

PAPERS on Economics & Evolution



MAX-PLANCK-GESELLSCHAFT

0804

**Past Experience, Cognitive Frames, and
Entrepreneurship: Some Econometric Evidence
from the Indian Pharmaceutical Industry**

by

**Saradindu Bhaduri
Hagen Worch**

The *Papers on Economics and Evolution* are edited by the
Evolutionary Economics Group, MPI Jena. For editorial correspondence,
please contact: evopapers@econ.mpg.de

ISSN 1430-4716

© by the author

Max Planck Institute of Economics
Evolutionary Economics Group
Kahlaische Str. 10
07745 Jena, Germany
Fax: ++49-3641-686868

Past Experience, Cognitive Frames, and Entrepreneurship: Some Econometric Evidence from the Indian Pharmaceutical Industry

Saradindu Bhaduri^a, Hagen Worch^{b}*

^a Centre for Studies in Science Policy, School of Social Sciences, Jawaharlal Nehru University, New Delhi 110067, India, E-Mail: saradindu@mail.jnu.ac.in

^b Cirus – Innovation Research in Utility Sectors, Eawag – Swiss Federal Institute of Aquatic Science and Technology, Überlandstrasse 133, P.O. Box 611, 8600 Dübendorf, Switzerland, E-Mail: hagen.worch@eawag.ch

Abstract: *The theoretical literature identifies three important entrepreneurial dimensions, namely discovering new opportunities, responsiveness to uncertainty, and coordination of a firm. In the empirical literature, past experience has been identified as having an important influence on organizational behavior. This literature, however, focuses predominantly on the impact of experience on new opportunities using a resource-based view and human capital perspective. In contrast, we draw upon the cognitive science literature to argue that past experience shapes an entrepreneur's cognitive frame, and, hence, influences entrepreneurship in a more holistic manner. We provide econometric evidence of the impact of past experience on all three entrepreneurial dimensions from the small scale Indian pharmaceutical enterprises.*

JEL: L26, M10, D83

Keywords: Entrepreneurship, Past experience, Cognition, Information and knowledge, Indian pharmaceutical industry

* Corresponding author

Acknowledgement: The data used in this paper are part of a dataset collected during a project at the Indian Institute of Technology, Delhi, sponsored by the Department of Science and Technology, Government of India. We are most grateful to all members of the research team for their valuable inputs during the preparation of the questionnaire and data collection. We also gratefully acknowledge their kind permission to use the data for the present study. Suman Biswas and Apurba Dey gave insightful comments on Indian corporate laws on ownership. We had thought provoking discussions with Brian Loasby and Ulrich Witt. Thomas Brenner, Guido Buenstorf, Christian Cordes, Giorgio Fagiolo, Dirk Fornahl, David Hsu and Victor Slavtchev gave important suggestions.

1. Introduction

Despite an early reference to the important role of human cognition in influencing entrepreneurship, an in-depth analysis of the cognitive processes underlying the various aspects of entrepreneurial activities has largely remained neglected (Witt, 1998). Recently, some studies have emphasized that perceiving a business idea, and conceptualizing the ways and means to implement it depends crucially on entrepreneurial imagination (Langlois (1997), Witt, 1998, Nooteboom, 2000, Wuyts et al., 2005). We extend this line of research by attempting to understand the cognitive process by which past experience and prior learning influence entrepreneurial behavior.

The commonly prevailed explanation for the influence of past experiences and education on entrepreneurship (Shane, 2000, 2003; for a review see Helfat and Lieberman, 2002), largely takes a resource-based perspectives, where the areas and themes of future endeavours of an entrepreneur are shaped by the various forms of social and human capital accumulated in the past (Helfat and Lieberman, 2002).¹ Beside the more general form of human capital denoting, for instance, literacy rates, there is firm- and industry-specific human capital, which is accumulated through on-the-job training and educational background (Becker, 1964). A more recent concept in this literature is the task-specific human capital (Gibbons and Waldman, 2004, 2006). This literature points out that task-specific human capital, rather than firm- and industry-specific human capital, is more important for determining employment trajectories. This new development is, however, yet to find a place in the literature on past experience and entrepreneurship.²

Much of the literature on past experience and entrepreneurship has analyzed how past experience exerts influence on new entrepreneurial opportunities. However, the conventional

¹ See Becker (1964) for the pioneering work on human capital. Notably, however, the resource based theories of firm and entrepreneurship does not always explicitly refer to this literature.

² One possible exception is Buenstorf and Fornahl (2006) providing empirical evidence of how past experience influences the thematic areas of new entrepreneurial ventures. However, there is no explicit reference to the literature on task-specific human capital.

literature on entrepreneurship does not confine its attention only to the dimension of new opportunities. Besides being creative to explore new dis-equilibrating opportunities (Schumpeter, 1934), an entrepreneur is also expected to show alertness to new information (Kirzner, 1973), judge uncertainty (Knight, 1921), and decide on how to coordinate a firm (Coase, 1937, Hirschman, 1958, Witt, 1998). One may wonder whether the reason for such disproportionate attention to the dimension of new opportunities, neglecting the other dimensions such as alertness to new information, judgment on uncertainty and attitude toward coordination, lie in the dependence on the human capital literature. Indeed, while the literature on human capital does provide a crucial tool to analyze the economic impact of learning and experience, it does not incorporate many complex dimensions of human cognitive processes which provides the crucial link between past experiences and present behavior of human beings (Simon, 1947). This paper analyzes the impact of past experience on entrepreneurship drawing upon the cognitive science literature. Simon's (1947, 1978) seminal work in this area highlights that past experience influences the way human beings organize incoming information to formulate a problem, which subsequently guides the efforts toward finding a solution.

In the context of our paper, we argue that the way entrepreneurs perceive and make sense of entrepreneurial options would be guided by their past experiences. Thus, past experience would not only influence the process of discovering new opportunities but all the generic characteristics of entrepreneurship, namely, attitude toward new opportunities, uncertainty and coordination. The paper uses data on small scale enterprises (SSEs) in the Indian pharmaceutical industry to empirically verify the hypotheses.

The paper proceeds as follows. The next section 2.1 gives an integrative overview of different theories of entrepreneurship. Section 2.2 develops the conceptual framework of how past experiences influence present behavior through cognitive frames. Section 2.3 analyses the implications of cognitive frame for entrepreneurial behavior. Section 3 develops our hypotheses.

Section 4 discusses our sample, and specifies the econometric method. Section 5 describes our results. Finally, section 6 synthesizes and concludes.

2. Conceptual framework

2.1 Theories of entrepreneurship: an integrative overview

The most discussed attribute of entrepreneurship is the attitude to explore new opportunities. According to Schumpeter (1934), it is the attempt by a creative entrepreneur to explore new opportunities. On the part of the entrepreneurs, efforts toward such new opportunities are motivated by the prospect of monopoly profits. New opportunities can take the form of either a new product, process of production, organizational model, or establishing a new market. All this would, eventually, involve changes in existing technological and organizational possibilities. Such monopoly profits would, however, only be transient, and the firm's competitive advantage vanishes as fellow producers imitate the new profitable opportunity. Then, the monopoly rents of the innovative firms decline and the industry moves toward a new state of equilibrium, before another wave of entrepreneurial action disturbs the state of circular flow of income.

Furthermore, in his work on entrepreneurship and uncertainty, Knight (1921) argues that human judgment to deal with uncertainty should be incorporated in the theory of entrepreneurship, particularly since entrepreneurship primarily implies creating new, disequilibrating opportunities. Knight (1921) does not separate uncertainty from the process of discovering new opportunities but sees it as an integral part of the discovery process. In this view, uncertainty depends on the degree of newness of entrepreneurial opportunities. Given that uncertainty is a state of deficient information, the level of uncertainty is higher when changes are drastic compared to the situation of minor changes.

As entrepreneurs attempt to innovate in an inherently dynamic environment, they have to address two characteristic challenges. These are, first, to discover and generate newness and, second, to deal with uncertainty. Loasby (2005a) emphasizes that a proper understanding of the Knightian uncertainty requires to distinguish between subjective and objective probabilities. Future events are uncertain because they are unknown. Therefore, dealing with such uncertain situations cannot be based on the assumption that all possible events are known with an objective probability. As a result, behavior under uncertainty is guided by the subjective probabilities that entrepreneurs assign individually to every new opportunities. If profit is the central goal, and if there exists a demonstrably correct procedure to earn profit, then profit would rely predominantly on the access to some privileged resources, and not on judgment as Knight had postulated (Loasby, 2005a). In contrast, the Kirznerian notion of entrepreneurship seems to attribute entrepreneurial profit to such a privileged resource, namely information (Kirzner, 1973, 1979, 1997).

In the Kirznerian framework, new opportunities exist because individuals possess asymmetric information, largely due to asymmetric levels of alertness to new information (Kirzner, 1997; Shane, 2000). A main difference between the Schumpeterian and the Kirznerian new opportunity, therefore, rests on their relationship vis-à-vis the equilibrium. While the Schumpeterian new opportunities are seen as disequilibrating force, which force an economy to deviate away from equilibrium, exploitation of the Kirznerian new opportunities gradually lead to establishing the equilibrium.³ In fact, “[e]ntrepreneurial *alertness* refers to an *attitude* of receptiveness to *available* (but hitherto overlooked) opportunities ... [and] *unnoticed* features of

³ There exists a literature that aims at integrating these two views by analyzing entrepreneurship in the framework of a product life cycle. It is postulated that the Schumpeterian and the Kirznerian entrepreneurship might complement each other in various phases of the product life cycle. Since behavior can be learned, individuals can also switch between the Schumpeterian and the Kirznerian types of entrepreneurship (see, for instance, Cheah, 1990). However, this literature does not incorporate a proper analysis of cognitive learning process, which would be important in such switchovers.

the environment” (Kirzner, 1997, p. 72)⁴. Thus, while the actions of a Schumpeterian entrepreneur seek to change the environment and available technological possibilities, the actions of a Kirznerian entrepreneur seek to gain from arbitrage as an entrepreneur “buys where prices are *too low* and sells where prices are *too high*” (Kirzner, 1997, p. 70)⁵ without changing the characteristics of the products, processes, organization or the market.

Finally, a Kirznerian entrepreneur, unlike a Schumpeterian entrepreneur, does not explicitly require a firm, since new opportunities are only functions of the alertness of an individual. Such a view has been criticized in the evolutionary economics tradition of entrepreneurial research (Witt, 1999). The absence of a firm in the Kirznerian theory, according to Witt (Witt, 1999), seems to undermine the important entrepreneurial dimension, namely, coordination. Although the importance of coordination within a firm was recognized much earlier (see Coase, 1937; Hirschman, 1958), treating coordination as an important entrepreneurial dimension is a recent development. Witt (1998) argues that achieving a business conception depends crucially on the entrepreneurial attitude toward coordination. . Coordination aims to convey a shared understanding of the business conception among firm members. Sharing a common cognitive model by all firm members about the goal of the firm enhances motivation to fulfill the jointly determined goal, and reduces opportunistic behavior.⁶ In addition, interactions within a firm are also essential for the creation of firm-specific knowledge (Nonaka and Takeuchi, 1995; Nonaka et al., 2000; Turvani, 2001).

Two crucial points emerge from the above discussion. First, it is possible to categorize the main schools of thought on entrepreneurship in, at least, two groups. We argue that one school views entrepreneurship as knowledge generating activity through minor or major innovations, while the other school identifies entrepreneurship as arbitrage through alertness to information.

⁴ Emphases added.

⁵ Emphases added.

⁶ A shared understanding of the entrepreneurial business conception also replaces the need for a strong incentive and control regime, often emphasized in the modern literature on corporate governance.

Second, coordination is a central dimension of entrepreneurship. The specificities of the implemented coordination regime affect motivation of the firm members as well as the process of knowledge creation.

2.2 The importance of prior experience: from human capital to cognitive frame

Conventionally, the literature on past experience and entrepreneurship has resorted to the resource-based view (Shane, 2000, 2003), where various forms of social and human capital generated through past training and investments in education augment the resources of individual entrepreneurs, and subsequently determine the areas of employment and entrepreneurial ventures (Helfat and Lieberman, 2002). The origin of the modern theory of human capital dates back to Becker, 1964), who had put more emphasis on firm- and industry-specific human capital⁷. Recently, a third dimension of human capital, namely task-specific human capital, has also been identified (Gibbons and Waldman, 2004, 2006). Task-specific human capital consists of acquired skills and knowledge, which are accumulated through on the job learning, but differs from firm- and industry-specific human capital in a significant way (Gibbons and Waldman, 2004). It emphasizes that the reason why people conduct certain tasks more efficiently lies in the way their task-specific skills and knowledge are augmented through past experiences, irrespective of the firm or industry, in which they were employed. The employment trajectories of individuals, their wages, job design and promotion paths, and area of employment depend more on their task-specific human capital (Neal, 1995; Gibbons and Waldman, 2004, 2006) rather than human capital of more broader types.

The literature on task-specific human capital makes an important departure from the conventional literature by arguing that employment opportunities would be more guided by the

⁷ The theory of human capital pioneered by Becker (1964) is based on a set of behavioral assumptions, which differ from the assumptions of the resource-based view of the firm. In particular, the resource-based view emphasizes cognitive level learning, whereas the human capital literature based its analyses predominantly on utility maximizing behavior of individuals. Despite these differences, Becker (1992) admits that past experience has important bearing upon present values and attitudes.

nature of the task rather than being necessarily specific to the firm or industry. Individuals can be productive in an industry or a firm, which is different from the previous sector of employment, provided the nature of the job remains similar. Although Penrose (1959) emphasized that carrying out similar tasks has important implications for cognitive processes of human beings, such cognitive dimensions are hardly mentioned in the current literature on task-specific human capital. We extend this reasoning and argue that task-specific human capital affects economic behavior more broadly. Drawing on the findings of the cognitive science literature, we argue in particular that task-specific human capital shape the way individuals make sense of new data and information, explore connections with existing information, and interpret tasks.

Drawing upon Simon's (1947) work, the idea of bounded rationality refers to human limitation to process information. Under the assumption of bounded rationality, therefore, past experience influences the processing of incoming information. Consequently, the formulation of goals would depend on existing knowledge and experience of the decision maker (Simon, 1978). This insight has important implications for economic behavior (Simon, 1947, ch. 5; March and Simon, 1958; Cyert and March, 1963).

More recent research in cognitive science and social psychology has shown in greater detail as to how the cognitive apparatus is limited in handling the amount of incoming sensory experiences and information (e.g., Devetag, 1999). The attention to incoming information, under such constraints, is discriminatory. The discrimination process is based on cognitive cues that help screening information on the basis of the association with the existing pattern in the memory. Incoming information are ignored if no similar pattern can be identified in the memory. The complex system created by such cues are called cognitive frame (Anderson, 2000). The subjective memory is based on and further develops into complex chains of associative cues, which also help enrich long-term memories. However, since associative cues play a central role in these processes, the memory structure is also restricted to interpret information. Therefore,

events in the environment are only perceived and interpreted along some specific associative lines. In this sense, a cognitive frame is a schematic representation of an individual's perception of the environment built through prior learning and adaptation (Witt, 1998, 2000). Thus, cognitive frames can be assumed to function as socially shaped filters (Bandura, 1986), which, in the presence of cognitive limitations, shape human behavior on the basis of past experiences and learning.⁸ It is precisely this influence of past experience on the subjective memory structure that makes cognitive processes central to the phenomenon of bounded rationality (Loasby, 2001, 2002).

Subjectivity in perceiving and making sense of information explains why past experience has a significant influence on learning, decision-making and economic behavior. Cognitive frames are, therefore, central to understand why individuals might stick to a particular mode of perceiving the environment and are often unable to switch into another mode, even in the medium run. When individuals choose to open and operate their firms, their perception about what is an entrepreneurial act would be guided, consciously or unconsciously, by the way their cognitive frames have been shaped during their past.

2.3 Past experience and entrepreneurship: the construction of entrepreneurship frames

On the basis of the above discussion, we may argue that an individual's cognitive frame about what constitutes an entrepreneurial act can be described as an *entrepreneurship frame*. An entrepreneurship frame guides an individual to judge, imagine and interpret an entrepreneurial option and gives necessary cognitive direction as to how entrepreneurial profit should be earned. Such a frame would be shaped by past experiences of that individual. In section 2.1, we pointed out that the main strands of the theoretical literature on entrepreneurship can be broadly

⁸ Cognitive learning can be of two types, namely learning through own experiences and vicarious learning by observing others. Our conceptualization of past experience encapsulates both these forms of learning. For details on vicarious learning see Bandura (1986, ch. 2).

categorized into two schools. One associates entrepreneurship with the creation of new knowledge through expanding the frontiers of new technological and organizational possibilities.⁹ While the other treats entrepreneurship as an equilibrating process through alertness to new information and arbitrage. If present behavior is shaped by cognitive frames developed through past learning and experiences, then these two broad patterns of entrepreneurship should also depend on how past learning has developed the entrepreneurship frame of individuals. We conceive two sub-frames within the entrepreneurship frame, which are the outcomes of two different experience trajectories in the past. We distinguish between the knowledge-oriented entrepreneurship frame, and information-oriented entrepreneurship frame. Before we proceed further, it is essential to briefly highlight the way information is distinguished from knowledge in the economic literature.

For a long period, the difference between information and knowledge had not been paid adequate attention. In fact, one main reason behind the powerful neoclassical conclusion that spillover discourages R&D, as in Spence (1984), may be found in treating information and knowledge alike. The work of Cohen and Levinthal (1989, 1990) makes an important departure in this context. The acknowledgement that diffusion is not automatic and absorptive capacity is needed to capture even the knowledge in the public domain is a step forward toward distinguishing information from knowledge (Rizzello and Turvani, 2002; Loasby, 2005b). The difference between information and knowledge can, perhaps, be best understood with reference to a cognitive process, which requires the input of information to generate the output in the form of knowledge (Turvani, 2001; Rizzello and Turvani, 2002). The underlying cognitive process operates both at the individual level and the social level of closely interacting individuals (Nonaka and Takeuchi, 1995; Turvani, 2001). The generated knowledge is open ended and local in nature, which can be imitated only imperfectly. Nevertheless, the relationship between

⁹ Innovations can be major or minor in nature. We are not concerned with inventions assuming, much in line with Schumpeter, that inventions are exogenously given to the entrepreneurs. See Witt (1992) for a detailed critical analysis of this view of Schumpeter.

information and knowledge is not linear and knowledge is believed to be more than the simple addition of all incoming information (Cowan et al., 2000). In this sense, the distinction between information- and knowledge-oriented activities is a useful conceptualization because it explains the variation in cognitive processes through which different kinds of past experiences exert their influence on entrepreneurial behavior.

Thus, the knowledge-oriented entrepreneurship frame is developed through past experience in innovative activities, where access to information was important to generate new knowledge through interpersonal interaction and individual experimentation. Although important for the generation of new knowledge, one may note that experimentation is uncertain, and interpersonal interactions enhance the possibilities of leakage of information. In contrast, information-oriented entrepreneurship frames are developed through activities, where solely the alertness to information is central to profit. Individuals involved in such activities tend to be reluctant to share information with others, because this enhances the competition for arbitrage, and reduces the profits to be earned by an individual. Throughout this paper, we refer to the two sub-frames as *frame-knowledge* and *frame-information*, respectively.

3. The hypotheses

3.1 The effect of past experience on discovering new opportunities under uncertainty

We hypothesize that past experience shape the attitude of an entrepreneur toward discovering new opportunities in an uncertain environment. In particular, entrepreneurs with past experiences in information-oriented activities and, hence, with frame-information are more oriented to exploit already prevailing, yet unidentified, opportunities in the current environment. This is because their past experience has shaped their cognitive frame in such a manner that they visualize entrepreneurial profit primarily through alertness to new information about existing, albeit unidentified, opportunities. Therefore, these entrepreneurs tend not to demonstrate an

aptitude for entrepreneurial opportunities which involve major changes in product characteristics or organizational structures. As a result, their entrepreneurial activities do not involve much alteration of the technological and organizational possibilities. In contrast, entrepreneurs with past experience in knowledge-oriented activities tend to be more proactive in discovering new opportunities that involve the alteration of the current environment through changing product characteristics and organizational structures. Such an attitude reflects their cognitive frame developed through past experiences, in which the generation of new knowledge was a crucial goal. As a result, the entrepreneurs' cognitive apparatus is directed to visualize new entrepreneurial opportunities in terms of changing the existing technological and organizational possibilities.

Hypothesis 1a: *Entrepreneurs with past experience in knowledge oriented activities and therefore with frame-knowledge tend to show more willingness to explore new opportunities that involve change in current technical and organizational possibilities than entrepreneurs with past experience in information oriented activities and, hence, with frame-information.*

While the process discussed above focuses primarily on how past experience channels an entrepreneur's attention to a specific way of discovering new opportunities, it does not consider the dimension of uncertainty in an explicit manner. However, discovering new opportunities in an inherently dynamic environment requires an entrepreneur to deal with uncertainty. According to Knight (1921), uncertainty is an integral part of the process of discovering new opportunities. Defining uncertainty as in Knight (1921), it can be argued that uncertainty involved with innovation processes would be far greater than uncertainty involved in activities of arbitrage in a given environment through alertness to new information. In the latter case, profit opportunities of incoming information are exploited instantly, rather than using the information to generate new knowledge and develop innovations through a cognitive process. Entrepreneurs with frame-

information, therefore, rely heavily on their ability to being alert to new information. Uncertainty is a state of information deficiency. A situation of uncertainty, therefore, makes their basic skill to reap entrepreneurial profit elusive by not disclosing enough information. As a result, they become more passive or inactive when uncertainty is high. Besides not being willing to explore new opportunities, which involve alteration of existing technological and organizational possibilities (hypothesis 1a), the individuals with frame-information tend also not to be willing to explore new opportunities in general, when uncertainty in the environment is very high.

In comparison, the entrepreneurs with experiences in knowledge-oriented activities tend to be more active under uncertainty. This is because their cognitive frames pay more attention to shifting the technological and organizational boundaries, which are inherently uncertain activities. In other words, dealing with information deficiency is a routine affair to this group of entrepreneur. Thus, rather than perceiving uncertainty as a threat, they perceive uncertainty as an integral part of entrepreneurial tasks. The key to their entrepreneurial profit lies in their capabilities in interpreting new information to generate new knowledge rather than in exploiting the raw information itself. Their cognitive apparatus pays little attention to being alert to new information per se, but rather to interpret information to generate new knowledge. Presumably, a state of deficient information would have less adverse impact on their entrepreneurial decision-making compared to the other group of entrepreneurs. Thus, the entrepreneurship frames with prior experience in trial-and-error-based activities of new knowledge creation tend to be less affected by uncertainty.

Hypothesis 1b: *Entrepreneurs with frame-knowledge tend to be more willing to explore new business opportunities under uncertainty compared to the entrepreneurs with frame-information.*

3.2 The effect of past experience on the attitude toward shared decision-making and the coordination of the firm

The characteristics of coordination and interpersonal interaction within a firm depend largely on the organizational form and governance structure. An open environment within a firm, either characterized by the entrepreneur directly engaging into interactive ways of decision-making or choosing a participatory governance regime, would encourage employees to get involved into a firm-specific knowledge creation process through interaction (Witt, 1998, Turvani, 2001). On the other hand, an organizational structure or governance regime with the entrepreneur either directly propagating a non-interactive approach or choosing a governance structure to that effect, would put high costs on generating such forms of knowledge. The important question arises why an entrepreneur would not support interaction within a firm, when such interactions generate new knowledge (Nonaka and Takeuchi, 1995), can suppress opportunistic behavior by other firm members (Rathe and Witt, 2001), and, thereby, raises productivity and profit. A simplest explanation could be the perceived spillover threat through spin-offs. When the level of such a threat is given, however, the decision to encourage interaction would also depend on the following two perceptions:

- i. perception about the imitability and tradability of the knowledge so generated through intra-firm interaction, and
- ii. perception whether information or knowledge are crucial for profit.

An entrepreneur would try to prevent such intra-firm interactions, if profit is perceived to be exclusively dependent on the access to information, and if the knowledge outcome of learning and interaction within a firm can be almost perfectly imitated or traded like a piece of information. On the other hand, interaction within a firm will be encouraged, if the entrepreneur perceives that profit depends not purely on the incoming information but on knowledge generated through intra-firm interaction. This knowledge would be firm-specific and hard to be imitated or traded such as

information, for instance, through spin offs.¹⁰ Rather than assuming that the perception of the entrepreneur is exogenously given, we claim that such a perception reflects as to how an entrepreneur's cognitive frame had been shaped through past experience. The attitude toward coordination will be guided by whether the entrepreneurial frame is characterized by a frame-information or frame-knowledge.

An entrepreneur with a frame-information would be oriented toward treating information as *the* important source of making profit. As a result, the entrepreneur's cognitive frame would pay more attention toward rapid exploitation of the available information rather than building further new knowledge through mutual interactions and discussions. In this case, the profits are fundamentally determined by the access to information. Any threat of leaking information would be dealt with utmost seriousness. The entrepreneurs would protect any informational advantage by all means. They perceive joint interaction as a potential channel through which they may lose valuable information. Thus, an entrepreneur with such a cognitive frame tends to opt for an organizational form in which interpersonal interactions and exchange of information are not encouraged. Business goals and objectives would be transmitted to firm members via orders and instructions and not by mutual discussions and interactions. Fearing the leakage of information, close monitoring of the clearly defined jobs of each firm member is a characteristic of a firm having entrepreneurs with frame-information.

In contrast, an entrepreneur with frame-knowledge tends to facilitate building up absorptive capacity and encourage the development of information into knowledge through interactions with other firm members. The perceived damage of profits due to leakage of partial information would be comparatively less. Consequently, the organizational form or the governance structure chosen by an entrepreneur with a knowledge frame would be more supportive of exchanging information and interpersonal interactions within the firm.

¹⁰ Moreover, if development of a shared cognitive frame through intra-firm interaction reduces opportunistic behaviour, as envisaged by Witt (1998), then a participatory regime would have less ex-post threat of spinning off, and therefore, leakage of information.

Hypothesis 2: Entrepreneurs, whose past experience shape their entrepreneurial frame as frame-knowledge, tend to opt for shared and interactive forms of governance within a firm compared to entrepreneurs with frame-information.

4. Data and variables

This section presents the data, discusses the construction of the variables and specifies the estimation method. For the cross sectional econometric analysis we have data on 45 randomly collected small-scale enterprises (SSEs, henceforth) of the Indian pharmaceutical industry.¹¹ The sample has been constructed on the basis of primary data. The data were collected through personal interviews with the owners of the pharmaceutical SSEs and/or the heads of their production units based on a structured questionnaire during a project sponsored by the Department of Science and Technology, Government of India, during 2001-2002. The firms are spread across four major cities in India, namely New Delhi, Chennai (Madras), Bangalore and Kolkata (Calcutta). Another 10 firms were interviewed in Bangalore and Delhi to construct our questionnaire. These firms have, however, not been included in the analysis. Table 1 provides a brief overview of the key characteristics of the 45 firms in the sample.

Table 1 about here

The pharmaceutical SSEs in India are unique among small-scale enterprises in high technology sectors. While SSEs in other technology intensive sectors focus almost exclusively on developing ancillary products and operating as component suppliers, pharmaceutical SSEs also

¹¹ There are only few studies that use primary level data on small scale pharmaceutical firms in India, mainly because of the complexities involved with the collection of data. These firms often do not have any formal representative associations, and collecting data on these firms requires getting the company's names from various drug manuals, identifying their addresses, and convincing them that such interviews would not hurt their professional interest in any way. That we were visiting them at a point in time, when the entire industry was in a turbulent phase of adjustment due to forthcoming WTO related changes, made the data collection process more complicated.

establish their own market niches, besides manufacturing for large firms on contract. Therefore, the pharmaceutical SSEs tend to have more options to respond to changes in the business environment than SSEs in other technological fields, which are mainly dependent on subcontracts from larger firms. In addition, India had followed a well-articulated policy to promote SSEs to augment employment and domestic entrepreneurship for a long time. A priority sector lending scheme of banks and various self-employment generating schemes were in place to support SSEs. The financial assistance continued to be provided even after several liberalization processes of the Indian economy during the 1990s.

In the empirical analysis, we take advantage of three particular characteristics of this data set. First, all firms in the sample are SSEs whose activities largely revolve around the capabilities and aspirations of the owner-entrepreneurs.¹² This makes it very likely that the decisions on the organizational structure and strategic direction reflect mainly the intentions of the owners. We can therefore presume that the owners purposefully initiated the organizational and strategic features we observe.

Second, the entrepreneurs have very different educational backgrounds and past experiences. We are able to distinguish between the following two groups: the first group consists of entrepreneurs with technical education and, in most cases, having past experiences as chemists in other firms. The second group consists of people with past experiences as independent traders of chemicals, or, in few cases, as sales or marketing personnel in other firms. This distinction is important to capture the influence of past experience and empirically distinguish between entrepreneurs with frame-knowledge and frame-information.

A third characteristic of the data allows us to identify the different aspects of discovering new opportunities. That is because the data set captures the industry in a phase of drastic shakeouts and readjustment to cope with the uncertain future of a policy by the Indian

¹² In the Indian pharmaceutical industry, SSEs are defined as firms with plant and machinery value of up to INR 10,000,000 (approximately, USD 250,000 and EUR 160,000; exchange rate as of April 2008).

government that intends to implement the norms of the World Trade Organization (WTO). From 2005 India had to amend its patent acts to enforce product patents in compliance with the Trade Related Intellectual Property Rights (TRIPS) agreement. Industries in the post-WTO era also have to comply with various production standards for domestic and export markets. This has far-reaching implications for the domestic pharmaceutical industry (Upadhyay et al., 2002).

The implementation of a TRIPS compatible product patent system brings the reverse engineering activities on patented drugs, typically pursued by the large firms, to a halt. As a result, they have to either successfully develop new chemical entities (NCE), or enter the off-patented drug segment. The latter, in turn, would expose the SSEs to stiffer competition, since this segment has traditionally been one major market niche for the pharmaceutical SSEs. Alternatively, large firms losing the lucrative markets for reverse engineered patented drugs can think of becoming contract manufacturers for innovating multinational firms. This exposes the SSEs into harsher competition too, at least domestically. However, the WTO regime also opens up new possibilities for the SSEs in the export markets. But a move into the export business requires also numerous adjustments. Apart from the inherent problems of small firms in lacking necessary expertise to monitor the demand pattern in export markets, quality requirements have become exceptionally demanding.

Precisely, considering the importance of product and process standards, and technical regulations for the effective functioning of modern economies (Hoekman, 1995), the WTO regime calls for increasingly stringent norms of product quality. Sustaining the competitiveness in the post-WTO era depends on the firms' ability to raise the standards of products and production processes. A commonly accepted mean of achieving the high product standards has been the adoption of good manufacturing practices (GMP) issued by the various international quality certificatory agencies such as the International Organization for Standardization (ISO), the U.S. Food and Drug Administration (USFDA), and the World Health Organization (WHO).

The basic objective of such GMP norms is to transform the concept of quality by shifting the focus from having a quality product to making a firm organization capable of producing quality products. For many firms in India, this means to transform from ad-hoc, experience-based, batch production to a better defined, methodical, and much automated continuous flow of the production process. This implies, for example, having an adequate plant layout, installing a proper air handling in plants, procuring raw material to environmentally efficient production processes with minimum exposure, and providing comprehensive operation manuals. Such transformations aim at optimizing the production process controlling the entire manufacturing process better through various in-process checks (Barkman, 1989). The general purpose of increasing the standards is to achieve a more consistent quality of final products. Yet complying with these standards requires high investments. The central challenge for the SSEs is, therefore, to decide whether the high investments in improving the production standards are worthwhile to keep their chances open for potentially new business opportunities in India and abroad.

A significant amount of managerial attention and other organizational resources have been spent to carry out this transformation in recent times. However, firms tend to have only discriminatory access to finance and expertise required for such transformations of their manufacturing facilities. Exploring and exploiting new opportunities under the conditions of WTO-initiated regulations is associated with substantial sunk costs and uncertainty.

Econometric specification

In this study, all dependent variables are discrete in nature. We therefore perform maximum likelihood estimation.

$$Q = X\beta + u$$

Where Q is the $n \times 1$ vector denoting the dependent variable, either binary or multinomial, for n number of firms, X is an $n \times k$ matrix consisting k explanatory variables, β is the coefficient matrix

of order $k \times 1$, and u is the matrix of error terms of the order $n \times 1$. The models represent a set of three independent equations with polychotomous dependent variables. We therefore use logit and ordered logit transformation of these models for estimation. The variables Q and X are described below.

Variables

Dependent variables (Q): Entrepreneurship

The literature on entrepreneurship has predominantly focused on factors such as new firm formation and the self-employment decision to measure entrepreneurship. Such measures implicitly assume that self-employment decisions are accompanied by a job change from a secured job in a firm to opening an own business, and therefore reflect entrepreneurial attitude toward risk bearing, uncertainty, and the affinity toward exploring new opportunities. However, in developing countries and emerging economies such as India, where the unemployment level is high and long-term employment opportunities are limited, self-employment decisions are rather linked with the need to survive than with any positive attitude toward risks bearing or uncertainty. Many businesses are set up out of distress of not getting any secure employment and not primarily for any narrowly defined entrepreneurial intention. Therefore, we understand entrepreneurship in a broader sense, which goes beyond solely considering the founding process of a new venture. The analysis includes also the various activities imagined and implemented by the owner-entrepreneurs of established firms. In this sense, our measures for entrepreneurship aim to reflect on entrepreneurial behavior more broadly than the formation process and the self-employment decision.

Patent is another variable conventionally used for measuring new opportunities. However, the Indian pharmaceutical industry does not produce patentable outputs. Pharmaceutical SSEs are even barred from producing a drug during the first three years of its launch in India. This makes

any variable related to the nature of the outputs less attractive as a proxy. Another feature of the pharmaceutical SSEs in India is that even though they take necessary approval for producing a whole range of drugs, in reality they produce only a handful of them. In fact, many firms produce only one product despite having a long list of approved drugs. Examining new opportunities on the basis of the number of new drugs can, therefore, also, distort the findings.

Attitude toward discovering new opportunities under uncertainty (NEWOPP)

In our empirical analysis, we construct two different variables to measure the impact of past experience on discovering new uncertain opportunities. This increases the robustness of our results. As a first variable, we use stringency of manufacturing norms (GMP). As mentioned earlier, the pharmaceutical manufacturing practice in India has undergone rapid changes in recent years to cope with increasingly stringent environmental and international regulations of product quality. For many pharmaceutical SSEs, such a reorganization means heavy investments on machinery, plant infrastructure and skill augmentation. However, such adjustments also help them to aim for new opportunities in the export market, under the WTO's "most favored nation" clause. Thus, the reorganization of manufacturing processes opens the prospect for survival in the domestic and the international market in the post-WTO era, albeit after incurring substantial costs.

The GMP variable captures the attitude toward new opportunities in a rather comprehensive manner. As discussed earlier, pursuing disequilibrating new opportunities involves altering the technological or organizational possibilities to capture a new market. Helfat and Lieberman (2002) emphasized that the success in a new market often depends on a set of parameters that differs from the factors that lead to commercial success in domestic markets. Organizations that explore new markets would have to invest in creating new knowledge pertaining to those markets. Changing the quality of products and altering the organizational design through the adoption of specific GMP norms reflect the willingness of a firm to generate

such knowledge. Thus, firms that voluntarily upgrade their manufacturing norms can be regarded as more forthcoming in exploring new innovative opportunities compared to the firms not adopting a GMP norm. It is this aspect that allows us to classify the entrepreneurial choice of an opportunity into different categories of newness. For example, firms that adopt USFDA norms intend to approach more dynamic markets in the Western Europe and North America, where quality is more dynamic and quality based competitiveness is substantially higher compared to the needs of the domestic market. The thrust on upgrading quality in these markets is much higher compared to markets where price competition can be assumed to be more intense than quality competition. Thus, through adopting a particular GMP norm entrepreneurs expressed their commitment to pursue different degrees of new opportunities. We take advantage of the fact that the level of necessary investments to comply with the regulations and the attached uncertainty varies with the GMP norms. This variation is central to empirically capture the entrepreneurial attitude toward discovering new opportunities under uncertainty.

India did not impose such a norm as a statutory requirement until the year 2005. Firms that nevertheless upgraded their manufacturing norms until our sample years 2001 and 2002 did so voluntarily to be at the forefront of exploring new opportunities despite the uncertainty that such a strategy involves. Indeed, a large section of pharmaceutical SSEs have shown considerable reluctance and inertia in upgrading their manufacturing process and organizational structure (Upadhyay et al., 2002; e-pharmail November 18, 2005¹³). Those firms that voluntarily adopted higher GMP norms can be regarded as more forthcoming in exploring new innovative opportunities compared to the firms that did not upgrade their manufacturing norms.

The GMP variable is an ordered polychotomous variable with four values. While 0 refers to firms with no-GMP norms, categories 1 to 3 refers to various GMP norms with increasing stringency on various aspects of product, process and organizational quality parameters (1=Indian

¹³ See www.pharmabiz.com.

GMP, 2=GMP of the World Health Organization, and 3=GMP of ISO/USFDA). In our sample 18 firms do not have any GMP norms (category 0), 15 firms conform to Indian GMP (category 1), 11 firms have WHO norms of GMP (category 2), and only 1 firm conforms to the USFDA norms of GMP (category 3). It can be argued that firms not adopting for any GMP norm do not imagine the technological requirements of the business environment to change in near future. Those with Indian GMP recognize that quality requirements would change, even if they seek to produce solely for the domestic market. Firms with WHO norms want to venture into other middle income countries in Central Europe, Africa and Asia, where quality requirements are changing only slowly. As a result, these firms assume the market structure and technological requirements to be different. The firm adopting the USFDA norm aims at exploring dynamic markets in the industrialized countries. Thus, the GMP variable ranks firms on the basis of the level of newness of the opportunities, which the firms aim to discover.

The second variable makes use of the fact that entrepreneurs differ in their plans whether to continue the business activities under the new WTO regime or withdraw from their current activities in the sector. In linking entrepreneurial behavior to emerging uncertainty due to the changing business environment, we draw upon an example given by Nelson and Winter (1982) about the adjustment processes of various firms during the oil crises of the 1970s. Many firms withheld their business decisions during the of oil crisis because the unprecedented crisis produced a state of deficient information about the post-crisis environment. This prevented firms to develop and implement effective business strategies. The WTO regime unfolded a very similar kind of situation for firms in India, particularly for SSEs. The firms' intended strategies under a WTO regime reflect their attitude toward exploring and exploiting new opportunities in a changing business environment about which they have little information and experience. The intention to continue and expand business activities under the WTO regime captures the willingness of an entrepreneur to exploit new opportunities under uncertainty. In contrast,

planning to withdraw reflect the entrepreneurial intention to avoid committing to new opportunities in the presence of uncertainty.

We use a binary variable WTOPLAN as a proxy. The variable takes the value 0, if firms express their inability to report any plan, or plan to withdraw from the business of modern drug production to diversify into the relatively less competitive business of producing alternative Indian medicine, or intend to withdraw from manufacturing activities to become a marketing partner for other small firms. A total of 22 firms fall in this category. We assign the value 1, if firms have shown their willingness to upgrade their manufacturing and quality control facilities to venture into export markets or enter into manufacturing alliances with large Indian firms being quality focused and export oriented. 23 firms fall in this category.

The variables GMP and WTOPLAN allow us to measure independently the entrepreneurial process of discovering new opportunities. However, we argued in section 3.1 that there are two different dimensions of an entrepreneur's attitude to explore and exploit opportunities. Such attitudes would be reflected in the type of opportunities identified and pursued (hypothesis 1a) and in their chosen strategies under uncertainty (hypothesis 1b). The two variables GMP and WTOPLAN capture, to a certain extent, these two dimensions of hypothesis 1. The GMP variable tends to measure the degree of newness of an opportunity as the four GMP norms reflect different levels of innovativeness with regard to technological and organizational possibilities. The WTOPLAN variable captures more the dimension of uncertainty by attempting to understand the strategies adopted by the entrepreneurs in the face of an uncertain regulatory environment of the WTO regime. In this sense, our analysis makes an attempt to empirically disentangle the two effects associated with discovering new opportunities.¹⁴

¹⁴, Note, however, that it is difficult to disentangle the level of uncertainty from the level of newness of an opportunity, which has been hardly attempted in previous studies. Indeed, the two variables in our study also carry features of both dimensions. For example, unwillingness to invest on upgrading their GMP norms may not only indicate the level of newness but also the well known preference for liquidity under uncertainty. Similarly, the decision of a sub-group of firms in our sample that opted to diversify into the market for alternative medicine under

Attitude toward shared decision-making and interactive behavior (SHARE)

The incorporation of business ventures is broadly considered an entrepreneurial act. The corporate structure determines, to a large extent, the pattern of decision-making and interaction in a firm. The Institute of Directors (1986) in England claims, for example, that “the limited company is the unsung hero of all free enterprise economies. Its structure provides a unique, flexible, efficient means of bringing together capital and *expertise*”¹⁵. However, while the issue of accessing capital through incorporation got prominence in the subsequent discussion (see Carney, 1999 for a review), the role of incorporation in helping access expertise remained neglected. We use the ownership structure of a firm to measure the entrepreneur’s attitude toward implementing shared and coordinative governance structures. Also, while it may be appropriate in the case of large firms to relate incorporation exclusively to the issues of finance and capital, the literature on the ownership structure of small firms points out that the decision to incorporate small firms tend to be guided by a set of more complex factors. In one such study, Freedman (1994), on the basis of survey responses from small business owners in the United Kingdom, found that the most often mentioned reason for *non-incorporation* is to retain personal control over a business. This view seems to reflect a deep-rooted perception among entrepreneurs about incorporation, where it is believed that “if you are a sole [owner] you have complete control of your business, but of limited companies, [they] can survive without you”.¹⁶ Only 23 percent of the survey respondents agreed that their problems to raise capital from the market are primarily due to non-incorporation. 66 percent of incorporated firms give limited liability as the main reason for incorporation, which is lower than what one expects if the issue of limiting liability was indeed the crucial determinant for incorporating these firms. Moreover, 54 percent of

the uncertain situation of the WTO regime, can be also understood as expressing the willingness to explore new opportunities with a lower degree of newness.

¹⁵ As quoted in Freedman (1994, p. 564). Emphasis own.

¹⁶ Barclays Bank booklet (1991) as quoted in Freedman (1994, p. 561).

incorporated firms stated that the director of these firms had to provide personal guarantee against bank loans, taking away much of the credibility of the argument relating incorporation with the ease of accessing finance. What all this means for our variable is that the level of incorporation implies more than simply access to capital. We use the variable as an adequate proxy for measuring shared decision-making and interactive behavior at the firm level.

Our ownership variable is a polychotomous variable having 4 categories. The category 1 refers to public sector firms owned by the government. Categories 2 to 4 refer to private firms. There are two broad groups among private firms; proprietorship/partnership firms (PP) are distinguished from limited companies (LTD). While firms under PP are characterized by unlimited liability, consensus rule, and limited number of members, firms belonging to the LTD category are characterized by rules of limited liability, majority rule and a large number of shareholders.

To cast light on the attitude to shared and interactive behavior, we highlight some important differences between the PP and LTD firms, especially related to the number of members and the decision rules. PP firms can have utmost 10 members. Any decision has to follow the rigid consensus rule. In fact, the decision to transfer shares of any individual has also to be ratified by all members (consensus rule). In contrast, LTD companies can have more members. Further, the individuals can transfer their shares at their discretion, or with the approval of a more flexible majority rule. It may therefore not be unreasonable to assume that owners of LTD companies are more amenable toward discussing and interacting with others, and incorporating knowledgeable human resources to shape their business goals compared to PP firms, where ownership and decision-making is often controlled by single individuals or a group of stable friends and family members.

The LTD firms can be further distinguished in terms of the number of shareholders. While private limited firms have a lower limit of 2 and an upper limit of 50 shareholders, the

public limited firms have a lower limit of 7 without any upper limit. Also, shareholders of private limited firms need approval of the majority to transfer their shares, which are done only at the discretion of an individual shareholder in a public limited company. Thus, owners of public limited firms, according to our categorization, should be regarded as the one having highest inclination toward shared interactive ways of developing business goals. In our classification, category 1 refers to government owned firms. Category 2 refers to public limited companies, category 3 refers to private limited companies and category 4 refers to PP firms. In our sample, there are 3 firms in the category of public sector firms (category 1). 5 firms are public limited companies (category 2), 13 firms are private limited companies (category 3), and 24 firms are PP firms (category 4).

Independent variables (X)

Experience and education (EE)

This is our key explanatory variable. If prior experience and learning shapes cognitive frames, then previous occupation of an individual can be regarded as a major source of such learning.

During our survey we collected data on past experiences of the owners. There are two broad groups of entrepreneurs on the basis of past experience and educational background. One group consists of spin-offs of other pharmaceutical firms, where they worked in the technical department as R&D scientists. The other group of entrepreneurs comes from a background with trading and sales experiences. Most of them were in the independent business of trading chemicals and pharmaceuticals before opening their own firms. Some of the entrepreneurs in this group had also past experiences in sales and marketing departments of other firms.

The success in trading and sales depends crucially on the alertness to exploit new information. Profitably trading implies having information about the existence or appearance of a

gap between demand and supply of a product or service. This enables a trader or sales agent to buy a product or service at less than the equilibrium price and sell it at more than the equilibrium price. The uncertainty involved in such activities is limited to the alertness to discover hitherto unnoticed features of the environment. Trading activities are therefore often characterized as “accepting the world as it is and adjusting to it” (Kingston, 1990). Thus alertness to incoming information and acting fast on them determine the success of trading and sales activities. It is, therefore, crucially important that the informational advantage is not lost to the group of competing traders. Consequently, sharing information bears the risk of inviting competition and sinking profits (Casson, 1982). The cognitive frame of entrepreneurs with prior experience in trading and sales tends to be shaped by information-oriented activities in the past. Thus, we define entrepreneurs with a background in trading and sales as entrepreneurs with frame-information.

R&D and product development, on the other hand, is characterized by the development of knowledge and absorptive capacity. Knowledge and absorptive capacity are central to develop new technological possibilities. The success in such a process depends largely on mutual interaction and sharing information with others. Information in the R&D process is important in so far as it provides the basic elements to generate new knowledge. For people engaged in R&D and product development, discovering new opportunities implies to explore new technological possibilities by modifying the existing environment with a futuristic agenda in mind (Kingston, 1990). The cognitive frame of entrepreneurs with prior experience in R&D departments is shaped by such knowledge-based activities in the past. Thus, we define entrepreneurs with a background in R&D and product development as entrepreneurs with frame-knowledge. The variable EE is a dummy variable. It takes the value 0 for the entrepreneurs with frame-information, and the value 1 for the entrepreneurs with frame-knowledge.

Control variable

Average growth rate (AG)

In identifying the cognitive influence of education and past experience on different entrepreneurial dimensions, we are applying an individual level approach on entrepreneurship. To control for the influence of non-individual factors, we take the average actual growth rate of firm sales as the control variable. We measure the growth rate of a firm by the ratio of its current sales turnover and the number of years they are in business (cf. Davidson and Wiklund, 1999). Precisely, we calculate the difference between the year 2002 and the year of founding, assuming the initial size to be zero. If the growth of the size is steady rather than fluctuating, the lack of time series data should not lead to major problems. We assume that this is the case since during our interviews no firm reported any significant fluctuations in their sales turnovers in the particular year.

5. The results

NEWOPP_{GMP}: The regression results are largely in line with our hypothetical framework. The equations 1a and 1b (table 2), estimated by ordered logit method, confirms our hypothesis regarding the entrepreneurial attitude toward exploring and exploiting new opportunities. In the presence of heteroscedasticity (equation 1b), the equation 1a has been re-estimated using robust standard errors. In both equations, EE is positive and significant at 5% level demonstrating that entrepreneurs with prior experience in R&D activities tend to be more willing to explore new opportunities compared to entrepreneurs with prior experience in trading and marketing. The second group prefers to confine themselves with opportunities in a known business environment. The other explanatory variable AG is significant at 1% level. The chi square statistic is significant at 1% level for both equations.

Table 2 about here

NEWOPP_{WTOPLAN}: The model for the hypothesis 1b (table 3), using a logit estimation, confirms the hypothesis regarding the attitude toward discovering new opportunities under uncertainty. In the equation 1c, EE is positive and significant at 5% level demonstrating that under uncertainty in the environment, the entrepreneurs with past experience in R&D activities tend to be more active in exploring new opportunities compared to the entrepreneurs with past experience in trading and marketing. The other explanatory variable AG is significant at 1% level. The chi square statistic is significant at 1% level. We did not detect any significant problem of heteroscedasticity in this model.

Table 3 about here

SHARE: For the hypothesis regarding attitude toward shared and interactive behavior (equation 2a and 2b, table 4) we dropped the 3 public sector government owned firms on the assumption that the ownership structure of these firms are independent of EE.¹⁷ It is, however, interesting to note that all 3 public sector firms in our sample chose to employ a person with R&D experience as the top decision maker. Our ordered logit estimation shows that EE is significant at the 5% level with the expected sign, while AG is barely significant at 10% level, when we do not correct for heteroscedasticity. In fact, after correcting for heteroscedasticity AG

¹⁷ Note that we have run all the models without public sector firms. Our basic results remain unaltered with some changes in the statistical level of confidence.

becomes insignificant, while EE remains significant at 5% level.¹⁸ The negative signs of EE and AG are because of the way we have measured the SHARE variable, with LTD firms getting lower values (2 and 3) than PP firms (4).

Table 4 about here

To gain some further insights into the decision-making process regarding ownership structure we carry out a multinomial logit analysis with the same set of observations (table 5). In the uncorrected equation 2c, the choice of PVT vis-à-vis PP is explained only by EE, while the choice of PUB vis-à-vis PP is solely explained by AG, both being significant, however, only at 10% level. The chi square test is also significant only at 10% level demonstrating a rather poor fit. However, the fitness increases when we correct for heteroscedasticity (equation 2d). Also, the explanatory powers of EE and AG increase in the corrected model. We also observe more diverse pattern of explanations. While EE significantly explains the choice of PVT vis-à-vis PP (significant at 10% level), the choice of PUB vis-à-vis PP seem to be guided by both high value of EE and high value of AG, both being significant at 5% levels. The overall fitness of the corrected equation 2d is also better with the likelihood ratio test being now significant at 5% level.

Table 5 about here

6. Synthesis and conclusions

This paper provides new insights into the nature of entrepreneurship. It highlights how the limited cognitive ability to process information makes past experience an influential factor in

¹⁸ In fact, if AG is omitted from the model, the overall explanatory power of EE and the overall fit of the model increase. Although EE still remains significant at 5 % level, the likelihood ratio statistic is significant at 1% level. However, we keep our initial specification to remain consistent.

shaping the attitude toward various entrepreneurial dimensions. The econometric evidence from the small scale firms in the Indian pharmaceutical industry suggests that past experience in information-based activities, i.e. selling and trading pharmaceuticals, and past experience in knowledge-based activities, i.e. working in a R&D unit, lead to different responses of the entrepreneurs in discovering new opportunities, judging under uncertainty, and coordinating a firm. We argue that the primary reason for this impact lies in the way past experience shape the cognitive frame of an entrepreneur, and determines the entrepreneurial behavior within the firm.

Regarding discovering new opportunities, entrepreneurs with frame-information tend to remain within the boundaries of a given environment rather than changing it, compared to entrepreneurs with frame-knowledge. Our empirical results support that entrepreneurs with frame-information are cognitively more averse toward exploring new opportunities that entail a change in the prevailing technological and organizational possibilities compared to entrepreneurs with frame-knowledge. In our data set this is reflected in the relative aversion of the former group of entrepreneurs in committing long-term investments to alter the product quality and organizational structure through augmenting the firms' manufacturing capabilities. Such investment opportunities are not pursued, even though they enhance the possibilities of a better performance in domestic and export markets. These results are consistent with some evidence from entrepreneurial studies in different countries. In the context of India, for example, Gorter (1996) finds that people with a trading background, even after becoming entrepreneurs, show significant reluctance toward investing on exploring new opportunities, which requires them to 'lock-in' their assets for a long period.¹⁹ These entrepreneurs rather prefer to hold their assets in liquid form or in easily realizable assets. Hirschman (1958, p. 20) categorizes such behavior as "personalized liquidity preference". The reason for such behavior, in his opinion, lies in an

¹⁹ Indeed, a considerably large body of the economic-sociology literature on Indian entrepreneurship focuses on how the background in trading, characterized by attitude to fast turnovers and unwillingness to reinvest, lacked motivation to deal with uncertainty, and trial-and-error-based experimentations to explore new opportunities. See, for instance, McCrory (1956) and Berna (1960).

excessive alertness to new opportunities, something surprisingly similar to Kirzner's (1997) view of arbitrage. These entrepreneurs have high reservations against long-term investments especially under uncertainty. An example from the period of Meiji restoration in Japan provides further evidence (Francks, 1999). It reveals that the then existing big merchants showed particular apathy to invest in new forms of industries. The reasons for their unwillingness were assumed to be their unfamiliarity with these new ventures, the scale of investment, the length of the expected period of return, and the requirements for adopting and building new knowledge regarding imported technologies (Francks, 1999, p. 38).²⁰

The paper also shows that entrepreneurs with frame-knowledge are more willing to explore new opportunities in the face of uncertainty, compared to the other group. We make a unique attempt to empirically disentangle the influence of past experience on discovering new opportunities in terms of two parameters, namely, degree of newness and level of uncertainty. Precisely, our data reveal how past experiences in knowledge-based activities make an entrepreneur more forthcoming in exploring new opportunities that involve shifting and extending the technological and organizational possibilities. In addition, these entrepreneurs are also more reconciled in the face of uncertainty. Due to their prior exposure to trial-and-error-based, knowledge generating activities, they do not perceive uncertainty as a threat but rather as part of the regular business activities. The key source of their competitive advantage lies in their capability to interpret new information and not being simply alert to new information. Uncertainty, therefore, does not, constrain their core ability. In contrast, entrepreneurs with frame-information rely, almost exclusively, on their capability to being alert to new information. Uncertainty being a state of deficient information, curtails the scope of accessing new information, and, therefore, restricts their core capability to make entrepreneurial profits. As a

²⁰ Hirschman (1958) also emphasizes that excessive alertness resulting from exaggerated and unrealistic expectation from business ventures often hinders the economic development as it deters investments in new projects.

result, these entrepreneurs show aversion to discover new opportunities. Moreover, they defer investments or even withdraw from business activities in a situation of uncertainty.

Regarding the decision-making on coordination of a firm, we argue that the main underlying reason for past experience having an impact is the way access to information is believed to augment the final payoffs. In an environment where profit depends largely on alertness to receive information, individuals tend to become secretive in sharing information with others to gain maximum payoffs from asymmetric access to information. In contrast, if information is viewed as an input into the process of knowledge generation, entrepreneurs show more pro-active attitudes toward sharing information with others. The two different kinds of exposure in the past, namely having experienced in R&D activities or being active as traders, shape the entrepreneurs' cognitive frames regarding information sharing. This, in turn, leads to differences in the entrepreneurial attitude toward shared and interactive behavior in coordinating a firm.

In our model, the differences in shared and interactive behavior are reflected by the different entrepreneurial choices of the legal form of ownership for the firms. Past traders adopted ownership structures, in which the decision-making is concentrated within a close group of stable relationships (e.g., family, friends, and ethnic groups). The main objective behind employing people from same family, friends and ethnic group is to insure against opportunistic behavior through non-market and informal norms of conduct. Adherence to the views of the owner becomes often more decisive as a criterion to join the firm than the skills or the ability to bring new knowledge into the firm. Contrary to conventional arguments, the addition of new human resources in this case would not bring much novelty into the firm. These practices reduce interaction among firm members and the scope of developing a shared cognitive frame. Consequently, they might hinder the process of developing new firm-specific knowledge.

Entrepreneurs with past experiences in technology and R&D, on the other hand, tend to seek more participatory forms of ownership and offer more opportunities to incorporate new knowledge embodied in new human resources into the decision-making process. Interestingly, the recent census on Indian small scale enterprises reveal that while the share of limited companies in total working units is only 2.5%, they share more than 30% of the gross output and exports by SSEs. In contrast, proprietary and partnership firms contribute to around 60% of gross output and exports, despite owning 96% of SSE units.²¹ Such a difference is not surprising in the light of our results. The firms belonging to the former group have possibly benefited from a more participatory process of decision-making and an intra-firm knowledge creation process that such a decision-making structure entails.

A key finding of our paper is to offer new insights into the importance of past experience in shaping economic and organizational behavior. Our econometric evidence suggests that the origin of such an influence lies in the past experiences of individual entrepreneurs. Other studies in the economics literature have highlighted the importance of prior knowledge of an entire firm (e.g., Berry, 1992; Scott Morton, 1999). Disentangling these different levels of influence on economic behavior in a firm organization is one aspect that may need further research.

Finally, departing from the predictions of the literature on task-based human capital, which postulates that past experience and training determines the area of future employment trajectory, we find evidence that past experience have a long lasting influence on various generic features of entrepreneurial behavior. Our results show that past experiences does not only influence the area of future entrepreneurial ventures, but affects substantially the entrepreneurs' attitude toward some key entrepreneurial dimensions, namely new opportunities, uncertainty and coordination, by shaping their cognitive frames.

²¹ SSI (2004, pp. 146, table R18).

Tables**Table 1: Summary Statistics**

Variable	Number of observations	Variable type (Binary/continuous)	Summary for binary variables	Summary for continuous variables			
				Average	Minimum	Maximum	Std deviation
Size (sales turnover)	43	Continuous	-	13.65	0.36	100	3.1
Age of firm	45	Continuous	-	23.7	3	67	2.24
Presence in export markets	45	Binary	No export=32 Export=13	-	-	-	-
Nature of past experience	44	Binary	Trading=17 Technical=27	-	-	-	-

Table 2: Ordered Logit Estimation, Dependent variable “NEWOPP_{GMP}” (hypothesis 1a)

Explanatory variable	Coefficients	Coefficients (robust estimates)
	1a	1b
EE	1.333** (2.03)	1.333** (1.97)
AG	0.773*** (2.72)	0.773*** (3.97)
Chi Square	12.69 ***	10.61***

Note: a. No. of observations =42
b. ‘Z’ values are in parentheses
*** denotes significance at 1 % level
** denotes significance at 5% level
* denotes significance at 10% level

Table 3: Logit Estimation, Dependent variable “NEWOPP_{WTOPLAN}” (hypothesis 1b)

Explanatory variable	Coefficients 1c
EE	1.753** (1.97)
AG	1.746*** (2.15)
Constant	-2.159*** (-2.69)
Chi Square	19.77***

Note: a. No. of observations =42
b. ‘Z’ values are in parentheses
*** denotes significance at 1 % level
** denotes significance at 5% level
* denotes significance at 10% level

Table 4: Ordered Logit Estimation, Dependent variable “SHARE” (hypothesis 2)

Explanatory variable	Coefficients 2a	Coefficients (robust estimates) 2b
Constant		
EE	-1.56** (-2.03)	-1.56** (-1.96)
AG	-0.53* (-1.64)	-0.531 (-1.45)
Chi Square	8.2**	8.27**

Note: a. No. of observations =39
b. ‘Z’ values are in parentheses
*** denotes significance at 1 % level
** denotes significance at 5% level
* denotes significance at 10% level

Table 5: Multinomial Logit Estimation, Dependent variable “SHARE” (hypothesis 2)

Category	Explanatory variable	Coefficients 2c	Coefficients (robust estimates) 2d
Public LTD	Constant	-3.64** (-2.49)	-3.636*** (-5.03)
	EE	1.92 (1.4)	1.915** (2.03)
	AG	0.84* (1.84)	0.841** (2.17)
Private LTD	Constant	-2.05** (-2.49)	-2.05** (-2.26)
	EE	1.74* (1.95)	1.738** (1.89)
	AG	0.28 (0.69)	0.28 (0.75)
	Chi Square	9.42*	12.52**

Note: a. PP firms are the comparison group
b. No. of observations =39
c. ‘Z’ values are in parentheses
*** denotes significance at 1 % level

References

- Anderson, J. R., 2000, *Cognitive Psychology and Its Implications*. W.H. Freeman, New York.
- Bandura, A., 1986, *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Englewood Cliffs, N.J.
- Barkman, W. E., 1989, *In-Process Quality Control for Manufacturing*. Marcel Dekker, New York.
- Becker, G. S., 1964, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Columbia University Press, New York and London.
- Becker, G. S., 1992, *The Economic Way of Looking at Life*, Nobel Memorial Lecture, December 9, 1992.
- Berna, J. J., 1960, *Industrial Entrepreneurship in Madras State*. Asia Publishing House, Bombay.
- Berry, S. T., 1992. Estimation of a Model of Entry in the Airline Industry. *Econometrica*, 60(4), 889-917.
- Buenstorf, G. and Fornahl, D., 2006, B2C - Bubble to Cluster: The Dot.com Boom, Spin-off Entrepreneurship, and Regional Industry Evolution, *Papers on Economics & Evolution*, #0620, Max Planck Institute of Economics, Jena.
- Carney, W. J., 1999, Limited Liability. In: B. Bouckaert and G. De Geest (Eds.), *Encyclopedia of Law and Economics*, Vol. III: The Regulation of Contracts. Edward Elgar, Cheltenham.
- Casson, M., 1982, *The Entrepreneur*. Martin Robertson, Oxford.
- Cheah, H.-B., 1990. Schumpeterian and Austrian entrepreneurship: Unity and duality. *Journal of Business Venturing*, 5(6), 341-347.
- Coase, R. H., 1937. The Nature of the Firm. *Economica*, 4(16), 386-405.
- Cohen, W. M. and Levinthal, D. A., 1989. Innovation and learning: the two faces of R&D. *Economic Journal*, 99(397), 569-596.
- Cohen, W. M. and Levinthal, D. A., 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35(1), 128-152.
- Cowan, R., David, P. A. and Foray, D., 2000. The Explicit Economics of Knowledge Codification and Tacitness. *Industrial and Corporate Change*, 9(2), 211-253.
- Cyert, R. M. and March, J. G., 1963, *A Behavioral Theory of the Firm*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- Davidson, P. and Wiklund, J., 1999, *Theoretical and Methodological Issues in the Study of Firm Growth*, Working Paper; a modified version published in: Sexton, D. (eds.), *The Blackwell Handbook of Entrepreneurship*.
- Devetag, M. G., 1999. From Utilities to Mental Models: A Critical Survey on Decision Rules and Cognition in Consumer Choice. *Industrial and Corporate Change*, 8(2), 289-351.
- Francks, P., 1999, *Japanese Economic Development: Theory and Practice*. Routledge, London.
- Freedman, J., 1994. Small business and the corporate form: burden or privilege? *The Modern Law Review*, 57(4), 555-584.
- Gibbons, R. and Waldman, M., 2004. Task-Specific Human Capital. *American Economic Review*, 94(2), 203-207.
- Gibbons, R. and Waldman, M., 2006. Enriching a Theory of Wage and Promotion Dynamics inside Firms. *Journal of Labor Economics*, 24(1), 59-107.
- Gorter, P., 1996, *The Rise of a New Class of Industrialists: Economic and Political Networks on an Industrial Estate in West India*. OUP, Delhi.
- Helfat, C. E. and Lieberman, M. B., 2002. The birth of capabilities: market entry and the importance of pre-history. *Industrial and Corporate Change*, 11(4), 725-760.
- Hirschman, A. O., 1958, *The Strategy of Economic Development*. Yale University Press, New Haven.
- Hoekman, B. M., 1995, *Trade Laws and Institutions: Good Practices and the World Trade Organization*, World Bank Discussion Paper, April 1995.

- Kingston, W., 1990, *Innovation, Creativity and Law: Studies in Industrial Organization*. Kluwer, Dordrecht.
- Kirzner, I. M., 1973, *Competition and Entrepreneurship*. University of Chicago Press, Chicago and London.
- Kirzner, I. M., 1979, *Perception, Opportunity, and Profit: Studies in the Theory of Entrepreneurship*. University of Chicago Press, Chicago and London.
- Kirzner, I. M., 1997. Entrepreneurial Discovery and the Competitive Market Process: An Austrian Approach. *Journal of Economic Literature*, 35(1), 60-85.
- Knight, F. H., 1921, *Risk, Uncertainty and Profit*. Houghton Mifflin, Boston, Mass.
- Langlois, R. N., 1997, Cognition and capabilities: Opportunities seized and missed in history of the computer industry. In: R. Garud, P. R. Nayyar and Z. B. Shapira (Eds.), *Technological innovation: Oversights and foresights*. Cambridge University Press, Cambridge, pp. 71-94.
- Loasby, B. J., 2001. Time, knowledge and evolutionary dynamics: why connections matter. *Journal of Evolutionary Economics*, 11(4), 393-412.
- Loasby, B. J., 2002, The organizational basis of cognition and the cognitive basis of organization. In: M. Augier and J. G. March (Eds.), *The Economics of Choice, Change and Organization: Essays in Memory of Richard M. Cyert*. Edward Elgar, Cheltenham, UK and Northampton, MA, USA.
- Loasby, B. J., 2005a, *Entrepreneurship, Evolution and the Human Mind*, Papers on Economics & Evolution, #0513, Max Planck Institute of Economics, Jena.
- Loasby, B. J., 2005b. Making Connections. *Econ Journal Watch*, 2(1), 56-65.
- March, J. G. and Simon, H. A., 1958, *Organizations*. Wiley, New York.
- McCrary, J. T., 1956, *Small Industry in a North Indian Town: Case Studies in Latent Industrial Potential*, Ministry of Commerce and Industry, Government of India, New Delhi.
- Neal, D., 1995. Industry-Specific Human Capital: Evidence from Displaced Workers. *Journal of Labor Economics*, 13(4), 653-677.
- Nelson, R. R. and Winter, S. G., 1982, *An Evolutionary Theory of Economic Change*. Belknap Press of Harvard University Press, Cambridge, Massachusetts, and London, England.
- Nonaka, I. and Takeuchi, H., 1995, *The Knowledge Creating Company*. OUP, New York.
- Nonaka, I., Toyama, R. and Nagata, A., 2000. A firm as a knowledge creating entity: A new perspective on the theory of the firm. *Industrial and Corporate Change*, 9(1), 1-20.
- Nooteboom, B., 2000, *Learning and Innovation in Organization and Economies*. Oxford University Press, Oxford, New York.
- Penrose, E. T., 1959, *The Theory of the Growth of the Firm*. John Wiley, New York.
- Rathe, K. and Witt, U., 2001. The Nature of the Firm - Static versus Developmental Interpretations. *Journal of Management and Governance*, 5(3-4), 331-351.
- Rizzello, S. and Turvani, M., 2002. Subjective Diversity and Social Learning: A Cognitive Perspective for Understanding Institutional Behavior. *Constitutional Political Economy*, 13(2), 197-210.
- Schumpeter, J. A., 1934, *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*. Harvard University Press, Cambridge, Mass.
- Scott Morton, F. M., 1999. Entry decisions in the generic pharmaceutical industry. *RAND Journal of Economics*, 30(3), 421-440.
- Shane, S., 2000. Prior Knowledge and the Discovery of Entrepreneurial Opportunities. *Organization Science*, 11(4), 448-469.
- Shane, S., 2003, *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*. Edward Elgar, Cheltenham, UK, Northampton, MA, USA.
- Simon, H. A., 1947, *Administrative Behavior: A Study of Decision-making Processes in Administrative Organizations*. Macmillan, Chicago, IL.

- Simon, H. A., 1978, Rational Decision-Making in Business Organizations, Nobel Memorial Lecture, December 8, 1978.
- Spence, M., 1984. Cost Reduction, Competition, and Industry Performance. *Econometrica*, 52(1), 101-121.
- SSI, 2004, Third All India Census of Small Scale Industries 2001/2002, SSI, Government of India, New Delhi.
- Turvani, M., 2001. Microfoundation of knowledge dynamics within the firm. *Industry and Innovation*, 8(3), 309-323.
- Upadhyay, V., Ray, A. S., Basu, P., Bhaduri, S., Iyer, P. et al., 2002, A Socio-economic Study of In-House R&D in Indian Industry, Report to the Department of Science and Technology, Government of India.
- Witt, U., 1992, Turning Austrian Economics into an Evolutionary Theory. In: D. F. Caldwell and S. Boehm (Eds.), *Austrian Economics: Tensions and New Directions*. Kluwer, Boston.
- Witt, U., 1998. Imagination and leadership - The neglected dimension of an evolutionary theory of the firm. *Journal of Economic Behavior & Organization*, 35(2), 161-177.
- Witt, U., 1999. Do Entrepreneurs Need Firms? A Contribution to a Missing Chapter in Austrian Economics. *Review of Austrian Economics*, 11(1-2), 99-109.
- Witt, U., 2000. Changing cognitive frames - changing organizational forms: an entrepreneurial theory of organizational development. *Industrial and Corporate Change*, 9(4), 733-755.
- Wuyts, S., Colombo, M. G., Dutta, S. and Nooteboom, B., 2005. Empirical tests of optimal cognitive distance. *Journal of Economic Behavior & Organization*, 58(2), 277-302.