor receives parts and materials from and delivers assembled products to a company or a subcontracting workshop. A subcontracting workshop receives raw materials from and delivers finished products to a company or a local trader.

⟵ – – indicates a marketing channel. Companies sell finished products to local traders or directly to outside buyers. Local traders sell finished products to carpenters or consumers directly or through traders outside the city.