INNOVATION IN EMERGING MARKET MICRO, SMALL AND MEDIUM ENTERPRISES:
BARRIERS AND ACCESS TO RESOURCES

by

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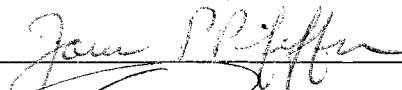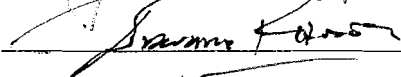
Innovation in Emerging Market Micro, Small and Medium Enterprises: Barriers and
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A dissertation submitted in partial fulfillment of the requirements for the degree of
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LIST OF ABBREVIATIONS

SME- Small and Medium Enterprises
MSME- Micro, Small and Medium Enterprises
ESME- Emerging Market Small and Medium Enterprises
OECD- Organization for Economic Co-operation and Development
GVC- Global Value Chain
UNCTAD- United Nations Conference on Trade and Development
IFC- International Financial Corporation

ABSTRACT

TITLE: INNOVATION IN EMERGING ECONOMY MICRO, SMALL AND MEDIUM
ENTERPRISES: BARRIERS AND ACCESS TO RESOURCES

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George Mason University, 2012

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This research study uses a resource-based perspective to addresses innovation in
indigenous micro, small and medium enterprises (MSME) in a globalized emerging
economy. Unlike large multinationals operating in these economies, indigenous
MSME are tied to their local/regional institutional contexts. While on one hand they
benefit from the spillovers of globalization, on the other, they have to compete for
resources with larger firms. Using a broad definition of innovation, this research
highlights the nature of innovation and the barriers affecting innovative outcomes in
these firms. Compared to earlier studies, this study explicitly makes a distinction
between micro-firms and larger SME as well as core and non-core innovative
outcomes. New data for this research was obtained by implementing a primary
survey along the lines of the Oslo Framework in Bangalore, one of India's most

globalized regions resulting in a sample of 108 MSME. This research finds that compared to larger SME, micro-firms have less innovative dynamism with both core and non-core innovations. This research also finds that firm size plays an important moderating effect between barriers and innovative outcomes. When barriers related to core technical innovations are present, larger SME are more likely to introduce other types of innovations whereas micro-firms are less likely to introduce any kind of innovation.

I.   INTRODUCTION

The Small and Medium enterprise (SME) sector plays an important role in national

economies around the world as a major source of employment and economic growth. The

OECD (2006) notes that SMEs are the dominant form of business organization,

accounting for up to 99% of the enterprises in some countries, with micro firms forming a

significant percentage of SMEs. In developing economies, it has been noted that the

Micro, Small and Medium Business Enterprises (MSME) "represent approximately 45

percent of employment and approximately 33 percent of GDP" (Stein 2010 pp. 1).

Despite the critical contributions made by this sector towards economic growth,

employment and entrepreneurship, as authors Eunni et. al (2007) note, there is a dearth in

the number of studies on micro and small firms in emerging economies owing to the lack

of primary and secondary data. They note further, "Additions to the body of SMEs in

emerging markets based on either kind of data are, therefore, invaluable as they fill an

existing gap in the literature on entrepreneurship and understanding of small business

strategies in emerging markets[1]."

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[1] Refer paragraph 2 in:
http://www.emeraldinsight.com/journals.htm?articleid=1601017&show=html

This research study furthers our understanding of MSMEs in emerging economies by focusing on innovation, which is a critical factor in the performance and the long-term survival of MSME. The focus on innovation is important because in various contexts, innovative firms have been associated with higher growth (Freel 2000, Geroski 1999), profitability (Roberts 1999, Qian 2003) and international competitiveness (Amendola 1993, Ozcelik 2004). In developed countries, the very survival of firms in a globalized world has been linked to innovation. In these countries, corporate downsizing, substitution of technology for labor and outsourcing of jobs to lower cost destinations has made innovation in the SME sector a policy imperative, aimed at maintaining a comparative edge in a knowledge-based economy, creating new jobs and competing in a global world (Audretsch 2003). Even in the case of emerging economies, the importance of innovation in SME cannot be overlooked as evidence suggests that lack of innovation is significantly correlated with the long-term decline of SME share in employment, number of firms and value added (Mulhern 1999, 2003). Emerging market SME (ESME), typically at the low-value-added low- technology end of the global value chain (GVC), also face increasing pressures to move up the value chain and constantly upgrade technology in order to survive (UNCTAD 2010). Innovation capability has been identified as one of the barriers that affect the entry of ESME in GVCs (UNCTAD 2010).

Specifically, this study focuses on innovative capabilities in micro-firms, which are a

subset of SME and are firms with less than ten employees.[2] This class of firms is most

prevalent in lesser-developed economies and is also a common form of employment in

many developing countries.[3] Compared to larger SMEs, they are also found to have

greater resource constraints, burdensome regulatory/institutional environments that

impede their growth and coerce them to remain small (Tybout 1999, Smallbone 1999).

This research draws on the resource-based view (RBV) of the firm to study the

relationship between resources endowments of the firm, access to resources and

innovative outcomes in emerging economy micro and small firms. Understanding

resource constraints in micro-firms vis-à-vis innovation is important as it has larger

implications for entrepreneurship policy aimed at scaling up new firm formation and the

growth of fledgling businesses in emerging economies.

This research also highlights the impact that resource endowments and barriers to

resources have on different types of innovative outcomes in emerging market MSME.

The meaning of innovation is also context specific. There is a plethora of research in the

field of international business, which suggests that though there have been many

developments in the recent past, firms from emerging countries play catch up to firms

from developed economies who are leading innovators (Rajan, 2010). Since emerging

economy MSME are found to be technologically laggard (Chaminade 2008, Ayyagari

2007, Intarakumnerd 2002, Crane 2002), this study uses a broad definition of innovation

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[2] European Commission definition. Refer
http://europa.eu/legislation_summaries/enterprise/business_environment/n26026_en.htm
[3] UNDP: Unleashing Entrepreneurship: Malking Business Work for the Poor.
http://web.undp.org/cpsd/documents/report/english/chapter2.pdf

more suited to the case of SMEs from emerging economies, including both core technological innovations and non-core innovations. Core innovations include products and processes and non-core innovations include organizational and marketing changes. While core innovations are changes in the product mix that a firm offers to the market or the way in which these products are manufactured, non-core innovations can be thought of as internal transformations and paradigm shifts that an organization undertakes (Tidd 2005). Since the nature and purpose of these innovative activities differ, a distinction is made between the two to address their relationship between resources and barriers. In the context of an emerging economy MSME, it is important to make this distinction as micro and small firms may engage solely in non-technical or incremental innovations owing to their position in the global value chain and resource constraints. This distinction will provide insights into whether resources and barriers encourage (or discourage) a particular type of innovative activity in micro and small firms.

The main research interests motivating this study are as follows:
- What is the nature of innovation in emerging market MSME? Are innovations predominantly core innovations like product oriented, process oriented or are they non-core innovations like organizational and marketing?
- How are firms' resources related to innovative outcomes of firms? Do these resources favor certain types of innovative outcomes compared to others?
- What are barriers to innovation in ESME and how are they related to innovative outcomes of firms? Is innovation hampered when barriers are present or do firms

overcome barriers related to innovation?

- How does firm size affect innovation? Do barriers and their relationship to innovative outcomes differ across firms of different sizes?

- What are the salient differences between innovative and non-innovative ESME?

The specific research questions answered by this study are:

- How is firm size related to core and non-core innovation? Is this relationship similar for micro-firms and larger SME?

- Is strategic planning positively related to both core and non-core innovations? Is this relationship similar for micro-firms and larger SME?

- Is availability of internal finance positively related to core and non-core innovations? Is this relationship similar for micro-firms and larger SME?

- How are barriers and access to external resources like finance, labor, and technology related to core and non-core innovative outcomes? Are these relationships similar for micro-firms and larger SME?

This study fills a number of gaps in existing innovation literature and contributes to the debate on globalization, indigenous entrepreneurship and resource constraints in indigenous micro and small firms. The main contributions of this research are discussed below:

1) Emerging Market Focus on Innovation: Research studies relating to SME innovation

have focused predominantly on developed economies owing to the policy push from these national governments. These initiatives have resulted in innovation related data, publicly available databases and related research studies in these countries[4]. In many developing economies however, there is dearth in innovation related data collection and literature. Innovation studies conducted in developed countries highlight determinants and drivers of innovation, but these results cannot be generalized to include emerging economy firms. Firstly, as noted, small firms in emerging economies operate in the low-value-added low-technology spectrum making the nature of innovation in these firms different from the entrepreneurial high technology small firms discussed in developed country literature (UNCTAD 2010). Secondly, the institutional make-up of emerging economies especially property rights and rule of law that govern how society functions (North 1994) are vastly different and often deficient compared to developed countries. The lack of well functioning institutions has been pointed out by many as one of the most important barriers to economic development in these countries (North 1989, Rodrick 2004). These institutional deficiencies pose various challenges related to resource use and strategy in firms operating in these markets that are absent in the case of developed economies (Khanna 2007 Peng 2008). Smaller firms operating in developing economies are especially found to face larger resource constraints that impede their growth (Beck 2006). Therefore, this research study fills an important gap in the understanding of entrepreneurship and small business strategies in emerging markets by focusing on the access and utilization of resources for innovation in the MSME sector.

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[4] Some of these initiatives include the OECD Community Innovation Surveys in Europe; the Survey of Innovation in Canada; SBIR Survey in the US and the Kauffman Firm Survey.

2) Micro firm innovation: The second area of contribution made by this research study is its explicit focus on innovation in micro firms, defined commonly as firms with less than ten employees. Studies have shown that compared to larger firms, SME are more disadvantaged with respect to economies of scale, market power, brand name recognition (Chen 1995) and slack resources for innovation (Ettlie 1987, Nohria 1996). However, as Kelliher (2009) notes, few academic studies have specifically focused on the micro firm sector, distinguishing this sub-sector from larger SME. Emerging literature on the micro-firm sector shows that these firms vary considerably from larger SME with respect to organizational structure and responses to business environment (Kelliher 2009, Aterido 2009). This study extends these findings to address the relationship between resources and innovation in micro firms by using firm size as a moderating variable between resources, barriers and innovative outcomes. This study therefore makes important contributions to understanding the key differences between micro-firms and larger SME with resect to innovative outcomes and their relationship between resources and barriers.

3) Domestic and Indigenous SME in a Globalized Regional Economy:
Thirdly, this study looks at innovation in domestic, indigenous MSME (MSME that are not subsidiaries of multinational companies) operating in a globalized regional economy. Research has shown that the main beneficiaries of globalization are developed and developing economy MNCs that are able to traverse across national boundaries in search of 'location advantages' like low cost and greater access to resources (Curevo-Carrura

2007, 2008). Globalization is also said to bring a number of advantages to innovation in SME in a local economy. These include technology transfer through vertical linkages with global firms, stimulation and growth through increased competition, knowledge spillovers and technological acquisition (Acs 1997, Meyer 2004, Gorodnichenko 2009, Park 2011). Though a number of studies have focused on the positive impact of globalization on innovation in ESME, there are considerable challenges arising from competing for resources with 'giants' (Dawar 1999, Etemad 2005). This research therefore contributes to the debate on globalization and its winners by focusing on domestic emerging economy MSME, who are captive to their respective locations and are therefore more adversely affected by 'location disadvantages' and institutional voids.

As authors of the Regional Innovation Systems' perspective posit, innovation in SME is a function of firms' absorptive capability of new technology, developed by their ability to interact with users, other firms and knowledge providers (Cooke 1997, Zahra 2000, 2002). ESME that are subsidiaries of MNC have access to parent companies' 'package of capital, technology and managerial skills' (Majumdar 2009) that are superior compared to what is generally available in a developing economy. Other ESME however have to rely on alternate sources of technology acquisition and development including indirect spillovers from other firms, labor mobility and networks with customers, suppliers and research institutions (Cubillo-Pinilla 2008, Vera-Cruz 2005, Tambunan 2007). For these firms, institutional deficiencies such as absence of knowledge sources, skilled labor and finance can create additional barriers and deterrents for conducting innovative activities.

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Therefore this study focuses on indigenous MSME to understand the nature of barriers faced by these firms.

The main gaps and themes addressed by this research study are illustrated in the figure below:
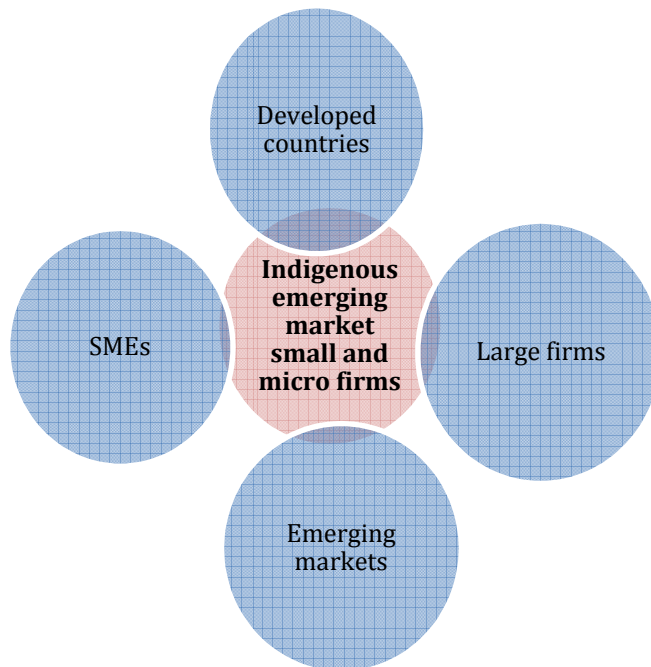
Figure i- Main Gaps Addressed by Research:

To study the resource-based antecedents of innovation in MSME operating in a globalized emerging economy, this study focuses on the Bangalore region in India. This region provides an ideal setting to study the resource based drivers and constraints of innovation in emerging market MSME. In the last decade, the city has witnessed rapid globalization and internationalization, driven largely by the growth in the information and

communications technology (ICT) sector. Today it is considered one of the global hubs of technological innovation (UNDP 2001). The region houses over 1500 information technology companies, major multinational corporations and nearly 40 global companies that have set up wholly owned R&D subsidiaries (Basant, 2006). Many studies have pointed out to the presence of essential elements that benefit global companies and the ICT sector, including the presence of large research universities, skilled workers, low wages, knowledge spillovers and availability of capital (Miller 2011, Chaminade 2008, Sonderegger 2010, Bala Subrahmanya 2005, Basant 2007, Saxenian 2005). Though it is considered the hub of technological innovation, studies in the region show that the MSME sector is technologically laggard and lacks the capacity to innovate (Chaminade 2008). This study therefore addresses important barriers faced by MSME in Bangalore with respect to innovation and their impact on innovative outcomes of MSME.

In order to measure innovation and access to resources in Bangalore's MSME, a primary survey along the lines of the Oslo Framework was implemented owing to the lack of secondary sources of data. The final sample includes 108 indigenous manufacturing MSME operating in the Bangalore region with information on firm characteristics, innovative outcomes, factors hampering innovative activities and access to firm finance. Using this data and a resource-based perspective, this study addresses the relationship between access to resources and innovation across firms of different sizes and across different types of innovative outcomes.

The rest of this manuscript is organized as follows:

Chapter II contains the theoretical development and hypotheses related to dependent and independent constructs used in the study. It includes a systematic review of literature related to firm innovation and discusses the development of the hypotheses driving this research, drawing on the Resource Based View and Schumpeterian hypotheses.

Chapter III discusses the implementation of the survey and data obtained for this research. This will include a discussion of the OECD framework in greater detail, the survey instrument used, sampling procedure and descriptive data. An exploratory factor analysis technique is used to identify and extract barriers related to innovation in ESME in the sample.

Chapter IV contains the methodology that is used by this study to address the main hypotheses.

Chapter V includes the results and discussion.

II. THEORETICAL DEVELOPMENT AND HYPOTHESES

i.   The Macroeconomic/Institutional Context:

An important factor distinguishing emerging markets from developed economies is that they are characterized by the presence of institutional voids, meaning they are characterized by insecure property rights, lack of credit rating mechanisms, lack of a local talent pool to staff operations and endemic corruption that outweighs potential rewards (Khanna 2007).

Institutions have been defined as 'rules of the game' including cultural norms, values, taboos and other constraints humans impose on themselves in order to structure exchange in a world with imperfect information (North 1990). At the core of institutional economics is the argument that uncertainty makes transactions costly and institutions are formed in order to reduce uncertainty in human exchange (Coase 1998). Knowledge of the institutional make-up of emerging markets is crucial to understand the behavior and strategies employed by actors in these settings. Since the reemergence of this perspective in mainstream economic theory (or the birth of New Institutional Economics), various economic activities have been studied and revisited using an institutional framework. Therefore, compared to developed economies, institutional voids in emerging economies give rise to a host of information asymmetry and agency issues that greatly increase the

transaction costs and the costs of doing business (Khanna 2010). As noted international business scholars Peng et al (2008), institutions in emerging economies play a much more significant role in firm strategic decisions than in developed nations.

The nature of institutional voids in emerging economies has been examined by a number of empirical studies. Makino et al (2004) finds that in developing countries, the main sources of variation in firm performance arise from country and industry effects rather than corporate effects as in the case of developed countries. The author notes that the variation in performance can be largely attributed to firms' external factors because infrastructure, institutional roles and enforced mechanisms are underdeveloped. Chan et al (2008) find that a high level of variation in the performance of foreign affiliates in institutionally underdeveloped countries, owing to increased uncertainty and non-availability of legitimate information on the ways of doing business. Chakrabarty (2009) considers the dual impact of cultural and institutional factors affecting family ownership patterns of large publicly listed firms in twenty-seven countries and finds that institutional voids moderate the influence of national culture on family ownership patterns. When institutional voids were present, national culture played a stronger role and when institutional voids were overcome, the influence of national culture was found to have weakened.

From the literature reviewed above, it can be inferred that firms embedded in underdeveloped institutional contexts are forced to *strategically* employ available resources to overcome voids and maximize benefits. For example, Welter and Smallbone

(2011) study entrepreneurial responses to challenging external environments and delineate six distinctive responses including 1) prospecting, a proactive response that includes firms focusing on innovation and flexible organizational structure, 2) evasion, resulting in informal (and illegal) activities, 3) financial bootstrapping to achieve low or no-cost financing, 4) diversifying entrepreneurial portfolio to include trade and services to finance main activities, 5) high use of networking and reliance on personal contacts 6) other forms of adaptation to cope with bureaucratic burdens, example using third party consultants to negotiate complex laws and tax codes. These studies provide insights into the underlying context and strategies possibly used by firms to introduce successful innovations in emerging markets. Firms that face barriers to innovation may therefore be more proactive with organizational changes, depending on their inherent capacity and degree of resource constraints. Emerging economies are also characterized by the ubiquitous presence of business groups, which are legally independent firms operating in diversified markets and bound together by formal or informal ties (Khanna 2007). Khanna and Yafeh (2007) hypothesize that these business groups are formed as responses to institutional deficiencies in emerging economies where corporate diversification is a necessity that helps firms pool and access valuable resources like capital and labor. The authors contend that unlike developed economies, in emerging markets, the benefits of business diversification overcome costs. In most cases, however, diversification and group formation strategies are more easily employed by larger sized firms rather than smaller ones.

Therefore, a number of studies show that in emerging economies, it is not only the

question of resource endowment for firms, but the institutional deficiencies give rise to further challenges with respect to accessing resources like labor, capital, technological know-how and distribution channels. Thus, previous research has established that firms from emerging countries are influenced by the highly deterministic institutional environment. Drawing from this perspective and informed by the results of these studies, we seek to understand the barriers to innovation in emerging market MSME, namely access to resources like finance, skilled labor, technology and knowledge networks. This study treats the institutional context in the study of innovation as a given and focuses on indigenous firms in Bangalore, which is a globalized emerging economy in India.

Microeconomic Context and the Resource Based View:

The resource-based view of the firm posits that a firm's long term competitive advantage depends on the resources that are under its control. Resources are broadly defined as "anything which could be thought of as a strength or weakness of a given firm" or "those tangible and intangible assets which are tied semi-permanently to the firm" (Wernerfelt 1984 pp 172). These include for example, assets, brand names, in-house technology, skilled personnel and trade contacts among many others " (Wernerfelt 1984). Amit and Schoemaker (1993) define resources as "stock of available factors that are owned or controlled by the firm; resources are converted into final products or services by using a wide range of other assets and bonding mechanisms such as technology and management

information systems." They define capabilities as "a firm's capacity to deploy resources, usually in combination, using organizational processes to effect a desired end." The resource-based-view attributes heterogeneity in firms fundamentally to the resources under their disposal and their inherent capabilities in deploying these available resources, meaning, firms with superior resources outperform firms with inferior resources (Peteraf 1993).

In an emerging economy, resources are inextricably linked with the institutional context (Oliver 1997, Peng 2008). As the macro economic context of emerging economies illustrates, there is strong evidence that leads us to believe that microeconomic business strategies are directly or indirectly determined by the institutional context in which the firm is embedded (Khanna 2001, 2007, Chacar 2005, Chan 2008, Meyer 2009)). While institutional theory provides an explanation of why organizations within a particular institutional framework tend to be homogenous, firm specific business strategies and responses to institutional challenges is better explained by the resource-based-view (Oliver 1997). According to Oliver (1997), resource selection and accumulation by a firm depends on firm specific as well as institutional contexts and 'enduring' variations across firms depend on factor market imperfections that are barriers to acquisition, imitation and substitution of key resources. Therefore in emerging economies, weak institutions affect the way in which firms of different capabilities accumulate resources and innovate over time. Treating this institutional context as a constant, this study applies the resource-based view to study the relationship between resources, barriers and innovative outcomes of MSME in Bangalore, India's most

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globalized emerging economy.

As Andersen (2011) observes, there is no general theoretical model in the innovation literature. This study focuses primarily on relationships between resources and innovation, including access to finance, knowledge resources and networks. Since the focus is on micro and smaller sized firms, the study also draws from the Schumpeterian hypothesis on firm size and market structure. Each of these constructs and related hypotheses are elaborated as follows. Following the frameworks presented by Rangone (1999), Rajdas (2009), Anderson (2011), Verona (1999), Beickeck (2006), Terziovski (2010), a thematic representation of the relationships considered in this study is illustrated in the figure below:

Explanatory Variables   **Outcome Variables**   **Policy Relevance**

Internal Factors/Resources (Resource Based View)

External Factors/Resources: Access and Barriers to Innovation (Resource Based View)

Firm Size; Market Structure, Industry Characteristics (Schumpeterian Hypotheses)

-Core Innovative Dynamism

-Non-Core Innovative Dynamism

Innovative Dynamism

Importance of Successful Innovation in MSME:

-Survival

-Growth

-Market Share

- Global Value Chain

Figure ii: Thematic Representation of Relationship between Explanatory and Outcome Variables for Micro and Larger SME

The importance of both core and non-core innovations is highlighted using the dotted lines. The policy relevant variables are not the explicit focus of this study and are therefore beyond the scope of this study. However, as discussed earlier, both core and non-core innovations are important for emerging economy MSME to survive, grow, increase market share and move up in the global value chain. The outcome of interest and explanatory variables are examined in detail as follows.

ii.   Outcome Variable: Innovation

The discussion of innovation, particularly in the context of developed countries is done so from the perspective of firms that proactively redefine the technological status quo, seek superior performance through innovation and develop sustainable internal capabilities that leverage their knowledge and learning (Knight 2004). This view of innovation is measured in terms of R&D investments, number of patents registered or number of radical technological innovations introduced by these firms. However, in the case of emerging economies, most small firms are often found to be the opposite- technologically laggard, passive technology learners who rely on 'off-the-shelf' imported technology to meet their needs rather than developing in-house technological capabilities (Intarakumnerd 2002, Crane 2002). Intarakumnerd (2002) also observe that this passive approach to innovation and technological learning is exhibited through weak linkages between actors like universities, firms and research labs that are usually prevalent in more developed economies. Chaminade and Vang (2006) reach similar conclusions about Asian SMEs, using the industrial cluster as their unit of analysis. They note that in developing countries, SME routinely lack access to skilled labor, have limited absorptive capacity with respect to technology and lack social capital and institutions that are providers of knowledge. Also in emerging economies, measures like R&D and patenting does not account for the informal nature of innovation in most small firms warranting a broader definition including both core and non-core innovative activities (Ayyagari 2007, Hadjimanolis 1999). Since emerging economy MSME are technologically passive, a distinction is made at the outset between core technical innovations and non-core

organizational and marketing innovations to capture the full extent of innovative activities in these firms.

Following the conceptualization by the OECD, this study also broadly measures innovation and includes both 'core' and 'non-core' innovative activities of ESME, In this study, core innovative activities include 'main' innovation activities like the introduction of new products and services by firms. These may be new to firm or to their market. Core innovations also include new processes introduced by the firm that may involve modern methods of production, improved logistics or introduction of new information technology for supporting activities. Core innovations, as their description suggests, are more likely to use resources that are tangible namely labor, raw materials, plant, property and equipment. Non-core innovations include changes in organizational structure, management, public relations and marketing innovations. While non-core innovations may be substitutes or complements to core innovative activities of firms, they are more likely to depend on intangible resources like knowledge, relationship with other network actors and strategic thinking by the management (Schubert 2010). With respect to firm size, Mel (2009) finds that firm size plays a larger role in process and organizational innovations that spread costs over all products than in product and marketing innovations.

We focus on several individual innovative outcomes as well as innovative dynamism in core, non-core and overall innovative activities. Compared to previous studies, this study makes a distinction between core and non-core innovative activities and examines factors

affecting each type of innovation.

Core innovative dynamism is defined as the number of types of core innovative activities undertaken by the firm. Non-core innovative dynamism is the number of types of non-core innovative activities undertaken by the firm and overall innovative dynamism includes both core and non-core innovative activities (Ayyagari 2007). Ayyagari (2007) finds that the main drivers of innovative dynamism in firms are access to external finance, market competition, firm ownership and legal organization and managerial experience and skill.

iii.   Explanatory Variables:

a. Schumpeterian Hypotheses, Firm Size and Market Structure:

The Schumpeterian hypothesis and subsequent industrial economics literature places an emphasis on firm size and market structure as important determinants of innovation. According to Schumpeter's first hypothesis, Mark I (1934), small entrepreneurial firms are the main drivers of innovation in an economy. His theory of 'creative destruction' envisioned entrepreneurs with new and radical technologies challenging the status quo established by large non-innovative firms. His second hypothesis, Mark II (1943), however stated the reverse- the drivers of innovation in an economy were large firms that enjoyed certain monopolistic advantages. In Scherer (1992), the theoretical advances explaining the Schumpeterian conjectures suggest that neither extremes of perfect

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competition or perfect monopoly is conducive to stimulate innovation in firms, giving rise to an inverse 'U' shaped relationship between innovative expenditure and the degree of competition in the market.

A number of empirical studies have found evidence supporting Schumpeter's second hypothesis. Scherer (1965) uses patent data from 448 large US corporations to study the relationship between inventive activity, firm size, technological opportunity and monopoly power. Using a regression framework and number of patents issued as the dependent variable, the results indicate that inventive output increases with firm sales (measure of firm size) but does so less than proportionally. Other important findings from this study suggest that patenting activity varies by industry suggesting the presence of higher technological opportunities or 'vigorous scientific climate' in some industries compared to the others. But, patenting is also found to be an increasing function of firm size irrespective of the presence of technological opportunity in the firms' industries. Soete (1979) uses R&D expenditure as a measure for innovative activity finds that innovative activity increases more than proportionally to firm size. Klienkneckt (1989), using data from Dutch manufacturing industries finds that on average SME are less R&D intensive compared to large firms. This study also finds that among the important barriers to innovation for SME, the biggest barrier was lack of capital. Santarelli et al (1990) using data from two surveys found informal R&D[5] to be a major part of total R&D undertaken by SME. When output indicators like number of and nature of innovations

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[5] Informal R&D is defined by the authors as R&D carried out without specific managerial or financial resources and without formalized procedures.

introduced by firms of different sizes was used, SME were found to mainly introduce incremental rather than major innovations. The research also found only large firms conducted formal R&D activities and that SME regarded R&D as a low priority source of innovation. Huergo and Jordi (2004) also find that small firms are less likely to innovate. Using data from Spain's manufacturing industries, the authors use a semi-parametric regression model with a dummy dependent variable to measure innovation. Innovation is found to widely vary with the firms' activities and industry of operation.

Other studies however are more ambiguous about the relationship between firm size, market structure and innovation. Acs and Audretsch (1987) find that small firms possess an innovative advantage in industries that utilize a large component of skilled labor, have highly innovative industries and are composed of relatively high proportion of large firms. Using the difference between innovation rates in large firms and small firms as the dependent variable, they show that relative innovation advantage is determined by the extent of to which there exists market imperfections. The authors find that large firm innovation advantage lies in capital intensive, concentrated, highly unionized industries and industries producing a differentiated commodity. Audretsch and Acs (1991) also find a 'U' shaped relationship between firm size and innovation when they use other control variables like the four-firm concentration ratio, capital-sales ratio, advertising sales ratio and extent of skilled labor used. When firms were divided into high and low technology sectors, the high-tech sectors demonstrated increased innovation with increase in size. The low-tech firms did not show an increase in innovation with size till a certain point

after which an increase in size led to increase in the number of innovations. Hansen (1992), using data from the US found that smaller firms did innovate but their contribution was understated by R&D data. Bhattacharya and Bloch (2004) find that innovation increases with firm size albeit at a decreasing rate. They also find that R&D intensity; exports, imports and industry concentration have significant positive effects while the availability of internal finance had no significant effect. Fritz (1989) analyzes the determinants of product innovation in two consumer oriented German industries. This study focuses on internal characteristics- size of the firm and execution of the top management function; and external characteristics including industry and competitive pressure. The study finds that in both the consumer oriented industries, innovations are launched mainly by owner run firms, enterprises facing low competitive pressures and small rather than large firms. Dijk et al (1997) use data from Netherlands to test the proposition that market structure determines the difference in innovation between small and large firms. They find that only when firms were divided into high and low technology categories, smaller firms had a negative and significant effect on innovation. Otherwise their results indicate that the size of the firm did not determine R&D. Finally, Koeller (1995) uses a two-equation model to examine the endogeneity of output measures of innovative activity and market structures. The results confirm other studies that show the negative effects of concentration on innovative output but the results also suggest that innovative output has significant effects on industry concentration, especially for large firms. The author concludes that market structure and innovative output should therefore be treated as endogenous variables as innovations serve to 'propel organizations forward'

and in the process 'reconfigure markets'.

Theoretical as well as empirical evidence suggests that the relationship between firm size and innovation is complex and is moderated by a number of other variables like market structure, technology and age. In ESME, the relationship between firm size and innovation is further determined by institutional characteristics and the underdeveloped nature of markets. Large number of SME are found to be too small to utilize innovative technology (Crane 2002) and tend to operate in the lower end of the technology spectrum in the global value chain. The ubiquitous presence of business groups in emerging economies suggests that small firms are inherently disadvantaged with respect to accessing resources or effectively implementing a business strategy. Extending this reasoning, resource disadvantages are more so in the case of micro-firms that are at the lowest end of the size continuum of firms.

Therefore, evidence from previous studies show that small firms in emerging economies operate in the low technology spectrum and inherently lack innovative capacity. Also, larger firms may have greater market scope and scale that encourage core innovations like new products and processes. Therefore, with respect to core innovative activities involving introduction of new products and processes, it is hypothesized that,

H1a: Firm size is positively related to core innovation
H1b: Micro firms are less likely to have successful core innovative outcomes compared to small and medium sized firms.

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Following Acs (1991) and Scherer (1992), the presence of a curvilinear relationship between firm size and core innovation is tested.

Since non-core innovations are organizational and managerial, smaller firms may have certain advantages compared to larger firms with respect to ease of decision-making and flexibility afforded because of their size. Smaller firms are more likely to have few managers who are independent, allowing the decision-making process to be more streamlined and quick (Avermaete 2004). Also in micro-sized firms, the organizational structure is such that the owner is often also the manager who makes all the executive decisions (Kelliher 2009). Therefore, in small firms, organizational and marketing changes that do not require large investments in tangible resources may be easier to incorporate than in larger firms. Also, firms that cannot afford to undertake core innovative activities may substitute them with marketing and organizational innovations (Schubert 2010) as a way to increase profitability and save costs.

However, authors Mel et al (2009) relate non-core innovative activities namely the use of new business processes, supply chain management, new quality standards for suppliers etc. to achieve cost-savings on all the products produced by the firm. Similarly, the authors posit that marketing innovations are also related to promoting new or existing products in firms. Since, as hypothesized earlier, larger firms are more likely to have core innovations like new products and processes because of greater market scope and scale, there exists a positive relationship between core innovative outcomes and non-core

innovative outcomes in firms. Therefore, larger firms are more likely to undertake non-core innovative activities compared to smaller firms. With respect to non-core innovations, the following are hypothesized:

H1c: Firm size is positively related to non-core innovation.

From the arguments above, it is hypothesized that firm size is positively related to non-core innovative outcomes of firms. Extending these arguments to the smallest firms in the MSME sector namely micro-firms, it is hypothesized that

H1d: Micro firms are less likely to have successful non-core innovative outcomes compared to small and medium sized firms

b. Resource Based View:

Many empirical studies affirm the hypothesis that easier access to resources has a positive effect on firm innovation, some of which are discussed as follows. Entriaglo et al (2001) study the effect of a firms' organizational context on innovation using survey data from Spain, testing the hypothesis that more the resources a firm has, greater the degree of entrepreneurship[6]. They find a positive relationship between a firm's resources like capital, human resources, and materials to the degree of entrepreneurship. Hola et al (2006) use a financial-human resource-organizational typology to determine resource and capacity constraints for innovative firms in Ireland. Using longitudinal data from

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[6] The authors define entrepreneurship as the sum of three indicators (innovation, pro-activeness and risk-taking) validated by a factor analysis.

manufacturing firms and an innovation production function, the study finds that small and large firms were identical with respect to identifying resource constraints but smaller plants were more likely to identify lack of capital, market opportunities and cumbersome legal and regulatory requirements as constraints. Romijn et al (2000) in an empirical study in the UK, examine key internal and external sources of innovation in UK firms and measure innovation by creating two indices- one measuring major product, process or organizational innovation and the other measuring the degree of novelty and scientific expertise. With respect to external factors, significant factors affecting innovation were the proximity of training institutes and public R&D institutions. Internal factors significantly influencing these measures of innovation were found to be the background of founder/manager, percentage of engineers in the workforce, and technological effort measured by R&D per employee. Though studies generally find a positive relationship between resources available and innovation, some like Avermaete et al (2004) find that firms with larger human resources, managerial and professional staffs are less likely to innovate as it renders lower flexibility with respect to decision-making.

Applying the resource based view to innovation, Nelson (1991) discusses the importance of a 'core set of capabilities' required by a firm to successfully conduct innovative activities (example, R&D). He notes that these capabilities are ultimately defined and constrained by the resources under a firm's disposal, making some firms better capable of innovating compared to others. Therefore in the long run, firms with superior resources are more likely to be innovative and perform better compared to firms with inferior resources and capabilities. All firms require resources regardless of firm size. Previous

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studies based on the resource-based view of innovation in SME have typically focused on the role played by resources like finance, skilled technical labor, technology and networks (Romijn 2000, Hola 2006, Avermaete 2004).

From the literature reviewed, two main types of internal resources emerge that are important determinants of innovation in firms, namely 1) Human Resources 2) Financial Resources

Firms that have a greater availability of internal finance and skilled personnel are more likely to be innovative compared to firms that have lesser internal resources (Entriaglo 2001, Rimijn 2000, Hola 2006). Skilled labor and financial resources have been found to be essential inputs that are positively related to innovation. Scarcity in these resources is therefore likely to affect innovative outcomes adversely.

The measure of human resource included in this study is the presence of strategic management personnel in MSME since they are responsible for managing both internal and external resources in a firm. Numerous studies have found that the presence of strategic planning has a strong positive effect on firm performance (Miller 1994). The primary channels through with strategic management affect firm performance and strategic outcomes are 1) Adaptation to external environment 2) Consolidation and effective control of firm resources (Miller 1994, Papadakis 1998, Powell 1992). In the context of globalization, strategic planning in firms has been positively linked to the process of internationalization of SME (Reuber 1997).

Firms with strategic management personnel are therefore more likely to be active rather than passive responders to market and institutional challenges. They are more likely to actively seek new opportunities and introduce new products, processes and organizational changes. Therefore it can be postulated that the presence of strategic management personnel is positively related to core, non-core as well as overall dynamism of the firm. However, since core innovative activities like new products and processes need greater planning and investment, the relationship between strategic management and core innovative outcomes is stronger.

Therefore the following are hypothesized with respect to strategic management and core innovation:

H2a: The presence of strategic management personnel is positively related to core innovative outcomes

Since non-core innovations are complementary to core innovations (Mel 2009), a similar relationship is expected between the presence of strategic management personnel and non-core innovative outcomes. Also, since strategic management plays an active role in a firm's goal formulation, marketing and organizational change (Anderson 1982), it is expected that the presence of strategic management personnel is positively related to non-core innovative activities.

H2b: The presence of strategic management personnel is positively related to non-core innovative outcomes

Overall innovative dynamism of the firm includes both core and non-core innovative outcomes. Since the presence of strategic management is hypothesized to be positively related to both core and non-core innovation, it is postulated that the presence of strategic management personnel will have a positive relationship with overall innovative dynamism of firms as well.

In the case of a micro firm, the organizational structure is highly centralized and the decision making process/resource allocation process is centralized usually rests with the owner who often is also the manager of the firm (Kelliher 2009). Therefore, the expertise and management capacity of the owner is a strong determinant of firm performance and strategic orientation (Greenbank 2000). Miller (1994) also postulates that the effect of strategic management on firm performance is greater in larger firms than smaller firms, as larger firms need to consolidate and integrate various parts of their organizations more than small firms do.

Since larger firms are more likely to benefit from planning than smaller firms owing to their size, it is postulated that the presence of strategic management benefits smaller and medium sized firms compared to micro firms. Also, since a positive relationship is expected between core and non-core innovative outcomes (Mel 2009), it is hypothesized that:

H2c: The presence of strategic management is more strongly related to higher innovative outcomes in small and medium firms compared to micro firms.

The measure of internal financial resources included in this study is the percentage of profits reinvested in the firm in a typical year. Percentage of profits reinvested can be described as a form of 'slack resource', which is excess of any resource that is available to a firm at a given time. The availability of slack financial resources implies that the firm is more likely to pursue a growth-oriented strategy including innovation. The availability of slack financial resources is also likely to encourage investment in innovation as it helps smooth over uncertain returns on investment on innovative activities to a certain degree.

Therefore with core innovations that are more resource intensive, it is hypothesized that:
H2d: Percentage of profits reinvested is positively related to core innovative outcomes.

Even with non-core innovative activities like organizational and marketing innovations, the presence of greater financial slack can encourage organizational and marketing innovations like acquisition of new knowledge management systems, changes in marketing and distribution methods. So it is postulated that percentage of profits reinvested in a firm has positive effects on core, non-core and overall

innovative dynamism of firms. Since non-core innovative outcomes are not as resource intensive compared to core innovative activities, it is postulated that,

H2e: Percentage of profits reinvested is positively related to non-core innovations but the effect is not as strong as core innovative outcomes.

Since overall innovative dynamism of the firms includes both core and non-core innovative outcomes, it is postulated that percentage of profits reinvested in the firm has a positive relationship with overall innovative dynamism of the firm as well.

Some research studies also suggests that larger firms are more innovative because of the availability of slack resources compared to smaller sized firms that may not be able to channel these resources for innovative activities (Richey 2005). Micro sized firms in emerging economies also tend to operate at the low-technology spectrum of the global value chain (UNCTAD 2010) and therefore the presence of financial slack may not translate into innovative outcomes as these firms are constrained by their technology and market position. It is therefore postulated that smaller and medium sized firms are more likely to benefit from slack resources for innovation compared to micro sized firms.

H2f: Percentage of profits reinvested is more strongly related to higher innovative outcomes in small and medium firms compared to micro firms.

As highlighted in the macroeconomic context of emerging economies, MSME operating

in these markets face considerable barriers related to access to resources (Khanna 2007,

Peng 2008, Meyer 2009, Luo 2008, Welter 2011). Hadjimanolis (1999) studies the

barriers for innovation for SME in Cyprus, a small and less developed country. This

study focuses on the relationship between barriers to innovation perceived by managers

and the level of innovation in a firm. The author hypothesizes that the perception of high

external barriers results in a low level of innovation for firms. However, the results

obtained using correlation analysis do not support this hypothesis and it is found that in

fact, perceived barriers do not hinder innovation related performance of firms. The main

reason for this is attributed to innovative firms' ability to overcome barriers. The study

also finds that the top two external barriers ranked by managers are shortage of

innovation finance and skilled labor. Similarly, Radas and Bozic (2009) study the

antecedents of SME innovation in an emerging transition economy, Croatia. Using data

from a postal survey and a logit regression framework, they study the impact of factors

like market scope, strategy and market orientation on product and process innovation.

They find that firms that catered to wider markets (market scope) and firms that

implemented new organizational structures are more likely to innovate. Regarding

obstacles to innovation, they find that firms facing obstacles are not less likely to

innovate, implying that they work around these obstacles.

A number of studies on innovation highlight external resources that are important

determinants to innovation and barriers to these resources impede innovative activities in

firms. Becheikh et al (2006) highlight the importance of resources and capabilities in their review of innovation studies conducted from the years 1993-2003, providing a systematic review focusing on innovation in the manufacturing sector. Categorizing their findings into two broad internal and contextual factors affecting innovation, they find industry in which the firm operates, regional characteristics, networking relations, policies and surrounding culture to be the most important environmental/contextual factors affecting innovation. Saliently, they note that most empirical studies conducted during this time owe their origin to the Community Innovation Surveys conducted in Europe. Ussman et al (2001) focus on the SME sector in Portugal to study perceived barriers and behavioral patterns of innovative firms. Using survey data and factor/cluster analysis methodology, they find that one of the main areas of difficulty for firms with respect to innovation was access to institutions. The two main institutional interactions found were bureaucracy and banks, validated by factor analysis. The authors also find that firms operating in traditional industries found it difficult to internalize the concept of innovation. North (2001) studies the provision of public sector and other support for innovating SME in the European Union and finds that access to finance was the most common barrier identified followed by access to skilled labor. Ayyagari et al (2007) use the World Bank Investment Climate Survey (ICS) data with 19000 firms across 47 emerging economies to investigate the determinants of firm level innovation. Using regression analysis, they find evidence that younger firms, firms with access to external financing and firms owned by an individual or family are more innovative, controlling for other characteristics.

Following the national Systems of Innovation approach, networks and linkages are considered key resources for a successful innovation system. Firms that engage in and utilize networks with customers, suppliers and knowledge providers like universities and research labs are more likely to be successful innovators. Empirical studies that focus on the effect of networks as resources on innovation largely support this view. In studying the impact of networks in Dutch firms' innovation, Oerlemans et al (2001) using data from firms in Netherlands estimate a innovation production function and find that utilization of internal and external networks by firms is positively related to innovation. Karlsson et al (1998) examine the determinants of innovation in small and large firms in Sweden, focusing on the roles played by enterprise characteristics, innovation networks and regional environment on the early use of micro-electronic components. Using a tobit model, the authors test the central hypothesis that SME are more dependent on the external environment for innovation compared to larger firms. The results indicate that networks with universities and customers stimulate early adoption in large but not small enterprises. Similarly, university engineers and labor force density in the labor region have positive effects on innovation in large enterprises but not SME. Love (1999) focusing on the effects of R&D, technology transfer and networking effects in UK firms concludes that R&D, technology transfer and networking effects are endogenous to the innovation process rather than being exogenous determinants. The author also finds strong evidence that a monopolistic position had a positive effect on R&D. Bighardi at al (2009) empirically investigate the determinants of innovation in Italian food machinery

enterprises, focusing mainly on the importance of networks. The results suggest that firms attribute great importance to universities and research centers as sources as knowledge for innovation. Other network actors were not perceived as being very important by firms that were innovators.

Access to firm finance: The theory of asymmetric information (Akerlof 1970) implies that owing to the uncertain nature of many innovative activities, external sources of finance for innovation may be very expensive to obtain or even absent. When considering external financing from various sources, bank finance has been typically associated with traditional technologies whereas equity finance has been associated with new or radical technologies (Allen 1993). According to Allen (1993), banking finance will predominate in industries where there is wide agreement on the nature of technology and where there are relatively few changes in the production function. On the contrary, in industries that are characterized by increasing returns, changing technology and production functions, non-bank sources like equity finance prevail. Aghion (2004) found that firms that reported positive but low R&D used more debt finance than firms that reported no R&D, but the use of debt finance fell as R&D intensity increased. Innovative firms were found to have more intangible assets resulting in a lower debt-asset ratio compared to non-innovative firms. In an empirical study of technology-based firms in Italy, Guidici and Paleari (2000) found that firms relied mainly on personal sources of finance and short-term debt to finance innovative projects. In emerging markets however, easy access to external sources of financing has been found to be positively linked to innovative

dynamism in small firms (Ayyagari 2007). Petersen (2002) finds that for bank based lending, relationships play an important role in determining creditwithiness and ability of firms to repay debt. Their results suggest that for small firms that usually find it difficult to raise loans, availability of finance from institutions increases as a firm spends more time in a relationship with large institutions. Berger (1995) find that small firms with longer banking relationships borrow at lower rates and are less likely to pledge collateral compared to other firms.

Following the resource-based literature, it can be hypothesized that firms with greater access external resources are more likely to have successful innovative outcomes. The important external resources that are found to significantly and positively influence innovative outcomes are finance, skilled labor, knowledge, technology and networks. Since core innovative activities are more resource intensive compared to non-core innovative activities, with respect to core innovations it is hypothesized that:

H3a: Barriers to external resources are negatively related to core innovative outcomes.

For non-core innovations that are not as resource intensive as core innovations, it is hypothesized that:

H3b: Barriers to external resources are negatively related to non-core innovative outcomes but their effect is not as strong as core innovative outcomes.

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Since evidence suggests that micro firms are more likely to be non-innovative because of resource constraints, it is hypothesized that:

H3.c: Firm size has a moderating effect on the relationship between innovative outcomes and barriers to innovation.

c. Other Control Variables:

The relationship between the outcome variable (innovation) and the explanatory variables (firm size and resources) is studied while controlling for a firm's legal incorporation and level of market diversification. The rationale for including these is elaborated below:

Legal Incorporation: In the works of La-Porta, Allen, Gale and Sultz,, the role played by legal origins is highlighted in how financial activities are organized in an economy and their impact on how firms raise capital. For instance, La Porta (2001) notes that countries with Common law are found to be predominantly stock-market based owing to the protection of minority shareholder rights and strong accounting practices, whereas Germany, which stresses on creditor rights has a bank-based financial system. Schleifer (1998) notes that private ownership of firms is superior to state ownership when incentives to innovate and contain costs are strong. Ayyagari (2007) find that ownership structures of firms have a significant impact on innovation in firms- the authors find that state owned firms are less likely to innovate compared to private owned firms. Moreover, they find that the identity of the controlling shareholder plays a significant role in

determining innovation in firms.

Since legal incorporation of firms has a significant effect on performance and innovation, it is treated as a control variable when studying the relationship between innovation and resources.

Exports and Diversification: The relationship between export intensity of firms and technological innovation in literature has been found to be mostly positive. Karagozoglu (1988) studies innovation behavior in Turkish firms using data from 61 medium to large firms. Using correlational analysis, the author analyzes the relationship between innovation measures like R&D intensity and innovation output and factors like firms' technological dependence, export intensity and importance attached to innovation. The study finds that innovative output is positively correlated with management's attitude towards innovation as well as export intensity of firms. This study does not however address other firm characteristics like size, age and profitability.

III. DATA:

Data and Sampling Methodology:

In order to study innovation in ESME in a globalized market, a primary survey
methodology was adopted and implemented across major manufacturing industries in the
Bangalore region in India. A primary survey methodology was used mainly because of
the absence of secondary sources of data with respect to innovation in this particular
context. A review of literature and surveys suggests that with respect to Bangalore, no
studies attempt a broad conceptualization of innovation from the perspective of local
firms (namely, Bala Subramanya (2001), NKC (2007)). A handful of studies that do
address innovation pay no attention to roles played by availability of capital, sources of
information and factors hampering innovative activity.

A preliminary questionnaire was designed based on literature and inputs from innovation
related firm surveys already implemented in other countries.[7] An initial field visit was
conducted in May 2009 to pretest the survey instrument after the research was approved
by the University Subjects' Review Board. A list of manufacturing firms in the Bangalore

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[7] Kauffman Firm Survey; OECD Community Innovation Surveys, Financing Firms in India (Allen et al. 2007), Innovative and Non Innovative Small Firms: Types and Characteristics (Khan et al 1989), Panel Study of Entrepreneurial Dynamics (PSED), Bhide, Amar (2000), Bhide Amar (2006)

region was obtained from the website of the Ministry of Small and Medium Enterprises in India. The initial mail invitation was sent to 400 firms in the list, out of which 17 indicated a willingness to participate in the study. A snowball sampling methodology was used further where respondents referred other participants for the study. The low response rate is due to a number of reasons- 1) small business owners in Bangalore were more likely to respond when referred to by a colleague, friend or another trustworthy source 2) similarly, SME owners were reluctant to answer questions regarding the size of the firm, value of assets or details regarding operations till they verified the purpose of the research and its objectives 3) a number of executives were averse to answering surveys in general and stated that they frequently turned down survey requests from marketing companies. For all the reasons stated above, considerable effort had to be expended to spread awareness about the survey and its purposes, including meetings with various industry representatives and presentations at industry events.

Detailed face-to-face interviews were conducted with 30 senior executives, business owners and representatives of industry associations in Bangalore who had responded to an initial mail invitation to participate in the study. These semi-structured interviews not only covered questions from the survey instrument but also open ended questions regarding owners' motivation to start a business, their background, sources of competitive advantage and issues relating to business environment, policies and day to day running of the business. The participants also provided inputs and feedback with respect to the survey design, terminology used and time taken to complete the

questionnaire. The final version of the questionnaire was drafted using the responses and feedback obtained during this initial fieldwork phase.

The final survey instrument used in the Bangalore Innovation Survey (henceforth BIS) was modeled along the lines of the Community Innovation Surveys (CIS) implemented in the OECD countries taking into account major shortcomings of the CIS and incorporating issues unique to firms operating in Bangalore. This is the first comprehensive innovation study in Bangalore, that addresses a wide range of activities and process related to innovative activity like knowledge transfers, markets, networks, competition and finance. The BIS was closely based on the CIS for two main reasons. Firstly the CIS encompass a broad concept of innovation including not only product and process innovation but also marketing and organizational innovation in a firm. The Oslo manual defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD). This definition is highly suitable in the context of ESME since traditional measures of innovation like R&D and patents do not adequately capture the extent of innovative activities these firms engage in (Ayyagari 2007). Also, the findings and feedback from the interviews in the pretesting stage validated the use of broader definitions (only one company in the pretest sample had filed for a patent or had any formal R&D expenditure. A majority of the firms identified changes they had made to production processes, marketing and organization changes as innovation). Secondly, since the main purpose of the Oslo Framework in Europe was to

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develop a harmonized innovation survey that could be implemented in different

countries, the use of a format similar to the CIS allows for the possibility of comparing

responses to firms in regions where the CIS has already been implemented. Therefore the

data obtained from this region could possibly be compared to data from other developed

and transition economies in Europe.

A major difference between the BIS and CIS however is the introduction of pilot

questions regarding access to firm finance in the BIS. Apart from being an important

research objective for this dissertation, the lack of an explicit focus on the financing of

innovation has been pointed out as a shortcoming in the case of the OECD CIS. It has

been possible to include detailed questions regarding innovation and firm financing in the

BIS without making the survey unduly cumbersome because a face-to-face interview

mode was used to execute the survey.

The survey questionnaire has three main sections covering questions related to the firm,

innovation and firm financing. Table 1 in the Appendix summarizes the chief contents

and the responses elicited by the questionnaire:

Taking into account constraints with time and resources, a target sample size of 200 to

250 MSME was set, proportionally sampled over five major manufacturing industries.

After the preliminary fieldwork and pretesting was complete, data collection in Bangalore

was executed by liaising closely with a professional survey organization. A non-random

sampling methodology had to be adopted owing to the absence of updated business

registries or databases of businesses operating in Bangalore.[8] A sampling frame of 1500

manufacturing firms was manually compiled from recently published hard copies of

business directories, which were obtained from autonomous industrial associations.

These businesses were then contacted over the phone to determine whether they fit the

criteria to be included in the sample. At the outset, solely retail enterprises, wholesale

enterprises, consultancies and service sector firms, public sector enterprises, public

limited companies and ancillary units of multinational companies were excluded from the

sample. Only manufacturing firms that were locally owned and operated were selected

for interviews. Face to face interviews were subsequently arranged with respondents who

were willing to participate in the study.

The field report indicates that the target sample of 250 was reached after contacting about

800 businesses on this list. However, further verification and audit of the data revealed

that not all the interviews conducted by the survey organization were with a CEO, senior

level executive of the firm. Those interviews where the respondent was not a CEO or

senior level management actively involved with the business were subsequently excluded

from the final analysis to preserve the integrity of the responses. The final sample size

used in subsequent analysis included 108 manufacturing MSME.

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[8] The lists previously obtained from official sources contained a majority of wrong numbers, e-mails and addresses in addition to making no classification of firms according to industry or size The lists were not in a database format but were rather industrial 'Yellow Pages' with advertisements placed by respective businesses.

i.   Description of Data and Variables:

The following section describes the general characteristics of the firms in the sample. This sample consists of 108 manufacturing firms located in the Bangalore metropolitan region in India. The variables that are considered here are firm size, type of legal incorporation, type of market catered to and industrial division.

Firm Size:

In India, firms are officially classified according to their size based on the value of investment in plant and machinery. According to the Ministry of Micro, Small and Medium Enterprises, small enterprises in the manufacturing sector are defined as having investment in plant and machinery between Rupees 2.5 million & 50 Million and for medium enterprises, between 50 and 100 million Rupees[9]. However, as has been found in the case of other developing economy studies (Ayyagari , 2006), the number of employees is found to be a more reliable measure of firm size than value of investment. In this survey as well, it was observed that responses to the value of total assets were understated in most cases, making it an unreliable measure of firm size.

Table (2) in the Appendix illustrates the distribution of firms in the sample based on number of full time employees:

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[9] 1 US Dollar approximately equals 45 Indian Rupees (Average of average annual currently exchange rates from 2007-2010) Source: http://www.forecast-chart.com/usd-indian-rupee.html

As can be observed from the distribution, the size of firms in the sample is positively skewed, consisting predominantly of small enterprises that employ less that 20 full time employees. Regarding micro firms, nearly half of the firms in the sample (46.73%) are found to employ less than 10 full time employees whereas only 5.6% of firms in the sample are found to employ more than 100 employees. The summary statistics indicate that the median firm has 10 employees, the minimum, maximum and the mean values being 2, 400 and 28.07 respectively.

Industrial Classification:

In the Indian context, especially in the case of the SME sector, firms are identified as parts of larger 'industrial clusters'. An industrial cluster is a conceptualization where firms belong to a localized group of enterprises that produce similar or related products and are usually part of the localized supply chain. This industry-focused conceptualization is used to generally characterize SMEs but large enterprises are also included. With respect to the research methodology, the consequence of using industrial clusters to officially classify firms was that when sample stratifications were constructed, they were based on cluster related information provided by official sources rather than Standard Industrial Classification codes. These classifications were subsequently found to be inaccurate in many cases when product related information from the survey responses were compared to the industrial cluster information. Therefore, firms in the sample were re-classified into one of the two-digit NIC categories using the product type information obtained from survey responses. For most firms in the sample, it was possible to identify

two and three digit NIC codes. Figure (1) in the Appendix represents the distribution of

the number of firms in the sample with respect to their two-digit NIC codes. [10]

A major portion of the firms in the sample (33.3%) is found to be producers of fabricated

metal products. This division consists of manufacturers of structural metal products like

tanks and reservoirs; metal working services like forging and pressing; manufacturers of

various hand tools and manufacturers of other metal products like fasteners, springs and

wires. For a list of specific products manufactured by firms in this sample, see table (#) in

the appendix.

Firms manufacturing Machinery and Equipment constitute nearly 17% of the sample.

Firms in this division include manufacturers of general-purpose machinery; special

purpose machinery like agricultural machinery, machine tools and textiles; and domestic

appliances.

Thirteen firms in the sample belong to the division manufacturing electrical machinery

and apparatus. This division consists of firms manufacturing motors, control panels,

batteries, lighting equipment and others.

However, it must be noted that the NIC classifications are based on the primary product

manufactured and may not indicate the specific industry focus of a firm. This distinction

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[10]   See Table (#) in the appendix for the list of two-digit NIC codes.

is important to remember because many firms in the sample manufacture products that are used in a wide variety of industries. For example products like nuts, bolts, wires etc. are used in the automobile, machine tool, heavy electrical engineering industries, to name some. Since the questionnaire did not specifically ask for information regarding primary customers of a firm, information about the firm's supply chain cannot be readily inferred from this data. Therefore, a number of firms manufacturing components for more technologically sophisticated industries for instance find themselves in the same two-digit classification as basic metal fabricators.

Size-wise Composition of Industry Divisions:

Since it was observed that the sample consisted of a large number of very small firms employing less than 10 full time employees, a size-wise distribution of these firms was constructed based on NIC divisions.

Figure (2) in the appendix illustrates the distribution of firms with less than 10 employees based on their industrial classification. The dark colored bars indicate very small firms in each NIC division that employ less than 10 full time employees and the light colored bars indicate firms that employ ten or more employees.

Considering the three largest industries represented in this sample, the Fabricated Metals division constitutes the largest percentage (68.57%) of firms that employ less than ten employees. If the whole sample is considered, 22.22% of firms that employ less than 10 employees belong to this NIC division. In absolute terms as well, this division consists

of mostly of very small firms compared to other divisions in the sample. About forty four percent of firms in the Machinery and Equipment division and 23.07% of firms in the Electrical Machinery and Apparatus division consist of very small firms.

Strategic Management Planning:

The survey asked respondents if their firms had employees dedicated to strategic management planning. With a response rate of 88% (N = 95) for the question, 23% answered in the affirmative (n= 22). The median firm in the sample had 4 employees dedicated to strategic management planning, with the minimum, maximum and mean being 1, 15 and 5.36 employees respectively.

Type of Business Incorporation or Legal Entity of the Firm:

In all, the sample consists of four types of business entities namely Private Limited Enterprises, General Partnerships, Limited Liability Partnerships (LLP) and sole proprietorships. Public limited firms were excluded *a priori* from the sample frame because this category of firms was not the focus of the research question.

According to the Indian Companies Act, 1956, a Private Limited Company is defined as a limited liability business where shares are held by members only and are not freely transferable to the general public. LLP is a business type that incorporates the limited liability characteristics of a private limited company along with the organizational structure of a general partnership. This is a relatively new corporate structure in India,

established by the Limited Liability Partnership Act of 2008. The main advantage of incorporating a Private Limited Company or LLP is that it is recognized as legally separate entity from its owners. Therefore, liability of the owners in both these business types is limited to the extent of their contribution to business capital. A proprietorship is defined as a business that is owned and managed by a single individual and a general partnership is a type of business entity formed by two or more voluntary members. For both general partnerships and proprietorships, liability is unlimited and extends beyond owners' contributions to business capital, as they are not considered legally separate entities from their owners.

Figure (3) in the Appendix illustrates the distribution of firms in the sample by the type of business. A majority of firms in the sample are sole proprietorships accounting for nearly 62% of the sample. Private Limited firms constitute 23.4%, Limited Liability Partnerships 2.8% and General Partnerships 11.2% of the sample.

Firm Size and Type of Business Incorporation

There is at least some evidence that firms with limited liability grow faster than firms without limited liability (Schleifer 1998, Ayyagari 2007). This is largely attributed to the limited investments in risky projects owners of unlimited liability companies are willing to make. Owing to these characteristics, the data obtained from the Bangalore survey is analyzed to determine if on an average limited liability firms are likely to be larger than

sole proprietorships or general partnerships. The descriptive statistics in Table (3) in the Appendix indicate that this is the case with the Bangalore sample.

The mean and the median number of full time employees for Private Limited companies are found to be larger than for the other types of businesses in the sample. Sole proprietorships are on average found to be smaller than Private Limited Companies and LLPs.

Figures (4), (5) and (6) in the Appendix represent the distribution of firms by the number of full time employees for each type of business. Compared to the other types of businesses, sole proprietorships are found to account for the largest percentage of small businesses in the sample. It is found that 64.6% of all proprietorships have less than 10 employees and 83% have less than 20 employees. Of the 12 firms that are General Partnerships, 7 firms (58%) are found to have less than 20 employees.

Markets Catered To:

The respondents in the survey were asked to indicate the percentage of total revenue their firms received from customers residing in the city of Bangalore, the rest of the state (Karnataka), the rest of India and outside India.

Table (4) in the Appendix contains the frequency distribution of firms in the sample that received at least some portion of their revenue from the said regions.

It was found that all firms received at least some portion of their revenue from within the city of Bangalore, which implies that there are no firms in this sample that receive

revenues solely from sales outside the metropolitan region or outside of India. Nearly thirty four percent or 37 firms in the sample reported receiving some revenue from sales to customers outside Bangalore and from the rest of the state. About eighteen percent of firms in the sample (n=19) reported receiving revenue from sales outside the state and from the rest of India. Only nine firms in the sample reported receiving at least some portion of their revenue from customers outside India.

A density graph (Figure 7 in Appendix) highlights the distribution of firms in the sample further. The y-axis measures the fraction of the total number of firms of each category on the x-axis contains, the height of all the bars summing to 1. The x-axis contains values of percentage of total revenue from Bangalore into which firms are categorized. From the last vertical bar in the figure, it can be inferred that nearly 65% of the sample firms receive all their revenue from sales to customers in the Bangalore region.

For the whole sample (n=108), the descriptive statistics for percent of total revenue received from various regions is highlighted in Table 5 in the Appendix:
The mean and the median values for the Bangalore region indicate that for the whole sample, a large percent (81.8%) of sales revenue in the sample is generated within the metropolitan region. Considering those firms that generate sales revenues from outside the metropolitan region (Table 6 in Appendix), thirty-seven firms on an average receive about thirty three percent of their revenues from the rest of the state. Nine firms in the

sample on an average receive about twenty four percent of their sales revenue from exports.

Firm size and type of market catered to:

The survey data was further investigated to determine if size had any bearing on the export characteristics of firms in the sample.

The mean and median values in Table (7) in the Appendix suggest a negative relationship between number of full time employees and the percentage of revenue received from sales within the metropolitan region. Except for the '0-25%' category, the mean and the median number of full time employees is found to decrease as percent of sales revenue from Bangalore increases.

The Spearman's coefficient correlating percent total revenue from Bangalore and number of full time employees was found to be -0.43 (p value = 0.00), suggesting a modest but statistically significant negative correlation between the two variables.

Table (8) in the Appendix considers the frequency distribution of firms that made no sales outside Bangalore, categorized into classes based on size. Of the 69 firms in the sample that had no sales outside Bangalore, a large number of firms (n=54) are found to have less than twenty employees, accounting for about seventy eight percent of that group. When the whole sample is considered, firms with less than twenty employees account for about sixty seven percent. The evidence from this sample suggests small firms are more likely to be dependent on local markets. This could be attributed to factors

like capacity constraints, stage in their life cycle or the nature of their

technology/product.

Markets Catered to and Industry Division:

Based on the NIC two-digit codes, there are three major industry divisions in this sample-

1) Manufacturers of fabricated metal products, 2) manufacturers of machinery and

equipment and 3) manufacturers of electrical machinery and apparatus.

About seventy eight percent of firms in the Fabricated Metal division and 78% of firms in

the Machinery and Equipment division get all their revenues from customers within

Bangalore. In comparison, 38.5% of firms in the Electrical Machinery division receive all

their revenues from Bangalore suggesting that this industry is less locally dependent.

Firm Resource Based Variables:

Percentage of Profits Reinvested:

The response rate of this survey item is about 74%. The median firm in the sample

is found to reinvest 15% of the earnings in a typical year. The mean value is 16.36%.

The maximum value reinvested by a firm in this sample is nearly 50% and the

minimum is 2%. The percentage of profit reinvested by a firm is found to have a

Spearman's correlation coefficient of 0.24 with the number of fulltime employees,

suggesting a modest positive correlation with firm size.

Employees dedicated to strategic management:

77% of the firms in the sample (n = 73) identified not having employees dedicated

to strategic management. The presence of employees related to strategic

management is modestly correlated to firm size, having a Spearman's rho of 0.34.

Barriers to Innovation- Factor Analysis:

The following items from the survey were included in the exploratory factor

analysis to extract latent constructs measuring barriers as well as to reduce the

number of variables to be included in the regression analysis-1) Factors hampering

Innovative Activities and 2) Difficulty in Obtaining Firm financing. These two items

measure barriers related to innovation namely financial, human resource,

knowledge networks and market factors. The purpose of the exploratory factor

analysis is twofold a) it serves as a data reduction technique and is commonly

employed in survey design and b) it identifies underlying latent constructs that may

be present between items. Each of the twenty items described below is indicative of

a barrier faced by a firm that is likely to affect innovative outcomes in firms.

Factors Hampering Innovative Activities: In section 2.7 in the survey, respondents

were asked to indicate the importance of various factors that hampered or

influenced a decision for the firm to not innovate. Following the OECD Community

innovation Surveys, the factors included in the survey is:

1) Cost factors, including a) Lack of funds within the enterprise b) lack of finance outside the enterprise c) Innovation costs too high

2) Knowledge Factors including a) Lack of qualified personnel b) Lack of information on technology c) Lack of Information on Markets d) Difficulty in finding cooperation partners for innovation

3) Market Factors, including a) market dominated by established enterprises b) Uncertain demand for innovative goods and services

4) Reasons not to innovate, including a) No need due to prior innovations b) No need because no need for innovation.

Table (9) in the Appendix summarizes the responses.

Difficulty in obtaining Firm Finance: In section 3.2 of the survey, respondents were also asked to indicate difficulty in accessing firm finance from the following sources a) Own money including partners personal money and personal loans b) family c) friends d) Angel Investors e) Venture capital f) Public Sector Banks g) Private Sector Banks h) Finance Companies I) Development agencies.

Table (10) in the Appendix summarizes these responses

Internal Reliability: The Cronbach's alpha test was used to assess the internal reliability of the items measuring barriers to innovation. The test computes the

average inter-item correlations for all pairs of variables included in the test and indirectly indicates the degree to which a set of items measures a single unidimensional latent construct (Stata 12 PDF Documentation). When the alpha was computed using all the items indicative of barriers to innovation, it was found to be 0.81, which indicates a good degree of internal consistency among the items included for measuring barriers to innovation. Since all the items were not on the same scale, the 'std' option was specified in Stata, so that the scale and reliability were based on the sum of standardized variables. [11]

The factor analysis was conducted using the principal factors method. The results indicate that there are three factors with eigenvalues greater than one. Following the scree plot test as well as the Kaiser criterion, the results indicate a three factor solution and the three factors with eigenvalues greater than 1 were retained for analysis. These three factors were also found to explain nearly 84% of the variance accounted by all the factors. In order to facilitate interpretation, the factors were rotated using the varimax orthogonal method.

The interpretation of the factors is as follows:

Factor 1: Access to 'Traditional Sources of Finance' (Barrier_TradFirmfinance): This factor loads highly on the following measures of barriers related to firm financing from the following sources a) Angel finance b) Venture capital c) Finance Companies

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d) Developing agencies. The factor has small loadings on 'standard' sources of firm finance including public banks and private banks. Standard sources of financing include public banks and to lesser degree private banks as they are the predominant sources of external sources of debt financing for firms in this sample. The data also suggests that owner's equity and debt from public banks account for the bulk of the capital structure of firms in the sample. Owner's equity accounts for 50 percent of the capital of the median firm in the sample. Debt from public banks accounts for 40 percent of the capital of the median firm in the sample. This factor therefore indicates 'Traditional Capital Structure'.

Looking at the item loadings on this factor, it can be interpreted as measuring easier access to standard sources of finance compared to other non-standard sources.

Factor 2: Lack of Core Innovative Capacity (Barrier_NoInnovCapacity): The highest loadings of this factor are on items that relate to reasons not to innovate because core innovations were considered unnecessary due to the existence of previous innovations. This factor is indicative of firms that follow traditional methods of production, operate in established stable markets or operate in the lower end of the technological spectrum where product or process innovation is unnecessary. This factor can also be interpreted as no core innovation potential or capacity.

Factor 3: Barriers to Core Innovative Inputs (Barrier_NoInnovinputs): This factor loads highly on the knowledge factors related to core innovation, especially lack of

skilled personnel and lack of information technology. This factor also loads

substantially highly but to a lesser degree on lack of funds available within the

enterprise to innovate. This factor can be interpreted as problems faced by firms

with respect to core innovative inputs namely internal finance, labor and

information technology.

Using the regression scoring method, these three factors were extracted to be used

in the regression analysis.

The Kaiser-Meyer-Olkin (KMO) sampling adequacy measure for these items is 76.26.

The KMO statistic takes the value 0 to 1, with smaller values indicating that a items

do not have much in common to warrant a factor analysis. Values less that 0.70 are

usually considered mediocre.[12]

Innovation:

Table (11) in the Appendix illustrates the percentage of firms undertaking each type of

innovative activity. A majority of firms (42.31%) are found to undertake organizational

innovations relating to knowledge management systems. This is followed by 41.35% of

firms undertaking innovations relating to marketing, designing and packaging.

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[12] Reference: Stata PDF Documentation

Relationship between different types of innovation:

Factor analysis of all the innovative activities in the questionnaire led to two distinct factors with eigenvalues greater than 1. The rotated factors show that the first factor is loaded highly on core process innovations and moderately on core product innovations. The second factor is loaded highly on non-core organizational and marketing innovations and less on core innovative activities. This shows that innovation in the sample firms indeed have two dimensions, which are core and non-core innovations.

An index was constructed for each dimension, which is the sum of responses for each firm in the core and non-core categories. A firm that has an index measure of zero did not undertake any type of innovative activity whereas a firm with an index measure of five undertook each innovative activity. The distribution of core and non-core innovative activities is highlighted in Table 12 in the Appendix.

The core innovation and non-core innovation indices have a Spearman's correlation of 0.59, with a 'p' value of 0.0000. This implies that core and non-core innovative activities are fairly complementary in this sample of firms.

Some salient differences between innovative and non-innovative firms in the sample are presented in Table (13) in the Appendix. The distribution of innovative firms in the sample with less than 20 employees shows that only 19 innovative firms in the sample have less than 20 employees compared to 54 non-innovative firms having

less than 20 employees. The t-test for comparing means between groups shows that on average, innovative firms are larger and have more number of full time employees. Non-innovative firms are also found to obtain on average a greater percentage of revenue from sales within the city of their location compared to innovative firms. Innovative firms are also found on average to reinvest a greater percentage of profits earned.

Common Method Variance:

Since the data obtained for this research uses a survey methodology, the presence of common method variance was tested. Common method variance is described as the variance that is attributable to the measurement methods rather than the constructs the measures represent (Podaskoff 2003). According to Podaskoff (2003), this bias is prevalent in behavioral research and could lead to both Type I and II errors if left untreated. The author notes that most of the evidence related to common method variance comes from the literature in psychology, marketing, sociology and business. The sources of common method variance include a) the same rater bias b) Item Characteristics c) Item Context and d) Measurement contexts. Common rater effects arise because the answers related to the predictor and criterion variables are answered by the same individual who might try to appear consistent, assume implicit theories related to the variables in the study or be affected by a particular mood or context while answering the survey. Item characteristics also cause common method bias as they might

be structured in a way that elicits a socially desirable answer, be ambiguous, have artifactual covariance causes by measurement scales or the use positive or negative item wordings that produce artifactual relationships among variables. The structure and context of the survey may also produce bias depending upon where the questions are placed, the length of the survey, length of the scale and time of measurement.

This study follows the procedural and statistical remedies prescribed by Podaskoff to control for the effects of common method bias. Procedurally, the author suggests that one of the ways in which this bias can be controlled is by "proximal, psychological or methodological separation of measurement" when data cannot be obtained from different sources (pp 887-888). In this survey, the dependent variables (or criterion variables) measures the actual innovative outcome for a firm and is a factual measure rather than a measure of attitude that the common method bias is most likely to affect. Also, the predictor variables include not only the factors hampering innovation using a Likert scale, they also use various factual resource based variables like percentage of profits reinvested and presence of strategic management.

Nevertheless, the data was subject to the Harman's single factor test, where all the variables used in the model were loaded into an exploratory factor analysis test. If common method bias is a pervasive problem, the exploratory factor analysis would yield a single unrotated factor that would account for the majority of covariance among the measures. When all the variables, both criterion and predictor, were loaded into an

exploratory factor analysis, more than one factor emerged and the first unrotated factor

explained only a quarter of the covariance between the items.

Therefore both procedurally and statistically it can be argued that bias caused due to

common methods is not pervasive in this study even though a single respondent from

each firm answered the survey. This study also does not use the ex-post statistical

remedy of extracting the single unrotated latent factor and including it in the regression

model, as it could distort genuine relationships between the dependent and the

independent variables in the study.

IV. METHODOLOGY AND MODEL

Method:

To test the hypotheses, the following base regression model is used where the outcome
variable measures innovative outcomes and explanatory variables measure the
determinants of innovation.

Innovative Outcome(s) $= (\alpha_i + \beta_{1i} * X_{1i} + \beta_{2i} * X_{2i} + \beta_{3i} * X_{3i})$;

Where $X_{1i} =>$ Vector of firm characteristics,

$X_{2i} =>$ Vector of resources

$X_{3i} =>$ Vector of Measures of Barriers

This study uses the following measures for outcome variables:

☐ Core Innovation (INNOV): This study defines core innovation as either a product or

process innovation. This is a binary variable that takes the value 1 if a firm

introduced one or more product or process innovations and zero otherwise.

☐ Core Innovative Dynamism (COREINNOV_I): Following Ayyagari (2007),

COREINNOV_I is an index that measures dynamism with respect to core innovative outcomes of firms and is the sum of the types of core innovations successfully introduced by firms. If a firm had no successful product or process innovation, this variable takes the value zero. On the other hand if the firm introduced all the types core innovative activities mentioned in the survey (two types of product and 3 types of process innovations), the value this variable takes is 5, which is the maximum. However, it should be noted that this variable is not a measure of the number of new products or processes introduced by a firm. Rather it is a measure of the different types of core innovations introduced by the firm and takes the value 0 to 5.

 Non-Core Innovation (NON_COREINNOV): This variable takes the value 1 if a firm introduced one or more types of organizational or marketing innovations and zero otherwise.

 Non-Core Innovative Dynamism (N_COREINNOV_I): Following Ayyagari (2007), NCOREDYN is an index that measures dynamism with respect to non-core innovative outcomes of firms and is the sum of types of non-core innovations successfully introduced by firms. If a firm had no organizational or marketing innovations, the index takes the value zero. If the firm carried out all types of non-core innovative activities (three organizational innovations and two marketing innovations), the index takes the value 5. The index ranges from values 0 to 5.

 ALLINNOV: This variable takes the value 1 if the firm introduced one or more of any core or non-core innovative activities.

⬜ Dynamism (DYNAMISM_I): Following Ayyagari (2007), this is an index that

measures the overall innovative dynamism of firms. This index is the sum of all

types of innovative activities undertaken by a firm including core and non-core

innovative activities. The index takes the value zero if the firm did not undertake

any type of innovative activity and value 10 if it undertook all core and non-core

innovative activities.

Explanatory Variables:

The explanatory variables include the following:

- Resource characteristics including percentage of profit reinvested by the firm and

  the presence of strategic management.

- Barriers to innovation, which are the factors extracted using the regression scoring

  method

- Firm Characteristics, including firm size, age, industry dummies, legal

  incorporation dummies and export characteristics.

Models:

Logit Model:

For the binary outcome variables, the logit model is used with the odds ratio option and is

functionally specified as follows:

Innovative Outcome $_{(1,0)}$ = $(\alpha_i + \beta_{1i} * X_{1i} + \beta_{2i} * X_{2i} + \beta_{3i} * X_{3i)}$;

Where X_{1i} => Vector of firm characteristics,

X_{2i} => Vector of resources

X_{3i} => Vector of Measures of Barriers

Following Gujarati (2003), the logit model is formally written as

$$L_i = \ln (P_i/(1-P_i)) = (\alpha_i + \beta_{1i} * X_{1i} + \beta_{2i} * X_{2i} + \beta_{3i} * X_{3i + } u_{i)}$$

where Pi = 1 if the firm has had a successful innovation and 0 if a firm has not had a successful innovation. [Pi/(1-Pi)] is the odds ratio, the logarithmic transformation of which is linear in both predictor variables and parameters. The β coefficients are interpreted as the change in 'L" for a unit change in X. The logit model was chose over the probit because a) there was no apriori reason to expect the underlying distribution to be normal b) the outcomes are an actual binary event and not implied occurrences.

Likelihood ratio statistic: The Likelihood Ratio Statistic tests the null hypothesis that all the slope coefficients are simultaneously equal to zero.

Ordered Logit Model:

For the outcome variables that are indices, namely core innovative dynamism and over all innovative dynamism, the ordered logit model was used.

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The ordered logit model is used when the outcome variable is ordinal in nature and is an extension of the binary case since the dependent variable has more than two categories. In this model, larger values of the outcome variable correspond to higher outcomes. In the case of innovation indices, this value ranges from zero to the maximum number of the types of innovations a firm has successfully introduced. The coefficients therefore are interpreted as the infinitesimal change in the explanatory variable that will result in the firm crossing over to a higher value or the adjacent category of the dependent variable.

Robust regressions were used to test the interaction effects between firm size and resources and between firm size and barriers to innovations.

V. RESULTS AND DISCUSSION:

i.   Results:

Logit Regressions:

Table 14 in the Appendix reports the results of the regression with binary

innovation outcome as the outcome variable. The models in this table only include

the main covariates and do not include any interaction terms. For each type of

innovation, two models were run. The first model that was run was the base model

(results not reported) that did not include variables related to access. The full

model, which contains the variables related to access, is reported along with the F-

test Chi square statistic testing for the joint significance of all three 'access' related

variables. As can be observed from the p-value of the F test, the null hypothesis that

the coefficients of the 'access' variables are zero cannot be rejected. Nevertheless,

the results can be interpreted using individual t-tests. The Likelihood Ratio chi-

square for all the models in the table is significant at the 1% significance level,

meaning that for each of these models, the null hypothesis that all the variables in the model are statistically equal to zero, can be rejected. Only those models where the Likelihood Ratio Chi-square is significant at the 5% level of significance is reported and discussed.

The coefficients reported in these regressions are the odds-ratio. Odds-ratios can be interpreted as the ratio of the odds of successful outcomes between two groups or when a unit change in the explanatory variable occurs, when all the other variables are held constant.[13] Odds in turn are the ratios of the probability of success of an outcome to the probability of failure. Therefore, in the binary regression models reported in Table 14, an odds ratio that is greater than 1 implies a positive relationship between the variable and the innovative outcome.

The outcome variable for Model 1 takes the value 1 if the firm undertook organizational innovation pertaining to knowledge management systems and zero otherwise. The binary outcome variable in Model 2 is organizational innovation pertaining to management structure and in Model 3 it is marketing innovation in sales. The outcome variable in Model 4 is Core Innovation, which takes the value 1 if a firm reported a successful product, or process innovation and zero otherwise. Non-Core Innovation in Model 5 takes the value 1 if the firm has had any

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[13] Reference: UCLA: Academic Technology Services, Statistical Consulting Group.
from http://www.ats.ucla.edu/stat/stata/output/stata_ologit_output.htm

organizational or marketing innovation and zero otherwise. Overall Innovation in Model 6 takes the value 1 if the firm has had any core or non-core innovation and zero if the firm has not had any type of innovation.

Ordered logit Regressions:

Table 15 in the Appendix reports the results of the ordered logit regressions using the index variables Core Innovation Index (Model 7), Non-Core Innovation Index (Model 8) and Overall Innovative Dynamism (Model 9). Each of these outcome variables is a measure of 'dynamism' with respect to core innovations, non-core innovations and overall core and non-core innovations of firms. The coefficients reported in Table M are the odds ratios. Similar to the logit models, two sets of regressions were run for each outcome variable including a base regression without the 'Access' variables (results not reported). However, the results of the F-test of joint significance of the Access variables are reported.

The Likelihood Ratio Chi-Square for all the models is significant at the 1% level of significance indicating the null hypothesis that all the coefficients in each model are statistically equal to zero can be rejected.

Robust Regressions and Interaction Terms:

Table 16 reports the results of the robust regression used to study 1) the interaction effects between firm size and internal resources and 2) the interaction effects of firm size and barriers to innovation on innovative dynamism of firms. In order to study the interaction effects, the robust regression method is used instead of the ordered logit method in Table 15. [14]

The variable for firm size in these models is 'MICROFIRM' which takes the value 1 if the firm has ten or less than ten employees and zero otherwise. This dummy variable for firm size is then interacted with each of the factors measuring barriers to innovation for firms.

The outcome variables are the index variables measuring dynamism in core innovation (Model 10), non-core innovation (Model 11) and overall innovative dynamism (Model 12). The interaction terms in the model are as follows:

For the resource based variables, the interaction terms are:

Micro-firm and strategic management personnel= Microfirm*STRMGT

Micro-firm and percentage profit reinvested = MICROFIRM*PCTPROFIT

For the access variables, the interaction terms are:

Micro-firm and Access to Traditional Finance = MICROFIRM*TradFirmFinance

Micro-firm and lack of core innovative capacity = MICROFIRM*NoCoreInnCapacity

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[14] According to Norton (2004), standard software packages like Stata do not compute the correct interaction effects and standard errors for non-linear models. The appropriate command in Stata to compute correct interaction effects and standard errors is *inteff,* but this command is functional only for binary qualitative models and not ordered logit or probit models.

Micro-firm and Access to Core Innovative Inputs = MICROFIRM*NoCoreInnInputs

If the dummy for MICROFIRM is zero (>10 full time employees), each of the interaction terms above reduces to zero and the marginal effect of a change in barriers to innovation to innovative dynamism is given by the coefficients of the variables TradFirmFinance, NoCoreInnCapacity and NoCoreInnInputs, when all other variables are held constant.

When MICROFIRM is equal to 1, the interaction terms are not equal to zero and the marginal effect of a change in access or barriers to a change in innovative dynamism is obtained by adding the coefficients of each variable measuring barriers to its respective interaction term. [15]

a. Firm size and Innovation:

Hypotheses H1a to H1e relate to the relationship between firm size and innovative outcomes in firms.

The results from Table 14, which have the binary outcome variables for innovation show that number of full time employees is positively and significantly related to the dependent innovation outcome in all the models in the table. An increase in the

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[15] Technically this is the Chow Test of Structural Change that uses a dummy variable in a single regression instead of running separate regressions on sub-samples to check for differences between intercept and slope coefficients of regressors (Gujarati 2003 pp 306-310).

number of full time employees by one employee increases the odds in favor of a core innovative outcome in Model 4 by 1.27 times. The coefficients in all the other models can be interpreted similarly. The square of the number of full time employees was included in the model to test whether the relationship between firm size and innovative outcomes was linear. In Models 1, 2, 5 and 6, the value of the odds ratio is less than 1 indicating that the relationship between the likelihood of these innovative outcomes and firm size is not linear and that the likelihood of innovative outcomes decreases with firm size after a point. Similar results are observed in the other models though the odds ratios are not statistically significant.

From Table 15, which has the index measures of core, non-core and overall innovative dynamism, it is observed that the number of full time employees is positively and significantly related to core, non-core and overall innovative dynamism. An increase in the number of full time employees by one increases the odds of a higher core innovative category by a factor of 1.22. The odds ratios for non-core and overall innovative dynamism are 1.3 and 1.28 respectively. A squared term of firm size was also included to check whether the relationship between innovative and dynamism is linear. The squared term is significant and negatively related to non-core and overall innovative dynamism, indicating that the relationship in models 8 and 9 is non-linear and concave.

From Table 16, it can be seen that when all the other variables are held constant, compared to larger firms, the innovative dynamism of micro firms is lesser. Compared to larger firms, the core innovative dynamism of micro firms is 1.29 units lesser. The non-core innovative dynamism of micro firms is 2.289 units lesser than larger SME and the overall innovative dynamism of micro firms is 3.737 units lesser than larger SME.

b. Resource Variables:

Hypotheses H2a to H2h relate to the internal resources of a firm that are related to innovative outcomes. H2a-H2d relates to the presence of strategic management personnel and H2e-h2h relate to the percentage of profits reinvested in the firm.

From Table 14, it is observed that employees dedicated to strategic management is significantly and positively related to core, non-core and over all innovative outcomes. The relationship is also positively and significant related to innovation outcomes in Models 1 and 2. This effect is most pronounced in the case of ALLINNOV, the broadest definition of innovation including any type of innovation. A firm that has employees dedicated to strategic management is 20.51 times more likely to have a successful innovation compared to a firm that does not have employees dedicated to strategic management. With respect to core innovation, a

firm that has employees dedicated to strategic management is 11.64 times more likely to have a main product or process innovation compared to a firm that does not have strategic management. This coefficient is also found to be positive and significant in the case of non-core innovation.

From Table 15 it is observed that the presence of employees dedicated to strategic management is positively and significantly related to core, non-core and overall innovative dynamism. The odds ratio in Model 7 indicates that with all other variables held constant, the odds in favor of belonging to a 'higher' core innovative category for a firm with employees dedicated to strategic management is 12.727 times that of a firm having no employees dedicated to strategic management. [16]The odds ratios for strategic management are 6.95 and 11.64 for non-core innovative dynamism and overall innovative dynamism respectively.

In Table 16, it is observed from Model 14 that the coefficient for strategic management is 3.724. This implies that when MICROFIRM = 0, the presence of strategic management personnel increases the innovative dynamism by 3.724 units. The coefficient for the interaction term MICROFIRM*STRMGT is -3.056 albeit this relationship is insignificant. This implies that when MICROFIRM = 1, the presence of strategic management personnel has a negative but insignificant relationship with innovative dynamism.

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[16] Reference: UCLA: Academic Technology Services, Statistical Consulting Group.
from http://www.ats.ucla.edu/stat/stata/output/stata_ologit_output.htm

From table 14 it is observed that percentage of profits reinvested in a firm is significantly and negatively related to organizational innovation in Model 1 relating to improved knowledge management systems and information. An increase in the percentage of profits reinvested in a typical year by one percent increases the odds in favor of a knowledge related organizational innovation by only 0.93 times. Percentage profit reinvested is positively related to innovative outcomes only in Models 4 and 5 although it is not statistically significant.

In table 15, percentage of profits reinvested in a firm is positively related to core innovative dynamism and negatively to non-core and over all innovative dynamism though they are not statistically significant in these models.

In Table 16, it is observed that the percentage of profits reinvested in a firm is significant only in Model 13 in the interaction term MICROFIRM*PCTPROFIT. The coefficient indicates that when MICROFIRM = 1, a unit increase in percentage of profits reinvested results in a decrease in non core innovative dynamism by 0.133 units.

Hypotheses H3a, b, and c are related to access to external resources and barriers to innovation.

From table 14, the following can be inferred: From Model 4, access to traditional sources of finance (Barrier_TradFirmFinance), increases the odds in favor of core innovation by 4.07 times. In Model 3, access to traditional sources of finance is negatively related to the likelihood of marketing innovations related to sales. A

marginal increase in access to traditional sources of finance increases the odds in favor of sales related marketing innovation by only 0.31 times. In all the other models, this variable is negatively (albeit insignificantly) related to the likelihood of a successful innovative outcome.

In Models 2 and 3, the variable Barrier_NoInnovCapacity measuring the lack of core innovative capacity in firms is positively and significantly related to the dependent variable. In Model 2, a marginal increase in the factor measuring the lack of core innovative capacity increases the odds in favor of an organizational innovation related to management changes by 11.6 times. Similarly in Model 3, marginal increase in the lack of core innovative capacity increases the odds in favor of a marketing innovation related to sales by 6.58 times. The lack of core innovative capacity is negatively related to core innovation as expected, but is statistically insignificant.

Model 3 shows that the variable measuring barriers to core innovative inputs (Barrier_InnovInputs) to be positively and significantly related to marketing innovation in sales. A marginal increase in barriers to innovation inputs increases the odds in favor of a marketing innovation related to sales by 8.5 times. Barriers to innovation inputs are also positively related to core innovation in model 4 but the relationship is statistically insignificant.

The results above indicate that barriers to innovation related to core product and process innovative activities result in a higher likelihood of other types of non-core innovative activities by firms. The results also indicate that when firms are faced with barriers related to one type of innovation, it increases the likelihood of other types of innovations in firms.

The results in table 15 show the following:

Access to traditional sources of finance is significantly and positively related to core innovative dynamism in Model 7. A marginal increase in the factor measuring access to traditional finance increases the odds in favor of belonging to a 'higher' core innovative category by a factor of 5.75. Access to traditional finance is not significantly related to non-core innovative dynamism and overall innovative dynamism though their effects are negative.

The lack of core innovative capacity is positively and significantly related to non-core innovative dynamism. A marginal increase in the factor measuring the lack of core innovative capacity increases the odds in favor of belonging to a 'higher' non-core innovative category by a factor of 2.52. This indicates that firms that have no core innovative capabilities with respect to product or process innovations are likely to have non-core marketing and organizational innovations. Lack of core innovative capability is also positively related to the overall dynamism of the firm though the effects are statistically not significant.

The factor measuring barriers to core innovative inputs is positively related to both non-core innovative dynamism and overall innovative dynamism of the firm. A marginal increase in the barrier to innovative inputs factor increase the odds in favor of a higher non-core innovation by a factor of 2.15 and overall innovative dynamism by a factor of 2.12.

Table 16 has the results related to the hypothesis that firm size plays a moderating effect on the relationship between barriers and innovative outcomes. In Model 10, the coefficient for TradFirmFinance is 0.77, meaning when MICROFIRM = 0 and all other variables are held constant; a marginal increase in access to traditional firm finance increases core innovative dynamism of larger firms by 0.77 units. When MICROFIRM = 1, the interaction term between traditional firm finance and microfirms is -0.8606. A marginal increase in access to traditional sources of finance increases the core innovative dynamism by -0.0875 units (0.77+(-0.8606)). Therefore the slope coefficient of access to traditional finance for larger firms is positive whereas when MICROFIRM =1, the slope coefficient is negative. A marginal increase in access to traditional finance decreases core innovative dynamism of micro firms by 0.0875 units when all other variables are held constant. Similarly, for overall innovative dynamism (Model 12), a marginal increase in access to traditional sources of finance increases overall innovative dynamism by 1.116 units for large firms. For micro firms, a marginal increase in access to traditional

finance decreases overall innovation by 1.309 units (1.116+(-2.425)) when all other variables are held constant.

The effects are similar for non-core innovation although the coefficient for access to traditional finance is not statistically significant.

The variable measuring lack of core innovative capacity NoCoreInnCapacity is positively related to non-core innovative dynamism when MICROFIRM = 0. When MICROFIRM = 0, a marginal increase in the lack of core innovative capacity results in an increase in non-core innovative dynamism by 1.011 units. When MICROFIRM = 1, a marginal increase in the lack of core innovative capacity results in a decrease in non-core innovative dynamism by -0.764 units.

The effects are similar for overall innovative dynamism where a marginal increase in the lack of core innovative capacity results in an increase in overall dynamism of larger firms by 1.495 units when all other variables are held constant. For micro firms, a marginal increase in lack of core innovative capacity decreases overall innovative dynamism by 1.103 units when all other variables are held constant.

ii.   Discussion:

The aim of this research is to understand the resources and barriers affecting innovative outcomes in micro firms as compared with small firms operating in a

globalized emerging economy. A primary survey of indigenous manufacturing firms was conducted for this purpose in the Bangalore region in India. The broad motivation was to understand the nature of innovation in these ESME, the differences between innovative and non-innovative firms, the resources impacting successful innovative outcomes and the nature of barriers and their impact on innovative outcomes. A final sample of 108 firms was obtained, operating in four main industries in the region.

A significant number of firms (38%) did not have any innovations between the years 2007-09, including core innovations like new products and process or non-core innovations like organizational and marketing changes. 34% of firms in the sample had both core and non-core innovations whereas only 4% of the firms in the sample had only core innovations. The median product innovator in the sample obtained 30% of sales revenues from a product innovation that was new to the firm and 22.5% of sales revenues from a product innovation that was new to the market.

Salient differences are observed in this sample between core innovators and non-innovators. On average, the firm introducing a core innovation was larger and had 23.21 employees whereas the average number of full time employees for non-innovative firm is 12.45 employees. Innovators and non-innovators differed in the revenues they generated from sales in various regions. Firms that did not have successful core innovations received a significantly larger share of sales revenues

from within the Bangalore region compared to core innovators, implying that the markets catered to by core innovators were geographically larger and dispersed. With respect to internal resources, the mean percentage of profits reinvested in a typical year for core innovative firms was larger at 19.28% compared to 14.52% of non-core innovative firms. The Spearman's correlation of 0.46 between core innovation and employees dedicated to strategic management shows a significant positive relationship between the two.

An exploratory factor analysis technique was used to understand the nature of barriers faced by firms in this sample. Barriers related to access to resources were observed along three distinct dimensions. 1) Easier access to bank and other traditional sources of finance compared to non-traditional and largely equity related external sources like angels, venture capitalists and development agencies 2) The lack of core innovative capacity identified by firms as reasons not to undertake any core innovative activity, including no demand for innovation and no need due to existence of prior innovations 3) The barriers in access to core innovative inputs including skilled labor, information technology and project finance.

To understand the impact of resources and barriers on innovative outcomes controlling for other factors, a regression framework was used.

The findings with respect to firm size suggest that firm size is positively related to core and non-core innovative outcomes. Firm size was also found to have an inverted 'U-shaped' relationship with innovative outcomes. Micro firms are found to

be less innovative in core, non-core as well as overall innovative dynamism compared to small and medium sized firms. The support for the Schumpeterian hypotheses is summarized in the table below:

Table i

	Hypotheses	Binary Outcome (Supported?)	Dynamism
Core Innovation	*H1a: Firm size positively related to core innovation*	YES	YES
	H1b: Micro firms less likely to have successful core innovative outcomes compared to small and medium sized firms.	N.A	YES
Non-Core	*H1c: Firm size positively related to non-core innovation*	YES	NO
	H1d: Micro firms less likely to have successful non-core innovative outcomes compared to small and medium sized firms.	N.A	YES

With respect to firm level resources, the results from the regression analyses show that firms that have personnel dedicated to strategic management are nearly 20 times more likely to introduce any successful core or non-core innovation and 11 times more likely to introduce a core product or process innovation compared to a firm without employees dedicated to strategic management when other variables

are controlled for. Firms that have strategic management personnel are not only more likely to introduce one particular core or non-core innovation but are also found to be more dynamic as shown by the number of innovations they undertake. The ordered logit regression results show that firms that have strategic management personnel are 12 times more likely to be more dynamic with core innovations and 11 times more likely to have overall innovative dynamism. The percentage of profits reinvested in a firm that measures the slack financial resources is not found to be a significant influence on innovative dynamism of firms in this sample. Percentage of profits reinvested is found to have a negative relationship with innovations related to organizational knowledge management systems. A possible reason for this could be that as percentage of profits reinvested increase, internal finances are channeled away from this type of innovation to other areas. This could be the result of unobserved lagged effects, whereby an organizational innovation in knowledge management successfully resulted in cost savings in the previous period so the innovation was discontinued in the current period.

As seen from the interaction effects between internal resources of a firm and firm size, the presence of strategic management personnel is found to be positively related to innovative dynamism in small firms but not in micro-firms. For micro-firms, the percentage of profits reinvested is also negatively related to innovative outcomes. This indicates that even when internal resources are present, they may not be channeled towards innovation. This points to the inherent non-

innovativeness of micro-firms that are likely to use scarce resources for activities

not related to innovation. The support for hypotheses related to the resource

variables are summarized below:

Table ii

	Hypotheses	Binary Outcome (Supported?)	Dynamism (Supported?)
Core Innovation	**H2a: The presence of strategic management personnel is positively related to core innovative outcomes.**	YES	YES
Non-Core	**H2b: The presence of strategic management personnel is positively related to non-core innovative outcomes**	YES	YES
	H2c: The presence of strategic management is more strongly related to higher innovative outcomes in small and medium firms compared to micro firms.	N.A	YES[17]
Core Innovation	**H2d: Percentage of profits reinvested is positively related to core innovative outcomes.**	Not Significant	Not Significant
Non-Core	**H2e: Percentage of profits reinvested is positively related to non-core innovations but the effect is not as strong as core innovative outcomes.**	NO[18]	Not Significant
	H2f: Percentage of profits reinvested is more strongly related to higher innovative outcomes in small and medium firms compared to micro firms.	N.A	YES[19]

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[17] For Overall innovative Dynamism

[18] Organizational Innovation related to knowledge management systems

[19] Overall Innovative Dynamism

The study hypothesized broadly that barriers to external resources have a negative relationship with innovative outcomes in MSME.

The results indicate that easier access to traditional finance compared to non-traditional finance is found to increase the likelihood of core innovative outcomes but not non-core innovative outcomes. This reflects the nature of debt financing and asset based lending offered by banks that usually need tangible assets as collateral. Easy access to bank finance therefore increases the likelihood that a firm engages in core innovations. As the results indicate, easier access to traditional finance is negatively related to intangible innovations in marketing and sales.

The lack of core innovative capacity is found to decrease the likelihood of core innovations but significantly increase the likelihood of non-core innovations by firms. Increased barriers related to core innovative inputs are also likely to increase the likelihood of non-core innovative dynamism and overall dynamism of firms. This may imply that firms overcome barriers related to core innovations by undertaking organizational and marketing innovations. It may also imply the presence of unobserved lagged effects, whereby a firm that undertook a core innovation in the previous period is following up with an organizational change or marketing innovation.

Firm size plays a moderating effect between barriers to innovation and innovative outcomes. Access to traditional sources of finance is positively related to the

likelihood of innovative dynamism for firms with more than ten employees. This relationship is reversed and negative in the case of firms with less than ten employees. For larger firms that perceive a lack of core innovative capacity, the likelihood of non-core innovative capacity increases whereas in the case of micro firms, a perceived increase in the lack of core innovative capacity decreases non-core and overall dynamism. This could mean that larger SME that lack core innovative capacity use existing products and processes but engage in better marketing techniques or organizational changes to be competitive in the market. In other words, these firms are currently non-innovative with respect to products and processes but engage in non-core innovations.

Compared to earlier studies on innovation, this study finds that when barriers related to core innovative inputs increases, the likelihood of marketing and organizational innovations increases. This study also finds that this effect is not uniform across firms of all sizes. Firm size plays an important moderating effect between barriers and innovative outcomes. The likelihood that non-core innovations increase when barriers to core innovations are present holds true only for larger firms. With respect to micro firms however, the presence of barriers reduces the likelihood of all types of innovations- core, organizational and marketing. This could be because larger firms that face barriers with respect to core innovations have the capacity to undertake non-core innovations to remain competitive whereas micro-firms lack that capacity. In the presence of unobserved

lagged variables, it could also imply that larger firms that faced barriers had successful core innovations in the previous time period and are following up with related marketing and organizational changes in the current time period. In the case of micro-firms, this could imply that firms that faced barriers in the previous time period were not able to successfully innovate.

All the results discussed above should be considered taking into account some of the limitations of this study. First, this study uses a convenience sample and the results obtained cannot be readily generalized to the population of firms in the region. Also, the nature of biases present cannot be defined or examined readily because of the use of a non-random sampling methodology. Secondly, the responses related to innovations are likely to have subjective biases with respect to how each respondent interpreted the meaning of innovation. Third, since the data concerns only one time period, the issue of endogeneity cannot be resolved using lagged variables.

VI. CONCLUSION

This study focuses on the relationship that resources and access to resources have on different types of innovations introduced by firms of different sizes in a globalized emerging economy. It specifically focuses on micro-firms, which are firms having less than ten full time employees and compares this sector with larger SME. Since emerging market MSME are found to operate in the lower end of the technology spectrum, a distinction was made between core technical innovation and non-core organizational and marketing innovations to understand innovative capacity in these firms. New data was obtained by implementing a primary survey along the lines of the OECD *Oslo Framework* in the Bangalore region in India. The sample consisted of 108 micro, small and medium businesses operating mainly in the engineering industry.

The salient findings of this research study are summarized below:

- Compared to larger SME, micro firms are found to be less dynamic with respect to core, non-core and overall innovative dynamism.

- Easier access to traditional finance is positively related to core, non-core and overall innovative dynamism of larger SME but negatively related to the likelihood of core, non-core and overall innovative dynamism of micro-firms.

- With larger SME, as the lack of core innovative capacity is positively related to non-core and overall innovative dynamism. The effect is opposite in the case of micro firms where the lack of core innovative capacity is negatively related to non-core and overall innovative dynamism.

- The presence of internal resources namely strategic management and percent of profits reinvested are positively related to innovative dynamism in larger SME but have a negative or insignificant relationship in micro-firms.

This study explicitly focuses on micro and small firms comparing innovation and resource utilization by each sector. The findings indicate that the presence of barriers is related to innovative outcomes of firms depending both on the type of innovation as well as on the size of the firm. While previous studies addressing the effect of institutional voids and barriers to innovation find a positive relationship between the presence of barriers and innovative outcomes concluding that firms in these circumstances overcome barriers, this study finds that the barriers related to core innovations are not positively related to core innovative outcomes. The presence of barriers related to core innovative inputs is positively related to non-core and overall innovative dynamism of all the firms in the sample. The study also finds that this relationship is moderated by firm size. Therefore an important implication these findings have for future research is that when addressing barriers

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and innovation, it is important to differentiate between different types of innovations and the effect that barriers have on each type of innovation. Previous studies on innovation also find a positive relationship between access to finance and innovation in firms. This study again distinguishes between micro and small firms and finds that easy access to banks has a positive relationship with innovative outcomes only for larger SME and a negative relationship for innovative outcomes for micro firms. A possible reason for this could be that though micro firms have easier access to bank finance compared to other sources, they are not able (or need) to channel finance from this source towards innovative activities. One inference that may be drawn from this result is that since micro firms are constrained by resources, market position and technology, the provision of bank finance, especially collateral and asset based lending ties these firms to traditional, less risky activities. It also raises further questions regarding the necessity of an optimal capacity or size for firms to be able to benefit from increased access to bank finance. The important implication this research has for policy is that improved access to finance, especially asset based, may only benefit innovation in firms that already possess some innovative capacity.

The findings of this research also support arguments that policy should aim at removing obstacles impeding investment and growth in micro-firms. For example, it has been found that a regressive tax system is detrimental to growth and formalization of the MSME sector and results in a large percentage of MSME

operating in the informal or shadow economy.[20] Firms operating in the informal

economy are in turn found to have reduced business opportunities and growth

potential (IFC 2007). Therefore, reforming a burdensome tax system may not only

encourage tax compliance and growth in the MSME sector, but as this research

shows, it could enable micro-firms to scale up and innovate. Another area of policy

focus is the incentives and subsidies provided to the micro-firm sector. In India, one

of the incentives provided to the micro-firm sector is the itemized reservation

policy, where certain products are reserved to be produced only by small firms.

While these might encourage the inception of micro-firms, they might also

encourage these firms to stay small in order to avail subsides and benefits. Since

there is strong evidence that innovation is positively related to firm size especially

in lower technology sectors, these policies might indirectly impede growth and

innovation in micro-firms.

This study also extends the debate on the role played by strategic management on

firm performance and strategy by focusing on the relationship between the

presence of strategic management personnel and innovative outcomes of MSME.

The findings show that while the presence of strategic management personnel has a

positive relationship with innovative dynamism in larger SME, in the case of micro

firms, no such relationship exists. For micro-firms, an important implication of the

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[20] IFC (2007) Designing a Tax System for Micro and Small Businesses. Available at :
http://www.ifc.org/ifcext/fias.nsf/AttachmentsByTitle/Taxationgrowthandgovernanceprogram_taxt
oolkit/$FILE/Taxtoolkit.pdf

insignificant and negative relationship between resources and innovation is that these firms may be inherently non-innovative because of their technological and market position and may not innovate even when resources are available. This brings up important questions regarding how micro-firms firms survive and compete in a regional economy and whether they are able to scale up or whether they eventually die out. Some evidence of a high mortality rate in this sector can be found in the Indian census of MSME (2002-03). The survey found that nearly 40% of the firms that were registered had ceased operations at the time of the survey, indicating a high mortality rate.

The findings of the study point out to the inherent differences between micro firm and small firm innovation. A number of studies on ESME innovation have pointed out to the technological backwardness and lack of innovative capacity in emerging economy SME (Chaminade 2008, Intarakumnerd 2007). This study finds that compared to SME, the lack of innovative potential is more pronounced in the case of micro-firms. Therefore, policy should treat these two sectors separately when addressing innovation. With respect to the micro-firms, policies should focus on creating incentives to scale up firms and build capacity. Policies should also focus on encouraging technology absorption by SME by incentivizing investments in technology and encouraging collaboration between universities, research labs and indigenous industry. Policies should also focus on filling institutional voids related

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to rule of law and contract enforcement to enable markets to function properly and increase the flow of capital to innovative firms.

The findings of this study are tempered by some of its limitations. First and foremost, the results cannot be generalized readily to the population of MSME operating in any region other than Bangalore because locational factors might impact the results. Secondly, this study is a snap shot and uses data from only one time period. Therefore important effects of lagged variables are omitted. For example, a firm that had a core innovation in the previous time period may only have a marketing innovation in the time period considered by this study. Since this study does not have panel data, these effects are not analyzed despite the firm having undertaken a core innovation. Thirdly, like other innovation studies, several unobserved factors may affect innovative outcomes that are not explicitly included in the regression models. Therefore, this study only highlights the relationships between different constructs and does not attribute causation between innovative outcomes and explanatory variables. Another important limitation of this study is the use of a convenience sample and the resulting biases that arise out of a non-random sampling methodology. Therefore, the results should be interpreted with caution as they may not be representative of the population of firms. Nevertheless, this study uses new data from a sample of 108 firms that sheds light on resources, barriers and their relationships with innovative outcomes. Lastly, a limitation of this data is since the responses are self-reported, they may be biases involving

respondents' understanding and interpretation of innovation, financial information

provided by them and their understanding of specific questions.

Nevertheless, there are important policy implications and questions raised by this

study that pave the way for future research agendas. Since this study employs the

Oslo Framework, it is possible to compare the metrics and innovation measures from

this study to the ones already implemented in Europe and other developed

countries to understand the differences if any. Also, if the firms in this sample are

surveyed in subsequent time periods, the effect of lagged variables can be analyzed

to further understand innovative capacity and potential of MSME. Lastly, the survey

can be expanded to cover other emerging economies so that firms that operate

under similar conditions can be compared.

APPENDIX

i. TABLES

Table 1

Section	Variables
General Information Related to the Firm	☐　　General Information: Industry, Location ☐　　Size and Scale: Value of Assets, Value of Sales, Average Growth Rate, Number of Employees ☐　　Markets: Percentage of revenue from domestic and export oriented sales ☐　　Legal/Corporate Governance: Type of incorporation, presence of external auditor? ☐　　Strategic plans
Innovation Related	☐　　Product/Process Innovation 　　　Whether firm had new product or process 　　　What kind of inputs were used to create this innovation? 　　　What were major sources of financing used? ☐　　Marketing/Organizational Innovation 　　　What kind of marketing/organizational innovation? - Other Policy Relevant Variables -　　　Factors Hampering Innovation -　　　Public Financial Support - Knowledge Networks/Sources of Information for Innovation
Firm Finance	- Major sources of finance used (capital structure) and level of difficulty obtaining finance from each source - Major sources of finance used for working capital - Relationship with financial institutions- type of institution, preferred institution and basis for preference - Rate and term for longest term loan

Table 2

No. FT Employees	Freq.	Percent	Cum.
0 to 9	50	46.73	46.73
10 to 19	23	21.5	68.22
20 to 29	12	11.21	79.44
30 to 39	3	2.8	82.24
40 to 49	3	2.8	85.05
50 to 59	5	4.67	89.72
60 to 69	4	3.74	93.46
70 to 79	1	0.93	94.39
>=100	6	5.61	100
Total	**107**	**100**	

Table 3

	Number of Employees (Descriptive Statistics)			
Type of Business	Mean	Min	Max	Median
Private Limited	74	3	400	20
LLP	19	5	60	13
General Partnership	10	5	15	10
Sole Proprietorship	12	2	70	6

Table 4

Regions	Number of firms receiving at least some portion of revenue from said region:	Percentage of Sample receiving at least some portion of revenue from said region:
Revenue from Bangalore	108	100%
Revenue from Rest of State (Karnataka)	37	34.25%
Revenue from Rest of India	19	17.59%
Revenue from Outside India	9	8.33%

Table 5

	Percentage of Total Sales (Descriptive Statistics)			
Region	Mean(%)	Median (%)	Min (%)	Max (%)
Bangalore	81.81	100	20	100
Rest of State	11.30	0	0	70
Rest of India	4.91	0	0	50
Outside India	1.99	0	0	50

Table 6

IF Revenue From:	No. of Firms	Sales Revenue			
		Mean (%)	Median	Min (%)	Max (%)
Rest of State>0	37	32.97	30	10	70
Rest of India >0	19	27.89	30	10	50
Outside India>0	9	23.89	25	5	50

Table 7

% Rev from Bangalore	No. of Firms	Number of Full Time Employees			
		Mean	Median	Min	Max
0-25%	6	17.33	17.5	11	23
26-50%	18	65.61	40	5	400
51-75%	12	64.08	9	3	300
76-100%	71	13.37	7	2	60
Total	107	28.07	10	2	400

Table 8

# of Employees	Frequency (# of	%	Cum. %	%
Firms with no Sales outside Bangalore				**Full Sample**
0-9	42	60.87	60.87	46.3
10 to 19	12	17.39	78.26	21.3
20-29	8	11.59	89.86	11.11
30-39	2	2.9	92.75	2.78
40-49	1	1.45	94.2	2.78
50-59	3	4.35	98.55	4.63
60-69	1	1.45	100	3.7
Total	**69**	**100**		

Table 9

Factors Hampering Innovative Activities:

		Importance of factors hampering innovation- (Percentage of Firms that identified how important each factor was)			
		High	Medium	Low	Not Faced
Cost Factors	Lack of funds within	34.29%	53.33%	11.43%	<1%
	Lack of funds outside	15.24%	51.43%	30.48%	2.86%
	Innovation costs high	45.19%	42.31%	9.62%	2.88%
Knowledge Factors	Lack qualified personnel	24.76%	66.67%	5.71%	2.86%
	Lack of I.T	20.00%	58.10%	19.05%	2.86%
	Lack of information on markets	20.19%	54.81%	22.12%	2.88%
	Difficulty finding partners	23.30%	24.27%	36.89%	15.53%
Market Factors	Market dominated by established enterprises	59.05%	26.67%	10.48%	3.81%
	Uncertain demand for innovation	19.23%	62.50%	13.46%	4.81%
Reasons not to Innovate	No need due to prior innovations	29.52%	46.67%	16.19%	7.62%
	No demand innovation	22.86%	53.33%	17.14%	6.67%

Table 10

Sources	Percentage of firms identifying level of difficulty in obtaining finance from listed sources		
	Very Difficult	Somewhat Difficult	Not Difficult
Own/Business Partners' Money	7.62	15.24	77.14
Family	2.94	66.67	30.39
Friends	28.16	65.05	6.80
Angel	82.69	15.38	1.92
Venture Capital	83.65	13.46	2.88
Public Sector Banks	19.05	71.43	9.52
Private Sector Banks	44.76	51.43	3.81
Finance Companies	66.35	28.85	4.81
Development Agencies	57.69	37.50	4.81

Table 11

Type of Innovation	Percentage of Firms Undertaking Innovation	Number of firms undertaking innovation
New or significantly improved goods	25.96%	27
New or significantly improved services	23.07%	24
Process- Methods of Manufacturing	24.76%	26
Process- Distribution methods	23.07%	24
Process- Supporting systems/activities	20.20%	20
Organization- Information/Knowledge management systems	42.31%	44
Organization- Management structure	31.73%	33
Organization- PR/external relations	34.62%	36
Marketing- Design/Packaging	41.35%	43
Marketing- Sales/franchising	36.54%	38

Table 12

Number of Core Innovations	Distribution_Core	Number of Non-Core Innovations	Distribution_Non-Core
0	64	0	45
1	6	1	9
2	5	2	11
3	6	3	10
4	6	4	12
5	10	5	17

Table 13

	Innovative	Non-Innovative
Number of firms in sample with less than 20 employees	19	54
Average Number of Employees per firm (Very large firms removed)	23.21*	12.45*
Export Characteristics (Mean % of total revenue obtained from sales within Bangalore)	69.24%*	90.07%*
Number of firms incorporated as Private Ltd Companies	16	9
Average Age	19.87	18.50
Percentage of Profits Reinvested in a typical year	19.28%***	14.52%***

*Classical test of hypotheses- t-test comparing means between groups significant at 1% level of significance.
*** Classical test of hypotheses- t-test comparing means between groups significant at 10% level of significance.

Table 14

Regression results for logit models.

	Model 1 Organizational (Knowledge Mgt Systems)	Model 2 Organizational Management Changes	Model 3 Marketing Sales	Model 4 Core Innovation	Model 5 Non-Core Innovation	Model 6 Overall Innovation
Independent Variables						
Emplys_FT	1.449***	1.723***	1.482**	1.274*	1.535***	1.585***
	(0.181)	(0.335)	(0.255)	(0.165)	(0.221)	(0.242)
Emplys_FT^2	0.9949**	0.993**	0.9932	0.997	0.994***	0.993***
	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
% profit_Reinvst	0.9289*	1.012	0.967	1.052	0.943	0.985
	(0.041)	(0.046)	(0.044)	(0.059)	(0.043)	(0.048)
Emplys_StrMgt	17.25**	18.65**	3.944	11.645*	8.483*	20.511**
	(21.757)	(26.931)	(4.666)	(15.521)	(10.706)	(29.803)
PctSales_inBlore	1.045*	1.043	1.074**	0.991	1.074***	1.075**
	(0.025)	(0.030)	(0.033)	(0.025)	(0.029)	(0.031)
Barrier_TradFirmfinance	0.571	0.3176	0.3116*	4.072*	0.848	0.599
	(0.302)	(0.223)	(0.219)	(3.316)	(0.484)	(0.365)
Barrier_NoInnovCapacit	3.478	11.61**	6.583*	0.582	1.318	1.191
	(2.727)	(12.383)	(6.485)	(0.464)	(0.868)	(0.792)
Barrier_InnovInputs	1.264	1.471	8.503**	2.516	2.355	2.555
	(0.743)	(1.025)	(7.236)	(1.668)	(1.696)	(1.901)
Constant	0.0035**	0.0002**	0.0001**	0.148	0.00033**	0.000134**
	(0.010)	(0.001)	(0.001)	(0.379)	(0.001)	(0.000)
LR Chi_sq	30.23	31.31	30.97	33.17	30.70	34.94
Prob>chi_sq	0.0168	0.0123	0.0136	0.007	0.0147	0.004
Pseudo_R2	0.3661	0.4377	0.3986	0.4298	0.3766	0.4232
Log Likelihood	-26.172189	-20.109443		-22.00572	-25.403	-23.8125
F Test-ChiSquare (df)	3.84 (3)	5.79 (3)	8.12 (3)**	3.68 (3)	1.93 (3)	2.80 (3)

*** Significant at 1% level of significance
** Significant at 5% level of significance
* Significant at 10% level of significance
   Only firms with full time employees less than 150 were included in the regressions to exclude outliers.
 - Results not shown for control variables

Table 15
Regression results for ordered logit models.

Independent Variables	Core Innovative Index Model 7	Non-Core Innovative Index Model 8	Overall Innovative Dynamism Model 9
Emplys_FT	1.221*	1.308***	1.283***
	(0.145)	(0.106)	(0.104)
Emplys_FT^2	0.999	0.996***	0.997**
	(0.002)	(0.001)	(0.001)
%profit_Reinvst	1.045	0.950	0.965
	(0.047)	(0.033)	(0.031)
Emplys_StrMgt	12.727**	6.952**	11.646**
	(15.970)	(6.271)	(11.060)
PctSales_inBlore	0.974	1.0403**	1.028
	(0.022)	(0.018)	(0.017)
Barrier_TradFirmfinance	5.746**	0.759	1.122
	(4.374)	(0.313)	(0.463)
Barrier_NoInnovCapacity	0.875	2.518*	2.115
	(0.606)	(1.302)	(1.095)
Barrier_InnovInputs	1.485	2.154**	2.112*
	(0.815)	(0.842)	(0.812)
LR Chi_sq	41.050	31.1	34.03
Prob>chi_sq	0.001	0.0131	0.0054
Pseudo_R2	0.312	0.1618	0.1568
Log Likelihood	-45.239	-80.571614	-91.473412
F Test- ChiSquare (df)	5.29 (3)	8.87 (3)**	6.65 (3)*

*** Significant at 1% level of significance
** Significant at 5% level of significance
* Significant at 10% level of significance
     Only firms with full time employees less than 150 were included in the regressions to exclude outliers.
Results not shown for control variables

Table 16
Robust regression Results for Interaction Effects:

Independent Variables	Core Innovation Index Model 10	Non-Core Innovation index Model 11	Overall Innovative Dynamism Model 12	Non-Core innovative index Model 13	Overall Innovative Dynamism Model 14
MICROFIRM	-1.29***	-2.289***	-3.727***	-0.096	-1.338
	(0.447)	(0.523)	(0.825)	(1.312)	(2.038)
% profit_Reinvst	0.0242	-0.0407	-0.0018	0.095	0.093
	(0.019)	(0.025)	(0.039)	(0.069)	(0.108)
Emplys_StrMgt	1.16**	1.013	1.572	1.422	3.724**
	(0.566)	(0.647)	(1.050)	(1.017)	(1.580)
PctSales_inBlore	-0.0153	0.014	-0.0078	0.010	0.007
	(0.010)	(0.012)	(0.019)	(0.014)	(0.022)
Barrier_TradFirmfinance	0.7731**	0.221	1.116*	-0.474	-0.067
	(0.346)	(0.401)	(0.633)	(0.355)	(0.554)
Barrier_NoInnovCapacity	0.515	1.011*	1.495*	0.326	0.268
	(0.483)	(0.558)	(0.881)	(0.437)	(0.680)
Barrier_InnovInputs	-0.1106	0.6022	0.593	0.355	0.568
	(0.337)	(0.391)	(0.616)	(0.358)	(0.559)
Microfirm*Barrier_TradFinance	-0.8606*	-1.775***	-2.425**		
	(0.493)	(0.589)	(0.926)		
Microfirm*NoInnovCapacity	-1.154**	-1.20*	-2.598**		
	(0.539)	(0.622)	(0.984)		
Microfirm*InnovInputs	0.5454	-0.713	0.1384		
	(0.591)	(0.687)	(1.084)		
Microfirm*STRMGT				-0.011	-3.056
				(1.538)	(2.492)
Microfirm*PCTPROFIT				-0.133*	-0.088
				(0.074)	(0.116)
Const	3.66***	2.991**	7.412***	1.474	3.449
	(1.163)	(1.352)	(2.125)	(1.707)	(2.662)
F	3.81	4.14	5.03	2.358	2.508
Prob>F	0.0002	0.0001	0	0.0106	0.0076

*** Significant at 1% level of significance
** Significant at 5% level of significance
* Significant at 10% level of significance
Results not shown for control variables
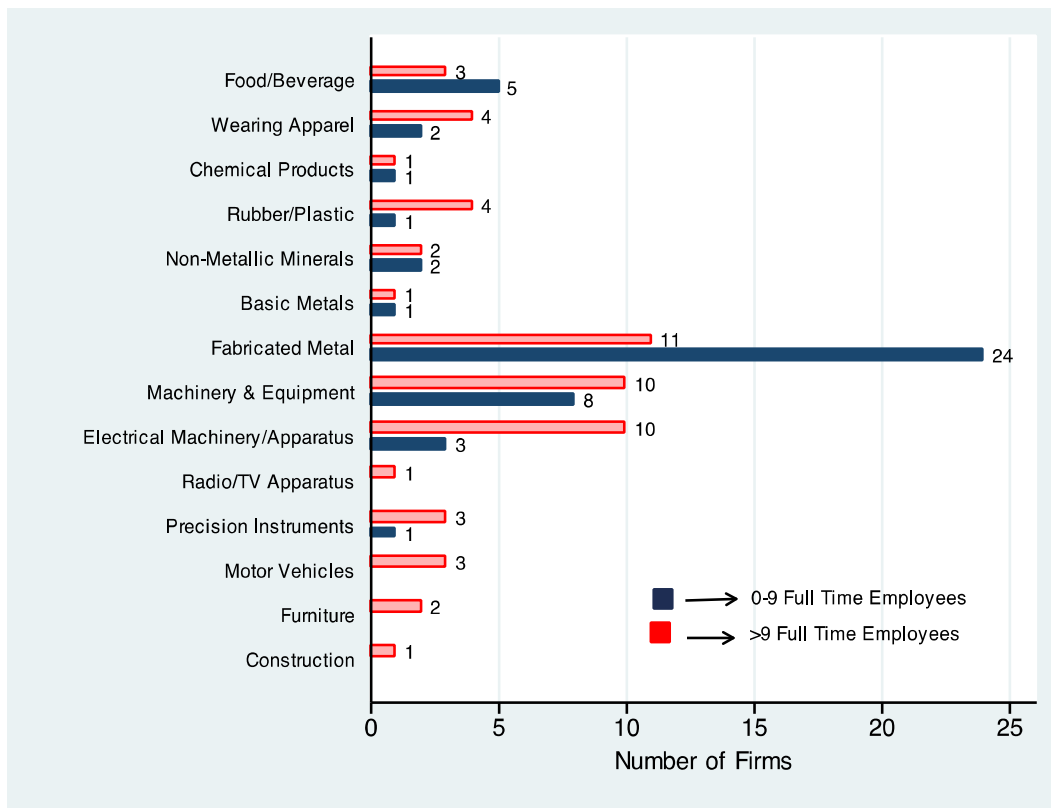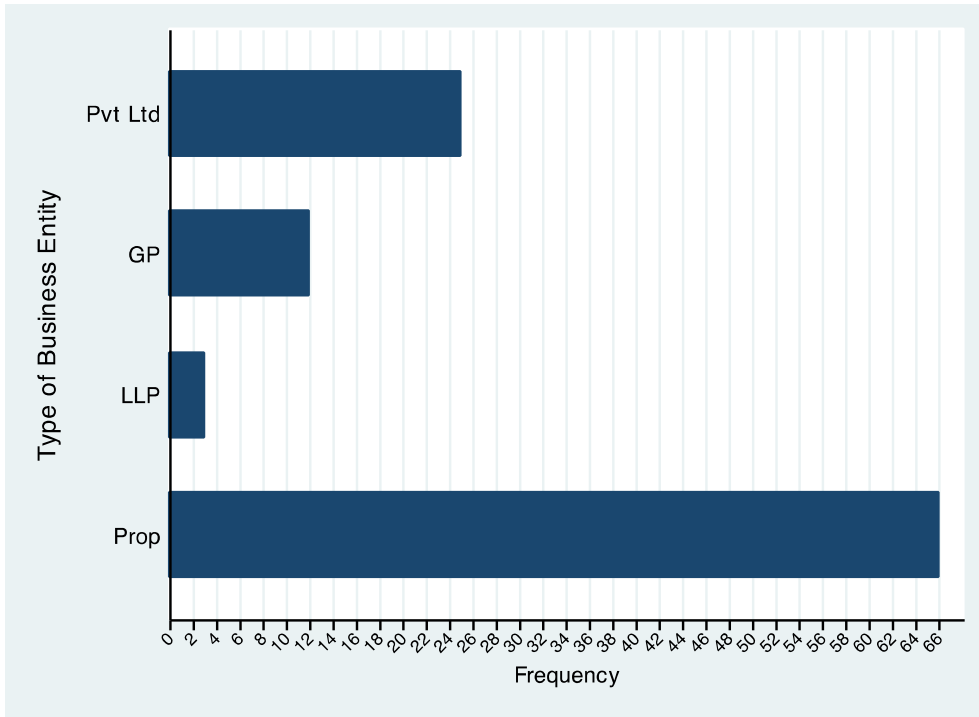
ii.   FIGURES
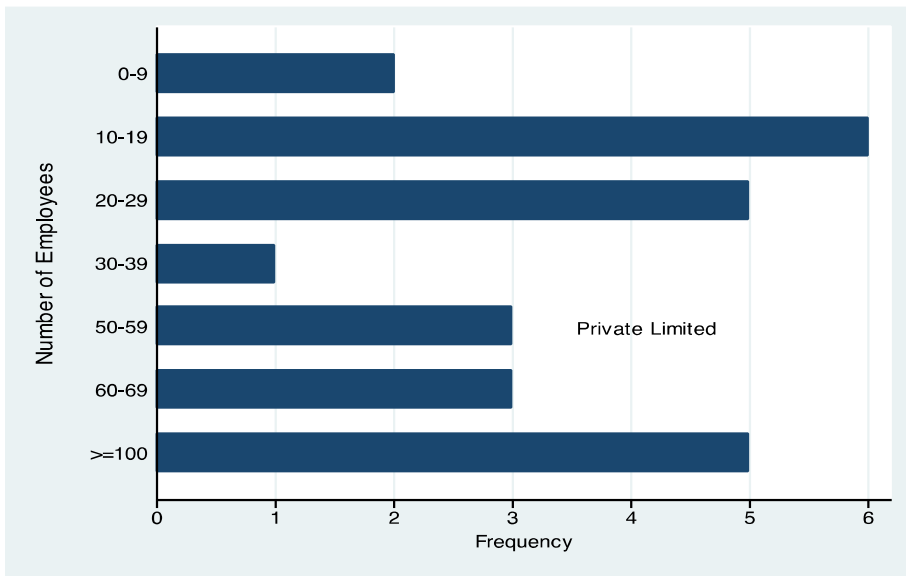
Figure 1
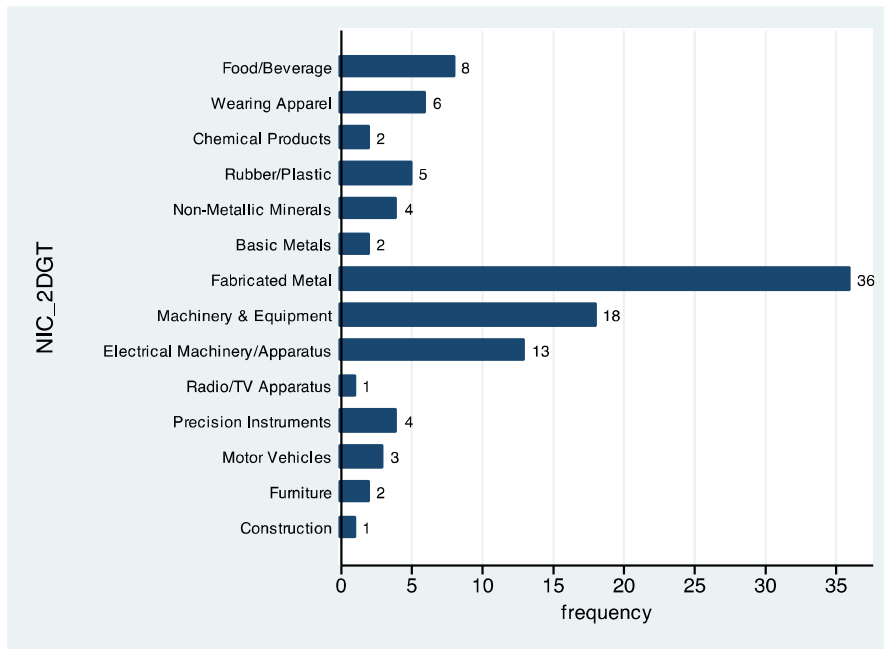
Figure 2

Figure 3

Figure 4
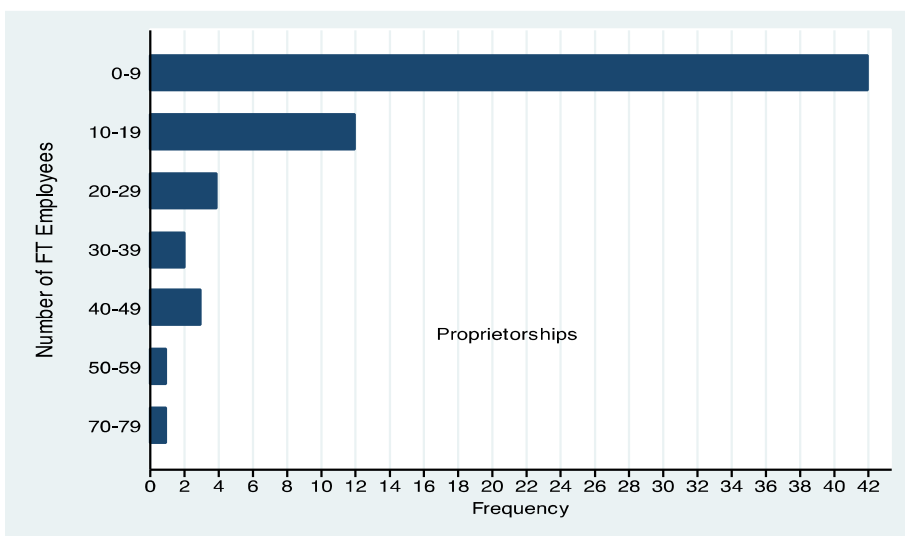
Figure 5

Figure 6

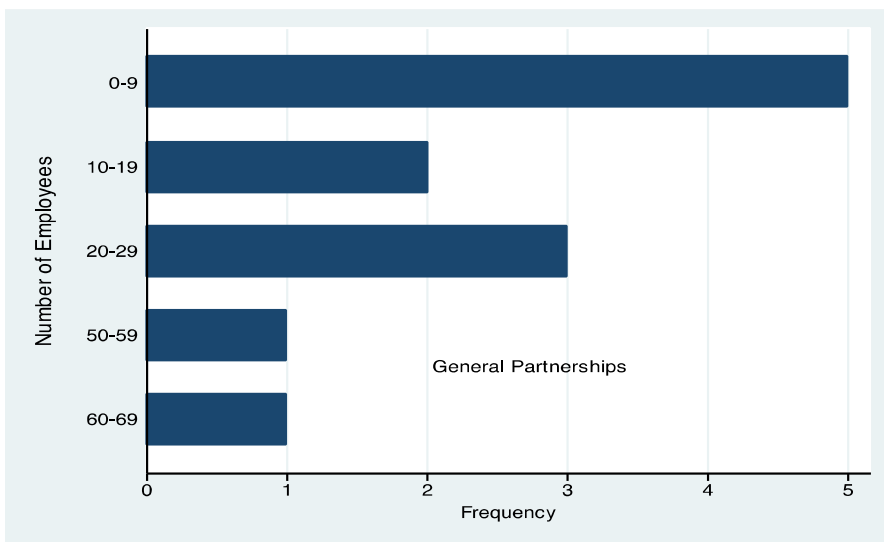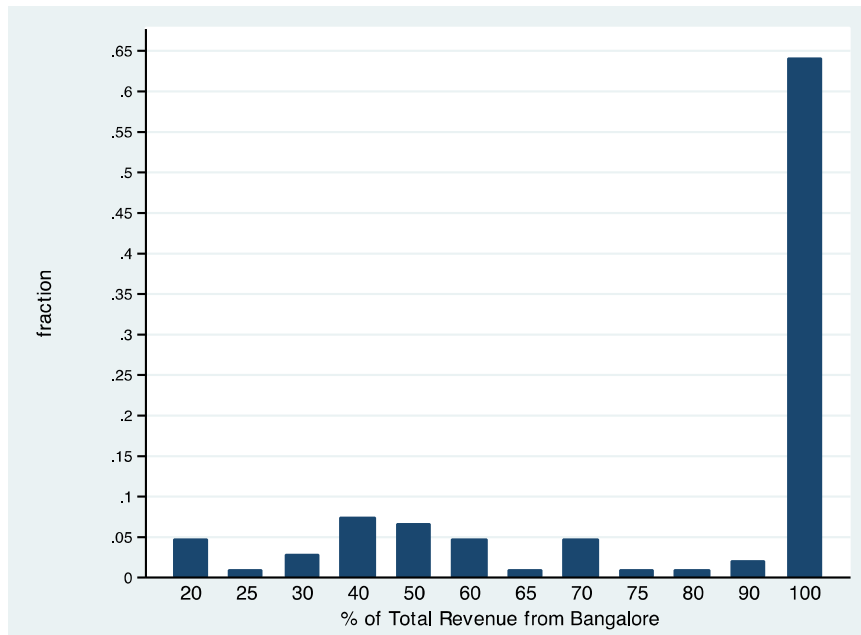**Figure 7**

c. Thank you for taking the time to answer this survey. Your responses will be an important contribution to understanding how public policy can better address the concerns of the Indian entrepreneur. This research will to bring to light the challenges and bottlenecks faced by business owners and entrepreneurs in Bangalore.

d.

Your responses and contact information are strictly confidential. This survey is only for academic research purposes. Your identity and any other information you provide will not be shared with any third party or government agency. At no time will you or your firm be identified by name, address or any other information and be associated to the responses you provide on this survey.

The survey has three parts and includes questions about the firm, firm level innovation and access to finance for your firm. Your participation in the survey is voluntary and you can skip any question you do not want to answer. Some questions will take you just a few seconds whereas some others may take a little longer. The whole survey is expected to take about 30 minutes to complete. Your candid answers are greatly appreciated.

e. Any suggestions and inputs you might have are welcome and will greatly help in broadening the understanding of issues involved.

Thank you again for choosing to be a part of this research.

f. Contact Information

Personal e-mail of respondent   : _____

Job Title/Designation: _____

(If you do not have an e-mail address, please provide your telephone number)

Telephone Number: (Office)   _____   (Mobile) _____

Job Title of Respondent _____

iv. **(Your e-mail or telephone number will not be shared, distributed or sold to any third party. It is requested so that we may contact you in the event of any questions and for sending you the summary of results.)**

v.

1. <u>FIRM CHARACTERISTICS</u>

1.1) **Describe the major product or service offered by your firm.**

    1.1.A. What is your enterprise's major competitive advantage?

1.2) **Last year, what was the mix of sales among major products, services or product lines as <u>percentage</u> *<u>of firm income</u>*? *(Please note the percentages add up to 100%)***

i. **Product Name**	**Percentage**
Product 1 ------------------------	----------- (%)
Product 2 ------------------------	----------- (%)
All Others ------------------------	----------- (%)
ii. Service Name	**Percentage**
Service 1 ------------------------	----------- (%)
Service 2 ------------------------	----------- (%)
All Others ------------------------	----------- (%)
Total	***100*** **(%)**

1.3) **Value of Total Assets in previous financial year:** **-------Rupees**

1.4) Value of total sales in the previous financial year?
------------------ **Rupees**

1.5) Average growth rate of net income over the last 3 years?
|_|_|_| **(%)**

1.6) Last year, what percentage of revenue was received from all customers (individuals and other businesses) residing in the following regions?

Bangalore	|_|_|_| (%)
Rest of Karnataka	|_|_|_| (%)
Rest of India	|_|_|_| (%)
Outside India	|_|_|_| (%)
Total	*100 (%)*

1.7) Number of employees in your enterprise:

- Fulltime _____
- Part time _____
- Consultant/Sub-contractors _____

1.7. A. Does your firm have employees dedicated to strategic management planning?

If 'Yes' Please specify number of employees dedicated to strategic management planning: ------------------

1.8) Is your firm registered with the Registrar of Firms/Companies?

1.8. A. Year in which your firm was registered: |_|_|_|_|

1.8. B. The legal entity of your firm is:

☐ Private Limited Company
☐ Public Limited Company

☐Co-operative enterprise
☐General Partnership
☐Limited Partnership
☐Joint Venture
☐Individually owned/Proprietorship
☐Others (Please specify) _____

1.9) **Does your firm have an external auditor? Yes/No**

1.10) **What are your enterprise's strategic plans for the next 2-3 years? (Please select all that apply)**

☐Introduce new products or services
☐Change the mix of products or services
☐Expand existing production
☐Relocation of firm
☐Get out of business
☐No major changes

1.11) **How many branches does your firm have (exclude headquarters)? ------**

Where are the branches located? ----------------------------------

2. Innovation:

The following questions are aimed at understanding the nature of innovation in your firm.

2.1 PRODUCT INNOVATION

o Means introduction of **new or significantly improved** goods or services by your enterprise.
o Must be new to your enterprise but need not be new to your sector or market.
o Does not matter who developed these innovations.

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During the three years 2007-2009, did your enterprise introduce?

- New or significantly improved goods? **Yes/No**

- New or significantly improved services? **Yes/No**

IF 'NO' TO BOTH, SKIP TO NEXT PAGE

A. Who developed these innovations? (Select most appropriate option only)
- **-** Mainly your enterprise or enterprise group ☐
- - Your enterprise together with other enterprises /institutions ☐
- - Mainly other enterprises or institutions ☐

B. Were any of the goods or service innovations during the three years 2007-2009:

- ▪ **New to your market?** (Your enterprise introduced innovation in your market before your competitors did) **Yes/No**

- ▪ **New to your firm?** (Innovation new to your enterprise but already available in your market) **Yes/No**

C. What was the percentage of total turnover to your enterprise in 2009 from goods or services that were:

Unchanged or only marginally modified
during 2007-2009|_|_|_| **(%)**

Introduced new to your firm during 2007-2009 |_|_|_| **(%)**

Introduced new to your market during 2007-2009|_|_|_| **(%)**

Total 100%

2.2 PROCESS INNOVATION

- Implementation of new/significantly improved **production process/distribution method/support activity** for your goods or services.
- Must be **new to your enterprise** but need not be new to your market
- Does not matter who developed the process.
- Exclude purely organizational innovations (ex. Reorganization of workforce)

During the three years 2007-2009, did your firm introduce:

- New or significantly improved **methods of manufacturing or producing** goods or services? **Yes/No**

- New or significantly improved logistics, delivery or distribution methods for inputs, goods or services? **Yes/No**

- New or significantly improved supporting activities for your processes such as maintenance systems or operations for purchasing, accounting or computing? **Yes/No**

IF 'NO' TO ALL OPTIONS, GO TO 2.3, OTHERWISE ANSWER SUB-SECTION BELOW

A. **Who developed these innovations? (Select most appropriate option only)**
Mainly your enterprise or enterprise group ☐
Your enterprise together with other enterprises/institutions ☐
Mainly other enterprises or institutions ☐

2.3 ONGOING OR ABANDONED INNOVATIVE ACTIVITIES:

- Include acquisition of machinery, equipment, software and licenses, engineering and development work, training, marketing and R&D

- Undertaken specifically to develop/implement a product or process innovation

2.3. A. Did your enterprise have any activities to develop product or

process innovations that were **abandoned** during 2007-2009?

2.3. B. Does your enterprise have any innovation activities
ongoing during 2009?

*IF YOU DID NOT HAVE **ANY** PRODUCT OR PROCESS INNOVATIVE*
ACTIVITIES DURING 2007-2009, SKIP TO PAGE 9, QUESTION 2.7

2.4 EXPENDITURES ON INNOVATIVE ACTIVITIES

During the years 2007-2009, did your enterprise engage in the following innovation activities?

A. **In-house R&D?** (Creative work undertaken **within your organization** to develop new and improved products and processes) **Yes/No**

If 'Yes', estimate expense in year

2007	2008	2009

B. **External R&D?** (Same as above but performed by other companies/institutions and purchased by your enterprise) **Yes/No**

If 'Yes', estimate expense in year

2007	2008	2009

C. **Training?** (Internal/External training of personnel specifically for development or introduction of new or significantly improved products/processes) **Yes/No**

D. **Market introduction of innovations** (Including market research and launch advertising) **Yes/No**

E. **Acquisition of other external knowledge** (Ex. Licensing of patents and non-patented inventions, know-how and other types of knowledge from other enterprises or organizations) **Yes/No**

If 'Yes', estimate expense in year

2007	2008	2009

F. Acquisition of machinery, equipment and software (Advanced machinery, equipment and computer hardware or software to produce new or significantly improved products or processes) **Yes/No**

If 'Yes', estimate expense in year

2007	2008	2009

G. Other Preparations (Procedures and technical preparations to implement new or significantly improved products and processes not covered elsewhere) **Yes/No**

2.5 ACCESS TO FINANCE FOR INNOVATION

A. For <u>your most major innovative activity</u>, what percentage of financing did you obtain from EACH of these sources?

                                                                           Nil

- Personal money (Savings, part time work etc) |_|_|_| (%) ☐

- Friends and Family |_|_|_| (%) ☐

- Reinvest Cash Flow from Firm |_|_|_| (%) ☐

- Angel Investors |_|_|_| (%) ☐

- Venture Capital |_|_|_| (%) ☐

- Payment from Customers in Advance |_|_|_| (%) ☐

- Inputs/materials from Suppliers on Credit |_|_|_| (%) ☐

- Banks |_|_|_| (%) ☐

Did this include owner's/partner's personal loans?

☐ Mostly ☐ Partly ☐ No

- Non Bank Finance Companies |_|_|_| (%)   ☐

Did this include owner's/partner's personal loans? ☐ Mostly ☐ Partly ☐ No

- Developmental Agencies/Lenders (SIDBI, SFC) |_|_|_| (%)   ☐

- Other (Please Specify) ------------------------------ |_|_|_| (%)   ☐

B. **Did you receive any public financial support for innovation activities from local/state or central government authorities?**
(Including financial support via tax credits, deductions, grants, subsidised loans and loan guarantees?)

If 'Yes', please specify source and purpose--------

2.6 SOURCES OF INFORMATION AND CO-OPERATION FOR INNOVATIVE ACTIVITIES

How important were each of the following information sources to your enterprise's innovation? Please identify information sources that provided information for new innovation projects or contributed to the completion of existing innovation projects.

		High	Med	Low	Not
	Information Source				
Internal	-Within your enterprise or enterprise group	☐	☐	☐	☐

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Market Sources	-Suppliers of equipment, materials, components etc	☐	☐	☐	☐
	-Clients or Customers	☐	☐	☐	☐
	-Competitors or other enterprises in your sector	☐	☐	☐	☐
	-Consultants/Commercial labs/ Private R&D Institutes	☐	☐	☐	☐
Institutional **Sources**	-Universities or higher education institutions	☐	☐	☐	☐
	-Government or public research institutes	☐	☐	☐	☐
Other Sources	-Conferences, trade fairs, exhibitions	☐	☐	☐	☐
	-Scientific journals and trade/ technical publications	☐	☐	☐	☐
	-Professional or industry associations	☐	☐	☐	☐

TO BE ANSWERED BY ALL ENTERPRISES

2.7 FACTORS HAMPERING INNOVATION:

A. During the years 2007-2009, how important were each of these factors in hampering your innovation activities or projects or influencing a decision not to innovate?

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		High	**Med**	**Low**	**Not**
Cost Factors	Lack of funds within your enterprise	☐	☐	☐	☐
	Lack of finance from outside your enterprise	☐	☐	☐	☐
	Innovation costs too high	☐	☐	☐	☐
Knowledge Factors	Lack of qualified personnel	☐	☐	☐	☐
	Lack of information on technology	☐	☐	☐	☐
	Lack of information on markets	☐	☐	☐	☐
	Difficulty in finding cooperation partners for innovation	☐	☐	☐	☐
Market factors	Market dominated by established enterprises	☐	☐	☐	☐
	Uncertain demand for innovative goods or services	☐	☐	☐	☐
Reasons not to innovate	No need due to prior innovations	☐	☐	☐	☐
	No need because of no demand for innovation	☐	☐	☐	☐

g. **B. Have there been any projects delayed, abandoned or non-started because of the following reasons? (Please select ALL that apply).**

☐ No Source of Finance
☐ Financing too slow
☐ Cost of Finance too High
☐ *None of the above*

2.8 INTELLECTUAL PROPERTY RIGHTS

During the three years 2007-2009, did your enterprise

Yes **No**

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Apply for a patent   ☐ ☐
Register an industrial design   ☐ ☐
Register a trademark   ☐ ☐
Claim Copyright   ☐ ☐

2.9 ORGANIZATIONAL AND MARKETING INNOVATIONS

- **Organizational Innovation**- New or significant changes in firm structure or management methods to improve quality or goods/services or efficiency.

- **Marketing Innovation-** New or significantly improved designs or sales methods to increase the appeal of your goods and services or to enter new markets.

A. ORGANIZATIONAL INNOVATIONS:

During the three years 2007-2009, did your enterprise introduce the following organizational innovations?

- New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your enterprise:
Yes ☐   **No** ☐

- Major change in the organization of your enterprise, such as changes in management structure   or integrating different departments or activities:
Yes ☐   **No** ☐

- New or significant changes in your relationships with other
- firms or public institutions, such as through alliances, partnerships,
- outsourcing or sub-contracting: **Yes** ☐   **No** ☐

B. MARKETING INNOVATIONS

- Significant changes to design /
  packaging of a good of service: **Yes** ☐   **No** ☐

- New or significantly changed sales or distribution methods, such
  as internet sales, franchising, direct sales or distribution
  licenses: **Yes** ☐   **No** ☐

3. Financial Markets and Access to Finance:

This section addresses an important policy concern, which is access to finance for the firm and the role played by financial markets, government and other financial institutions to support entrepreneurs.

3.1 Please identify the major sources from which your firm has obtained financing. If your firm has raised financing from a particular source, what percentage of total financing (or total assets) did this particular source contribute?

Source	Whether Used?		Percentage of Source to Total Assets
	Yes	No	
Own/Business Partners' Money (include personal loans, credit cards)	☐	☐	
Family	☐	☐	
Friends	☐	☐	
Angel Investors	☐	☐	
Venture Capital	☐	☐	
Public Sector Banks	☐	☐	
Private Sector Banks	☐	☐	
Finance Companies	☐	☐	
Development agencies (SIDBI, IDBI, SFC)	☐	☐	

Total = 100%

3.2 How difficult is it for your enterprise to obtain funds from the following sources?

Sources	How difficult is it to use debt from this source?		
	Very	Some-What	Not
Own/Business Partners' Money (include personal loans, credit cards)	3☐	2☐	1☐
Family	3☐	2☐	1☐
Friends	3☐	2☐	1☐
Angel Investors	3☐	2☐	1☐
Venture Capital	3☐	2☐	1☐
Public Sector Banks	3☐	2☐	1☐
Private Sector Banks	3☐	2☐	1☐
Finance Companies	3☐	2☐	1☐
Development agencies (SIDBI, IDBI)	3☐	2☐	1☐

3.3 SOURCES OF FINANCE FOR WORKING CAPITAL

Identify major sources from which your enterprise obtains working capital.

		Yes	No
Lines of Credit From:	Public Sector Banks	☐	☐
	Private Sector Banks/Finance Companies	☐	☐
Term Loans From:	Public Sector Banks	☐	☐
	Private Sector Banks/Finance Companies	☐	☐
Trade/Supplier Credit	-	☐	☐

Profits from Firm	-	☐	☐
Personal Credit Cards/Savings	-	☐	☐
Friends and Family		☐	☐

3.4 RELATIONSHIP WITH FINANCIAL INSTITUTIONS

How many banks or other financial institutions currently have outstanding loans to your enterprise? (Please give number) --------------

3.4. A. Which type of financial institutions are they (select all that apply)?

Public Sector Banks ☐
Private Banks ☐
Finance Companies ☐
Development Agencies like SIDBI/SFC ☐
Others (Please Specify) ----------------------------- ☐

3.4. B. If you have a choice, which of the following institutions would you most prefer to borrow from? (Select your three most preferred using '1' for your most preferred, 2 for second most preferred and so forth)

Public Sector Banks ☐
Private Banks ☐
Finance Companies ☐
Development Agencies like SIDBI/SFC ☐
Others (Please Specify) ----------------------------- ☐

3.4. C. On what basis do you choose financial institutions? (Select top three reasons using 1 for most important, 2 for second most important and so on)

Interest Cost ☐
Good repayment terms ☐
Relationship history with institution ☐

Personal connections with lending officer ☐
Geographic proximity ☐
Special schemes for your enterprise/industry ☐
Others (Please Specify) ☐

3.4. D. For the last long term loan your enterprise obtained, what was the
- Rate of Interest ＿＿＿ (%)
- Term of Loan ＿＿＿ Years

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BIBLIOGRAPHY

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