What makes micro enterprises perform in a jewellery cluster? *Seeing space for Computer Aided Designing (CAD)*

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We examine factors which contribute to the performance of micro business units located in a business cluster. Notwithstanding the stable system of business, the cluster which is embedded with local socio-cultural milieu in the past, with the advent of big enterprises to the vicinity of the cluster, sees a dampening effect of new capital and ideas, pushing these enterprises through a trajectory of contraction. In this paper, based on a sample of 174 jewellery units drawn from a cluster of 200 jewellery units in Mangalore, Karnataka State, India, we study core aspects of business such as marketing channels, sources of finance, design, customer relation, employment, output and major constraints in the business. Quite important, barring a few exceptions, business units are quite small, who are engaged in the tradition business of jewellery making; whose fortunes swing between subsistence and windfall surplus. Drawing cues from the field experience, we construct simple static and dynamic models of firms' performance. The estimate of the median based Quantile Regression model shows that proportionate change in output is significantly determined by catalogue being source of design, lack of demand as a major constraint, design done by the staff, number of skilled staff and year of establishment. While year of establishment reports negative sign, others report significantly positive relation. Drawing cues from theory we developed, data we collected from field –both quantitative and narratives-, and regression estimates unequivocally point to the role of technologies like Computed Aided Designing (CAD) and skill formation to rejuvenate a beleaguered cluster.

Introduction

In evaluating economic opportunities, notwithstanding the primacy of cost-benefit calculus, social-cultural milieu may throw cues on why certain traditional businesses cluster in particular locations. A noteworthy case is jewellery business, pursued by enterprise owners who share same social identities like caste, which tends to cluster around spaces like temple premises. A likely pattern of clusters of this nature is higher density of extremely small enterprises whose pay-offs hover around expected stream of earning with occasional fortunes and misfortunes. As long as economy remains in a steady state, least perturbed by the influx of capital and new ideas, cluster is likely to retain its composure in terms of cluster size, earning and so on. However, as economy becomes more open, featuring new resources, capital and ideas, steady state of assured stream of payoffs being earned by traditional enterprises in the cluster may give way for a new series of pay-offs which do not satisfy reservation utilities of enterprise owners, gradually sliding to extinction. Nevertheless, even in the midst of tumultuous changes, a few or some enterprises might identify ways of sustaining their performance albeit not many opportunities to grow. In societies where identities like caste are embedded with organising businesses/livelihoods by self, social milieu and economic objectives may overlap, generating both propitious and constraining scenarios for business[1]. While embedding of this nature may form favourable conditions for a short run equilibrium, deviating from this state might be viewed as irrational choice, then forming the part of shared conventional wisdom, in the long run with infusion of ideas, design, technology and capital, viewing performance and growth through the prism of received views and conventions might turn out to be a spiral of myopic decisions, with no adjustment being made for ideas, design, technology and capital[2].

In this paper we study a cluster of jewellery making enterprises located in the vicinity of *Kalikamba* temple in Mangalore City, Karnataka State, India. This cluster, more than 8 centuries old, has close to two hundred enterprises, which are quite small in size varying between 100 square feet to 1000 square feet, employing on an average two workers. All enterprise owners belong to Hindu sub-caste *achari*, whose traditional occupation is gold smithy. The sub-caste *achari*[3] is classified as Other Backward Class (OBC)[4]. Interestingly, according to local sources of chronicle, *Kalikamaba* temple was built by *achari* community who had settled in the premises of place where the cluster is located. While *Kalikamba* temple was established in the year 1700 AD by *achari* families, cluster's genesis dates back to 1200 AD. In the 1980s, the cluster had more than thousand units, which dwindled to a measly collection of 200 by the 2000s. There is hardly any archived history on the cluster, in particular its ups and downs. Nevertheless, based

[1] Granovetter (2005) describes the nature of overlap between social and economic systems, delineates salient features of embedding.

[2] As shown by Uzzi (1997), while emembeddedness generates positive effects, beyond a threshold it may adversely affect economic performance.

[3] Belongs to *vishwakrma* caste, which consists of gold smiths, silver and bronze smiths, black smiths, carpenters, and stone mazons.

[4] see http://www.ncbc.nic.in/Pdf/karnataka.pdf

on cues from narratives and oral history, cluster appears to have had greater embedding with the social-cultural system of the region. For instance, institutional traits like religious procedures and social customs seem to be pivotal in sustaining the business of units in cluster. Moreover, the size of cluster might have grown with the increase in the population of *achari*s who live in the region. Quite important, since goldsmith as an occupation was quite traditional and being endemic in a social system built on caste and patriarchy, increment in male members in the family might have positively contributed to the size of the cluster.

However, the story of steady growth took a convoluted turn in the 1990s when new capital, ideas and technologies struck the local jewellery market, generating a spiral of changes, even to the extent of creating holes in the socially embedded exchanges which had characterised the cluster. Post 1990s, Mangalore witnessed the influx of new capital which was infused to create new production-trading system to sell the jewellery. Some of these changes were: (i) designs which were tacit in persons and artefacts became explicit through codified sources like catalogues –printed and electronic-, (ii) entry of new large and integrated jewellery show rooms, which use advertising as the principal means of attracting customers while word of mouth is the major medium for small traditional enterprises, and (iii) emergence of capital intensive centralised production systems of jewellery making. As socially embedded traditional business was being substituted by new form of business, driven by large enterprises, many small enterprises had to seize operations, leading to massive mortality of small units. Interestingly, even in this milieu of prey-predator dynamics, most of the enterprises hover around subsistence level while exceptional ones show exemplary performance. Against this backdrop, we examine what determines performance of these enterprises. We move in a sequential manner. First, we make a simple model of small enterprises, presenting static and dynamic scenarios. Second, we attempt a modest econometric analysis to sketch determinants of performance.

This paper is organised into five sections. Section 2 presents a theory of small enterprises in a traditional cluster. Section 3 describes fieldwork, in particular sampling and data collection. Section 4 gives findings and discussion based on it. Finally, section 5 gives conclusion.

Theory of small enterprises in a traditional cluster

We present a model of micro enterprise, embodying salient characteristics of enterprises in the jewellery cluster. First, we show a static scenario where there are no multiple points of time. In this model, time is viewed as an expanse without interval. We assume that there are 'n' enterprises in the cluster. There is neither slack nor surplus. Even if any of these 'imbalances' occur, market implicit in the cluster is capable of self curing deficits or surpluses. Being a traditional livelihood, cluster is open to adult males in the concerned caste, while persons from other castes, but desirous of launching self into the cluster, is unlikely to have an unassailable passage into the system. We assume that while enterprises may have

multiple objectives, the credible and visible objective is to earn revenue in excess of cost. Therefore, as shown in equation 1, for enterprise 'i', objective is to maximise the surplus - π_i -.

$$\pi_i = p \cdot Q_i - w \cdot L_i \qquad (1)$$

π_i = Surplus of benefit over costs for enterprise *i*

p = Unit Price, Q = Output, w = Unit Wage, L = Labour in Hours, i = i^{th} enterprise in the cluster.

It is worth noting that gold jewellery being the output is a highly liquid asset, assuming negligible transaction costs for exchanging the jewellery for cash. So, we set p equals one. In normal circumstances, enterprise *i* is likely to produce $\frac{1}{n}$ th of Q. But there may be occasions when *i* produces less or more. The abnormal loss or gain is represented by a random variable u, with mean zero and standard deviation σ. So, output of *i* is a fraction of total output of the cluster. This fraction is the sum of $\frac{1}{n}$ th and random variable u. So Q*i* becomes

$$Q_i = \left[\frac{1}{n} + u\right] Q \qquad (1.a)$$

Assuming a greatly flexible labour market in a competitive cluster, unit wage (w) is supposedly determined on the basis of value of marginal productivity of labour i.e. $\frac{dQ}{dL}$. Further, we rule out any possibility of increasing returns to scale, and assumes constant returns. Thus, marginal productivity is equal to average productivity. So, w is expressed as follows:

$$w = \frac{Q}{L} \qquad (1.b)$$

It is important to note that w tends to be homogenous across enterprises on two principal reasons: (i) being a competitive cluster any deviation from uniform wage results in imbalances in labour market equilibrium, (ii) information about wage spreads like a contagion in a cluster, leaving no scope for leveraging on informational gaps.

Incorporating (1.a) and (1.b), equation 1 becomes:

$$\pi_i = \left[\frac{1}{n} + u\right] Q - Q/L \cdot L_i \qquad (2)$$

Further, L_i is δ fraction of aggregate labour force (L) in the cluster. Expected value of π_i is given below:

$$E(\pi_i) = \frac{Q}{n} - \frac{Q}{L} \cdot (\delta L) \qquad (3)$$

Differentiating $E(\pi_i)$ with respect to output Q and sets equal to zero, we get

$$f_I = d\frac{E(\pi_i)}{dQ} = \frac{1}{n} - \delta = 0 \quad (4)$$

Equation 4 says that, at surplus maximising output of enterprise *i*, 1/n th fraction of number of enterprises in the cluster becomes equal to enterprise *i*'s absorption of labour from the labour supply in the cluster (i.e. δ) . In other words, if n declines, δ tends to go up. Interestingly, we get same conclusion, when we view enterprise aggregate surplus over time (V_t), may be over years. V_t is expressed below:

$$V_t = \int_0^t E(\pi_i)e^{-rt}dt \ ^5 \quad (5)$$

As shown in equation 5, we aggregate assuming time as a continuous scale of discounted values of surplus. The rate r is used as a discounting factor, which may be the expected interest rate in the cluster. Assembling equation 3 and 5, we get 5.a.

$$V_t = \int_0^t Q_t\,[\frac{1}{n} - \delta]e^{-rt}dt^6$$

$$= Q_t/r(\frac{1}{n} - \delta)(e^{-rt} - 1) \ (5.a)$$

Differentiating V_t with respect to output Q and sets equal to zero,

$$\frac{dV_t}{dQ} = 1/r(\frac{1}{n} - \delta)(e^{-rt} - 1) = 0$$

$$\frac{1}{n} - \delta = 0 \quad (6)$$

In equation 6, we get the same conclusion given in equation 4.

The theory we described above presents unperturbed static and dynamic situations; system is hardly punctured by exogenous forces. What happens if the cluster is impacted by new forces like big showrooms, which enter the market with huge investment on specific assets, with a risk of irreversibility of processes and sunk costs emanating from that? In such scenarios, new entrants would try to mitigate risks from sunk costs by consolidating business, through strategies like foraying into so far stable economic system of the cluster, making entry tougher for other big players through scale and scope, and novel ways of extending relation with customers. Perhaps, this brings very interesting dynamics, resulting in either convergence to stable point or spiral of divergences. We create a simple system of two differential equations to present this dynamics[7].

[5] $\int_0^t E(\pi_i)e^{-rt}dt = \int_0^t [Q_t/n - Q_t/L_t(\delta \cdot L_t)] \cdot e^{-rt} \cdot dt$

[6] $V_t = Q_t\left(\frac{1}{n} - \delta\right) \cdot \left(\frac{e^{-rt}}{r}\right) - Q_t \cdot \left(\frac{1}{n} - \delta\right) \cdot (1/r)$

[7] We have greatly benefitted from a pedagogic document uploaded in the Website http://personal.lse.ac.uk/Sasane/ma209.pdf. See exercise 2 given in page number 30 of the document in this site. This exercise is an interesting problem of prey-predator dynamics.

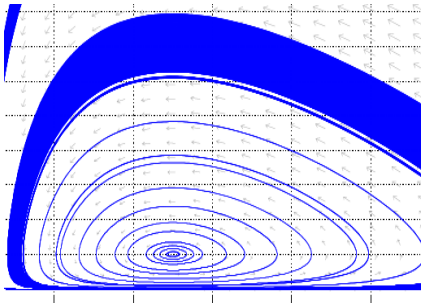
$$\frac{dX}{dt} = (m - nY)X \quad (7)$$

$$\frac{dY}{dt} = (-o + pX)Y \quad (8)$$

X = Number of enterprises in the cluster, Y = Number of Big Players,

m, n, o, and p are parameters which are non negative.

Equation 7 states that change in the number of enterprise in the cluster (X) with respect to time is positively impacted by the initial size of the cluster, by setting an exponential trajectory, while this path gets dampened down by new big players' (Y) interface with X. So, we have m and n as parameters, representing magnitudes of explosion and dampening, respectively. On the other hand, equation 8 conveys that since big players (Y) are on perpetual conflict, approximating a zero sum game and discernible trust deficit, initial point might act as a dampener, represented by (-) o., while interface between X and Y, like Y as a leader and X as a follower in a value chain, might trigger off positive vibes, moderated by p. To get an exhaustive view of stable and unstable systems implicit equations 7 and 8, we may have to combine possible relations between parameters -both inequality and equality-. First we explore with m=0.10, n=0.01, o=0.50, and p=0.01. Here, we give same values to interfaces i.e. n and p, while m and o get values 0.1 and 0.5, respectively; this is a combination of moderate initial value effect for the cluster, less visible interfaces, and cut throat competition between big players. As shown in figure 1, phase map of equations 7 and 8 indicates possibility of stable equilibrium, evident in the convergence of trajectories. The equilibrium features a combination of 50 small enterprises in the cluster and 10 big new enterprises. More less same pattern emerges if we maintain same hierarchy for values of parameters.



Note: New Big Enterprises (Y) is on vertical axis and Enterprises in cluster (X) on horizontal axis[8]

Figure 1: Phase map of equations 7 and 8 (m=0.10, n=0.01, o=0.50, and p=0.01)

Interestingly, if o decreases to 0.1, remaining other parameters same, indicating lesser competition or possible collusion between big players, the size of cluster might shrink to just 10 enterprises while number of big players remains same in the new equilibrium. On the other hand, if o increases to 1, remaining

[8]Figure 1 was created using pplane routine of MATLAB software

other things same, cluster size jumps to 100 while number of big enterprises remains same. Most likely, leaving aside logical scenarios, given that big enterprise might be seriously engaged in committing to specific assets, in the survival game, only a few big enterprises would sustain in the long run. Therefore for small enterprises to grow or sustain needs to adapt with these changes. We did fieldwork in a jewellery cluster in Mangalore to understand what makes these enterprises to perform when new equilibrium of performance is being created by big enterprises.

Field work in Mangalore jewellery cluster

With an objective of knowing what are the determinants of enterprise' performance, we conducted a survey of enterprises during April-August 2012 in the jewellery cluster, located in the vicinity of *Kalikamba* temple, Mangalore in Karnataka State, India. This cluster has 200 small enterprises, which formed our universe. We had a plan of covering all 200 units in our survey. In view of constraints such as non availability of enterprise owner for interview, we could cover 173 enterprises, missing the rest. Nevertheless, this sample appears to be quite a representative one. Across the units of analysis – enterprises-, we did not identify any worthy strata to generate variation. First, we designed an interview schedule, covering questions on i) basic profile (ii) operations (iii) employment, and (iv) constraints and competitiveness. Using the schedule, we did a pilot survey of 20 enterprises, mainly to see how instrument works in obtaining data. This process led to refinement of the schedule. Thus, the final schedule came (see Appendix 1).

In our survey, we defined enterprise owner as the respondent, representing the unit of analysis 'enterprise in the cluster'. This became a constraint to obtain data since we found in some occasions when visited the enterprise for the data, owner would be away. So, this led us to adopt a strategy of taking prior appointment first then make a visit. Barring a few exceptions, respondents were quite cooperative with the survey. On an average, each interview took an hour. Interestingly, while a large portion of interview time was on filling the schedule, during rest of the time respondents shared their experiences and concerns about their livelihood. A few respondents before participating in the interview were eager to know the possible outcome of the research, in particular any policy changes. We generated a standard answer to probes of this nature, conveying that the research is purely an academic exercise with no clear policy implications.

In the pilot phase, we had tremendous difficulties in obtaining credible data on surplus/profit. On the other hand, respondents were not hesitant to share data on annual turnover/output in quantity of gold. So, in the later phase, we dropped any probe on surplus/profit. Nevertheless we retained question on annual turnover/output. Later, we converted output in gold to monetary value. Further, our interaction with respondents during the survey brought knowledge about conventions like 'quantity gold in the business' is being seen as performance. Later in the analysis, we use quantity of gold in the business as an

indicator of performance. The common conversion rate is that business worth one kilo gram gold[9] is equivalent to an income of Indian Rupees 60, 000.

Most of the questions, used in the schedule, are multi response, allowing space for overlaps. This design was greatly influenced by our preliminary field work, when we found that seeing the choices to questions, respondents were eager to pick multiple options. On probing why they like to pick multiple options, they shared that the reality they face is in sync with overlap of options than mutually excusive ones.

Findings from the Survey

It is important to note that close to two third of enterprises in the sample were established before 2000 while slightly above one sixth of enterprises in the sample were set up before 1980. Further, 70% of enterprises do not employ more than 2 workers. Only 3% of enterprises employ more than 5 workers. Close to two third of enterprise do business of not more than 3 kilo grams of gold, while just 3 percent of them have business not less than 10 kilo grams. Out of 173 enterprise owners whom we interviewed, 26 of them did not share information on value of business. Quite important, half of them do business worth just 2 kilo grams of gold. This variable reports a markedly skewed distribution with a longer right tail; the mean turns out to be much higher than the median and the median is greater than the mode. Although this asymmetry in the distribution may have roots in enterprise owner's ability to generate and sustain business, narratives which we gathered from some respondents indicate that the advent of big players since the 1990s might have dented the business prospect of the cluster, causing a downward movement of average volume. Citing a narrative on nostalgic past, an enterprise owner shared "before these changes, we hardly had time for leisure…. day and night we were engaged in gainful work".

Age of enterprise owners varies between 24 and 71, 43 being the median age. While one fourth of the distribution is not above 36, three fourth are below 52. The whole sample belongs to *achari* sub-caste, who is classified as Other Backward Classes (OBC) social category. In the sample, there is no single woman. Close to two third of the sample have attained at least twelve years of education. Five sixth of the sample are married.

As shown in Table 1 (Appendix 1), raw material for production, mainly glod, come from sources like local traders, bullion merchants, banks and customers. Local traders and customers are principal sources of raw material i.e. gold. A meagre share of respondents sources raw material from bullion merchants and banks. Interestingly, customer appears to be the major marketing channel for these enterprises, forming more than three fourth of the sample. While five sixth of respondents source finance from Banks, two third depend on friends to source the finance. Interestingly only six percent availed finance from money lenders. Perhaps, 'low participation' of money lenders in the cluster has roots in contraction of business

[9] Business worth one kilo gram gold means that enterprise has got order to transform one kilo gram gold to jewelry. The standard price charged by enterprise from the customer is Indian Rupees 60,000.

activities for last two decades; enterprises may look for money from informal credit market presumably when conventional-formal conduits of credit inadequately cover requirements of expansion.

The design is 'software' of jewellery making, which may emanate from self or external sources like books, catalogue, websites, professional designers, and customers. As shown in table 2 (Appendix 1), a whopping majority use own ideas (96%) and books (89%) to generate design, while two fifth source designs from catalogues. Only minuscule fraction relies on sources like websites, professional designers and customer to come up with design. In the initial stage of fieldwork, we met an enterprise owner who laments forgone opportunities cluster had. Narrating what is amiss in the cluster, he reflected "designs exist in our minds…then to make them more contextual and relevant we need to know computer, software and so on... We hardly got any orientation about contemporary know how of design." This pattern of greater reliance on own ideas[10] and lesser credence to external sources presumably evolves from the phase of contraction the cluster is going through. It is quite likely that in a competitive and expansive cluster, where new ideas, capital, knowledge and persons vie for opportunities, enterprises, to cope the risk of scenarios like 'knowledge disappears with person', tend to create resources for easy and cost-effective reuse and recombination of design by codifying it[11]. Who does design? Table 2 (Appendix 1) shows that barring a few exceptions, almost all enterprise owners know how to design, and some of them source deigns from the staff, while a few get the design done by family members.

In the cluster, enterprise owners use not just their facility, and in times of need, they outsource production to others in the cluster (Table 3, Appendix 1). Quite important, friends act as principal agents of outsourcing. Other channels include artisans, jewellery traders and associations. This behaviour is duly expected from a cluster wherein enterprises get embedded with each other by sharing facilities and business. Affirming the role of embedded relations in the cluster, trust is cited as the commonest element in the relation between enterprise and customer, followed by factors such as access, and cultural-religious factors while being economical is not a principal factor.

Our survey reveals that enterprise owners expect workers to be skilled in two core areas: designing and operating machines. As shown in table 4 (Appendix 1), shortage in skill to operate machines is a commonly shared concern (94%), and then comes shortages in skills relating to designs (53%). It was evident during our survey that most of enterprises employ migrants from other states like West Bengal who are quite young and honing their skills. As viewed by an enterprise owner "Natives of this region, in particular youth of our caste, find their greener pastures… finding traditional livelihood less attractive." Further, this respondent said "so, the mentor-mentee system of learning the skill has gone…" May be this was a qualm that arose from a shared pessimism. Responding to the question 'How to deal with skill

[10] While 'own idea' is akin to the concept of tacit knowledge and sources like websites, catalogues and books are explicit (codified) sources of knowledge. Cowan et al (2000) presents the economic logic of classifying knowledge into codified and tacit.

[11] Design that is tacit in cognition is different from design in public domain; while the former appears to be a private good, the latter conforms to quasi public good, excludable but not rival (See.Romer (1990)).

shortage', nearly five sixth visit other enterprises to learn possible solutions, while slightly above a half see training workers as a solution.

We asked enterprise owners in the cluster to choose major constraints they face in the conduct of the business. We formed the choice of constraints based on our interaction with enterprise owners in the preliminary phase, by probing them in-depth about challenges they face in the business. As shown in Table 5 (Appendix 1), five sixth of the sample note labour shortage and cost of raw material as principal constraints, while three fifths observe working capital and competition as challenges. Just one third see migrant workers as a problem to tackle. Interestingly, one sixth views that lack of demand as a constraint. A minuscule fraction (3%) points to lack of government support as a constraint.

It is worth noting that a whopping four fifth of enterprise owners agree that in comparison with big enterprises they do not get good margin of surplus/profit for their output. Albeit business is embedded with tradition, relation and culture, there appears to no breakthrough in sight from the grip of steady contraction of the cluster. All enterprise owners meet friend/family/relatives in relation to their business at least once a day. May be the social capital implicit in day to day socialisation is not being transformed to credible business gains, akin to the phenomenon of 'weakness of strong ties'[12].

Having described salient aspects of enterprises in the cluster, based on responses elicited from enterprise owners, it is important to assess what accounts for variation in output. Foremost, these enterprises, while sharing some features with entities like firm, are primarily are sources of livelihood, which is traditionally pursued in the region. Enterprises covered in this paper are neither firm nor self employment, rather somewhere between. May be, this is closer to self employment. So, conventional performance indicators such as profit or value added may have limitations in absorbing the field reality. Realising this, we probed enterprise owner on what they view as performance in the initial phase of field work. Quite emphatically, in a converging manner, the amount of gold in the business was seen as performance. We too adopt gold in the business as the measure of performance, which we label as 'output'. While exploring explanatory variables for throwing light on what explains the output, we came across a good number of variables as prospective candidates. First, without applying any screens, being liberal, we ran an ordinary least square regression model with all 'candidates'. The regression turns out be a non-sense, presumably plagued by conventional illnesses like multi-collinearity, heteroscedasticity and so on. As observed before, dependent variable shows a positively skewed pattern with a long right tail. Secondly, we start applying screens to filter eligible variables, applying our heuristics of variable with potential for great variation in dependent variable and its grounding in the reality. In this process, we found most of the commonly shared features turn out to be less relevant and qualifying our test. Thirdly, we found Quantile Regression (QR) as a good

[12]Granovetter (1973) shares similar observation (1378) "Strong ties, breeding local cohesion, lead to overall fragmentation."

alternative to Ordinary Least Square (OLS)[13] since QR would allow us to have centres of gravity which are less influenced by observations lying in extreme left or right corner of the distribution.

So, we came up with the following model:

Output = f (Years of establishment, Source of finance,
Source of Design, Who does design, Number of skilled workers,
Relation with customer, major constraint, Constant)

As mentioned before, gold in the business forms the content of output. We transformed output into natural logarithm. Year of establishment refers to the year when enterprise was established. Source of finance is actually a multi response set with six variables. Out of this, we found, relying on above mentioned heuristics, the question 'if bank is the source of finance' would be more appropriate to our research. In a similar way, whether design is sourced from catalogues represents the set source of design. For the set who does design, we chose the variable whether the staff designs. We had collected data on number of employees and skilled workers, which show high correlation (close to 0.8). Quite clearly, enterprises with more workers tend to employ more number of skilled workers. Presumably, this pattern emerges since learning by doing is a convention in the cluster; employees invariably pick nuances of design and machine operation. To refrain from committing non tolerable level of collinearity, we picked number of skilled workers, dropping number of employees. It is important to note that, albeit strong correlation between number of employees and number of skilled employees, nearly half of enterprises do not have single skilled employees. While exploring the alchemy of fitting variety of equations, we found the variable 'number of skilled employees' makes more sense than number of employees. From the multi response set of relation with customers, applying filters, we picked weather the relation is economical. Finally, the variable 'lack of demand' was chosen from the set major constraints. Table 1 provides estimates of Simultaneous Quantile Regression (SQR). First, we pick median as central tendency to run regression, setting 0.5 as quantile. Second, we make quintile points as central tendencies, setting 0.2, 0.4, 0.6, and 0.8 quantiles. So, we have five equations to estimate. Results are given in Table 1.

[13] See Koenker and Hallok (2001) for a lucid presentation of core ideas and applications.

Table 1
Simultaneous Quantile Regression Results[14]

Dependent Variable: Natural log of Output	B	SE	B	SE	B	SE	B	SE	B	SE
	Quantile (.50)		Quantile (.20)		Quantile (.40)		Quantile (.60)		Quantile (.80)	
Years of establishment	-0.01 (**)	0.00	-0.01	0.01	-0.01 (**)	0.00	-0.01 (**)	0.00	-0.01 (*)	0.00
Source of finance (Bank =1, Others = 0)	0.40	0.28	0.98 (***)	0.29	0.56	0.36	0.38	0.23	0.25	0.48
Source of Design (Catalogue =1, Others=0)	0.36 (***)	0.11	0.09	0.19	0.35 (***)	0.10	0.34 (***)	0.10	0.35 (**)	0.15
Who does design (1=staff, 0=Others)	0.20 (*)	0.11	-0.01	0.20	0.15	0.12	0.25 (**)	0.11	0.17	0.17
Number of skilled workers	0.18 (***)	0.04	0.15 (**)	0.07	0.18 (***)	0.05	0.17 (***)	0.04	0.14 (***)	0.05
Relation with customer (1=Economical, 0=Others)	0.23	0.15	0.15	0.17	0.12	0.17	0.23 (*)	0.14	0.21	0.16
Major Constraints (1 = lack of demand, 0=others)	0.32 (***)	0.12	0.40 (**)	0.17	0.28 (**)	0.13	0.26 (**)	0.11	0.16	0.20
Constant	14.95 (**)	6.67	15.71	12.84	18.11 (**)	8.06	13.97 (**)	5.72	14.89 (**)	7.31
Pseudo R Square	0.22		0.21		0.19		0.23		0.23	
	N =139									

Note: B is coefficient. SE is bootstrap Standard Error for 1000 times. B is coefficient. ***, ** and * represent 1%, 5% and 10% significance levels respectively.

In Table 1, estimates of first equation which takes median as central tendency show that barring relation with customers and source of finance, rest are statistically significant. While year of establishment carries negative sign, rest of variables show positive signs. Compared to other sources of design, design being sourced from catalogue appears to explain variation in performance. Compared to enterprises which do not use catalogue as a design along with other sources, enterprises that use catalogue in combination with other sources tend to perform better. Enterprises which use service of staff in designing along with other sources performs better than those do not allow participation of staff in the process of design. Higher the number of skilled workers, higher will be the performance. Enterprises which see lack of demand as one of the constraints appear to perform better than ones who don't see lack of demand as a constraint. Albeit a weak relations, older the enterprise, higher the performance is. From median we move one to quantile 0.2 as central tendency, showing different results. In this regression, only three explanatory variables are significant –bank as source of finance, number of skilled workers, and demand as a major constraint- with positive coefficients. Estimates of quantile 0.4 are quite similar to median regression, except who does design turn insignificant. Interestingly, regression taking quantile 0.6 as central tendency shows all coefficients are significant except bank as a source of finance. At quantile 0.8, leaving the constant, while three coefficients –year of establishment, catalogue as source of design, and number of skilled workers- are statistically significant, rest of the coefficients are not significant.

Comparing regression estimates presented in Table 1, only one variable –number of skilled workers- remains significant across quantiles, while bank as a source of finance and relation with customer were

[14] We used software package *Stata* 12 simultaneous quantile regression procedure for estimating regressions given in Table 6.

significant just in one model. It is worth noting that coefficient of three variables–year of establishment, catalogue as a source of design, and demand as a constraint-are significant in three regressions. Finally, coefficient for who does design is significant in just two regressions. Across regressions, catalogue as a source of design turns out to be most vital determinant, followed by demand as a constraint and number of skilled workers. The principal hunch, drawing cues from Table 1, is that given other factors same, knowledge and skill matter a lot in attaining higher levels of performance.

Combining figure 1 and Table 1, we posit that if at all cluster expands in future, notwithstanding big players in the field, seemingly pragmatic option for enterprises in the cluster, or cluster as whole, is to carve own niche by creating unique competencies which can dampen the expansion of big players. On the other hand, feeding into the trail of growth fuelled by biggies is unlikely to foster the cluster. It would be worth reflecting on one narrative of a respondent who has been in the cluster for more than three decades, witnessing expansion as well as contraction of the cluster. He said "we are talented and having skill and knowledge. But, our know-how is of little value if we don't learn computers and systems like CAD[15]… we are left measly endowments to afford training in computer and software… At least I am hopeful about future if I get good orientation to CAD." Throughout our fieldwork, although not many shared views of this nature, a few who anticipate better times too echoed similar concern. In brief, our discussion points to the scope for fostering the existing cluster through innovative and affordable learning support systems in information technology and design.

Conclusion

We unravelled a cluster of small enterprises, sharing features of livelihood and firms. Being grounded in close to thousand years of history, enmeshed socio-cultural milieu of the region, social institutions, in particular conventions, family and caste, have been playing active and pivotal role in shaping the business. In last four decades, the cluster has seen up and down swings. While the 1970s and 1980s saw an expanding cluster, post 1990s witnesses steady contraction of the cluster. The decline was seemingly accentuated by the entry of new enterprises to Mangalore city where the cluster is located.

Drawing cues from the non archived oral and shared history of cluster, collected during the preliminary phase of the fieldwork, we generated a theory of small enterprises in a cluster, showing static and dynamic decision making by enterprises in a closed system. However, making closed to open, say new big enterprises enter the business; we brought the dynamics of biigies and cluster of small player, akin to prey and predator in an ecological scenario, we explore potential conditions of convergence and divergence.

From the theory, taking forward dome hunches, we described finding of the survey of 173 enterprises in the cluster. We ran simultaneous quantitle regression to find major determinants of performance in the

[15] CAD is acronym of Computed Aided Designing.

cluster. Quite interestingly, catalogue as a source of design, view that endorses demand as a principal constraint in the business and number of skill workers emerge as principal determinants. Combing our theory and estimates, we argue that in big-small business ecology, collective of small may have to carve own niche to survive and sustain. Otherwise, further contraction of cluster is likely to happen.

While we reiterate that CAD is pivotal in innovating jewellery products, thus setting pace for a higher order competitiveness in the cluster, as Molinari et al (1998), describing the role of CAD in modern jewellery business, argues that "CAD/CAM should not be considered as a substitute for traditional techniques, but as a complementary technique that helps the goldsmith to carry out some operations more rapidly and more accurately" (p. 6). Quite important, design does not stand alone, rather it ought to move along with operational excellence[16].

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[16] Corte (2003) shares similar view.

Appendix 1

Table 1 Raw material, Marketing and Finance

Source of Raw Material	Percentage (N=173)
Local Traders	85.5%
Bullion Merchants	7.6%
Banks	8.1%
Customers	92.4%
Marketing Channels	Percentage (N=173)
customer Channel	78.1%
showroom Channel	42.0%
Source of Finance	Percentage (N=173)
Money Lenders	5.8%
Cooperative societies	42.2%
Banks	83.8%
Friends	64.7%
Relatives	45.7%
Chit fund	20.8%

Source: Survey data

Table 2 Design: Sources and who does

Source of Design	Percentage (N=173)
Own Idea	96.0%
Books	89.0%
Catalogue	43.4%
Websites	2.9%
Professional Designers	2.3%
Customers	4.0%
Who does design	Percentage (N=173)
Proprietor	93.1%
Staff	55.5%
Family members	15.0%

Source: Survey data

Table 3: Production, Sub-contracting, and Customer Relation

Production arrangement	Percentage (N=173)
In house facility	97.7%
Outsourcing	94.7%
Sub-contracting	Percentage (N=173)
Through friend	72.4%
Through artisans	55.8%
Through jewellery traders	27.6%
Through association	7.7%
Relation with customer	Percentage (N=173)
Preference for traditional designs	7.0%
Cultural religious factors	32.0%
Access	89.0%
Trust	92.4%
Economical	15.7%

Source: Survey data

Table 4: Skill shortage

Areas of skill shortage	Percentage (N=173)
Designing	52.9%
Operating machines	94.1%
To deal with skill shortage	Percentage (N=173)
Learning from experienced ones	45.7%
Visiting other places	86.1%
Training	54.3%

Source: Survey data

Table 5: Major Constraints

Major Constraints	Percentage (N=173)
Lack of Demand	18.5%
Technical defects	28.0%
Competition from other firms	62.5%
Labour shortage	87.5%
Cost of raw material	84.5%
Lack of working capital	61.9%
Migrant workers	33.3%
Lack of government support	3.0%

Source: Survey data

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