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**Economic Adversity and Entrepreneurship-led Growth
Lessons from the Indian Software Sector**

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Abstract

It is commonly believed that the business environment in developing countries does not allow productive technology-based entrepreneurship to flourish. In this paper, we draw on the experience of Indian software firms where entrepreneurial growth has belied these predictions. This paper argues that the business models chosen by Indian firms were those that best aligned the country's abundant labour resources and advantages to global demand. Many potentially higher value added opportunities struggled to attain success, but the qualitative value of experimental failures and the capability gaps they exposed was invaluable for collective managerial learning in the industry. Second, the paper also shows that the presence of growth opportunities and the success of firms stimulated institutional evolution to promote entrepreneurial growth. Last we show that the distinctive aggregate contribution of entrepreneurial firms was that they outperformed business houses and multinational subsidiaries in their more productive use of available capital resources whilst achieving similar levels of growth in output and employment.

This paper draws upon an earlier shorter paper co-authored with Mike Hobday and titled 'Overcoming Development Adversity: How Entrepreneurs Led Software Development in India'.

Keywords: technology entrepreneurship, institutions and economic development, Indian software, intellectual property rights

JEL classification: L26, L86, O10, O32, O34, I28

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Abbreviations

BPO	Business process outsourcing
COSL	Citicorp Overseas Software Ltd.
ERP	Enterprise Resource Planning
IT	Information technology
LAN	Local area network
LSE	London Stock Exchange
MNC	Multinational corporation
NASSCOM	National Association of Software Services companies
NASDAQ	National Association for Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
PCS	Patni Computer Services
R&D	Research and development
SAP	Systems, Applications and Products in Data Processing
TCSs	Tata Consultancy Services

Tables and figures appear at the end of the paper.

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UNU-MERIT Working Papers intend to disseminate preliminary results of research carried out at the Centre to stimulate discussion on the issues raised.

1 Introduction

In many developing countries of the world large scale, effective business development through entrepreneurial activity 'should not occur'. Research by de Soto (2000) and Djankov and McLiesh (2005) and others show that starting and running a business is extremely difficult in many such countries. Taking this argument further, Djankov and McLiesh (2005: 3) argue that a reform of the business environment could have a positive impact on the growth of some of the poorest countries. They contend that there is a positive relationship between the 'ease of doing business' and the human development index.

The problems posed by an adverse business environment can go much deeper than the mere inconvenience and costs of delays caused by regulation. As Krueger (1974) and Baumol (1990) argue, excessive government regulation and intervention often function as a means of rent extraction by particular groups in society. For example, the granting of licences by government officials frequently leads to competition for large rents, encouraging bribery, and diverting entrepreneurs into rent seeking and away from innovative activities. In extreme cases, the perception that businesses become successful by exerting influence or bribing officials 'to do what they ought in any event to do' undermines both the link between pecuniary reward and business efficiency and trust in the motives and actions of government (Krueger 1974: 302). Favouritism towards certain business groups can lead to the perception that government policy is a mechanism for rewarding the already rich and influential and erode values for doing business legally and ethically.

In India, the problem of an adverse business climate is especially acute. India is ranked 116th (out of the 155 countries) in a ranking which shows how difficult it is to do business according to a series of criteria (Doing Business in 2006). The country also ranks 130th in terms of difficulties in trading across borders and 138th for the ease in enforcing of contracts. Indian senior management spent 12.9 per cent of their time dealing with requirements of regulations compared with 6.4 per cent average worldwide. Indian officials' interpretations of regulations are highly inconsistent and licensing laws in India have been notoriously difficult to navigate.

Nevertheless, despite the many difficulties of an adverse business environment, in recent years we have seen an explosion of technology-based entrepreneurship in India's software, information technology (IT) and business process outsourcing (BPO) industries. But how can we explain this? The kind of techno-entrepreneurship witnessed in India faces numerous institutional constraints, only some of which are imposed by or presided over by Government. Serious constraints arise from underdeveloped financial markets, poor protection for property rights, and weak contract enforcement. These constraints should erode profitability, restrain market entry, and impose high transactions costs on new entrepreneurial ventures, thereby stifling creativity and innovation. In theory, the Indian software industry 'should not' have developed in the way it did.

This paper shows how the Indian software industry achieved its astonishing results despite the adverse conditions facing entrepreneurs.¹ When given the economic opportunity, domestic entrepreneurs developed new world class business models, and started a demonstration effect for other industries to follow. In turn, these changes created the conditions for more widespread institutional transformation and reform of the business environment in the economy.

Technology-based entrepreneurship in the Indian software sector thus provides vital lessons for our understanding of the constraints to entrepreneurship in other countries with poor business environments. The remainder of the paper is organized in the following way: Section 1 of the paper reveals how Indian software entrepreneurs overcame the huge institutional barriers to development and how they themselves initiated institutional change despite the Government's restrictive policies. Section 2 discusses some of the economic benefits achieved by the software entrepreneurs, relative to other kinds of firms, and their wider impact on other service sectors. Section 3 concludes.

2 Technology-based entrepreneurship and its role in development

2.1 Entrepreneurship and the economic environment

Entrepreneurship studies can be traced back to the work of Richard Cantillon (circa 1730) and Jean Baptiste Say (1816).² Cantillon saw entrepreneurs as bearers of uncertainty, while Say (1816) saw the entrepreneur as the agent who united all means of production in order to make profits. These ideas about what entrepreneurs did were rediscovered in the 20th century. Thus, Frank Knight (1921) emphasized the entrepreneur's role in coping with the uncertainty of market dynamics, arguing that entrepreneurs were also required to perform fundamental managerial functions such as direction and control. Harvey Leibenstein in the 1960s and 1970s saw the entrepreneur as the agent which resolved market deficiencies through input completing activities.

A somewhat different twist to the advantages of entrepreneurship was given by Joseph Schumpeter (1934) who saw the entrepreneur as a heroic innovator who implements change within markets through the carrying out of 'new combinations' of various kinds. For Israel Kirzner (1979) the entrepreneur is the one who recognizes and acts upon market opportunities. More recent contributions by Rothwell and Zegveld (1982) identified 'intracorporate' entrepreneurship (or intrapreneurship) in the modern context, showing how managers can create new businesses within large corporations. None of these writers explicitly examine entrepreneurship within the context of the developing countries or asked how the modern problems of development described by de Soto (2000) affect the ability of entrepreneurs to operate. These include, as we noted earlier, the presence of underdeveloped financial markets, poor protection for property rights and weak contract enforcement. Most entrepreneurship

¹ Other papers focus on the globalization of the Indian software sector (e.g. Desai 2003; Arora and Gambardella 2004; Athreye 2005; Bannerjee and Duflo 2000; Basu 2005). Therefore, the focus of this paper is on how entrepreneurial Indian firms managed to enter and grow the industry despite the disadvantages of their economic environment.

² For an excellent summary of research on this subject see:
http://www.westaction.org/definitions/def_entrepreneurship_1.html

research today implicitly assumes that there is no difference between the entrepreneurship being carried out in the most developed nations and that carried out in 'latecomer' or developing countries.

Similarly, a surprising aspect of the development literature that developed through the 1950s and 1960s is that it never took entrepreneurship as a serious agent of development for poor economies despite the important role played by entrepreneurship in the overthrow of feudal economies in the First World. The first paper that looked at the issue of entrepreneurship and the development of poor economies was probably Leff (1974) who identified poor institutions as an impediment to entrepreneurship. Yet, it was not until the 1990s and the works of Baumol (1990; 2005) and North (1990; 2005) that significant theoretical insights emerged about the relationship between the quality of institutional environment and type of entrepreneurship and to some extent these have remained the important arguments about why entrepreneurship may not flourish in developing countries. While Baumol argued that institutions enshrine incentive structures for rent seeking as opposed to productive entrepreneurship that would contribute to growth, Douglas North identified the essential endogeneity of institutions and economic activity. Entrepreneurial firms will adapt their activities and strategies to exploit opportunities and overcome the limitations in their business environment through the formal and informal institutional network.

Two aspects of formal institutional environment pose particular problems in developing economies: poor private property protection and poor capital market institutions. Much of our knowledge about the impact and responses to these two problems come from studies on transition economies. One predominant effect of poor private property protection is corruption which may increase the costs of doing business. Johnson et al. (1999) argue that businesses in transition economies generally circumvent this problem by relational contracting (i.e. contracts informally enforced through networks). Access to informal networks to alleviate the shortcomings of the environment and the resources of the firm is also seen as relevant in developed market economies where entrepreneurs with good ideas may nonetheless lack all the resources required for successful new firm formation. Johnson et al. (2002) also argue that reputational incentives often substitute for court enforcement of contracts. What these studies show is that though poor institutional environments provide obstacles which may often reduce the profitability of an economic opportunity, entrepreneurial firms can and do devise ways to get around them.

The absence of capital market institutions and other intermediate markets for industrial goods and services can hinder the emergence of entrepreneurial businesses because they make the risk of starting a business quite high. Their role in facilitating the formation of business groups in emerging economies has been stressed by Khanna and Palepu (2000). In the context of scarce capital and large initial scales of production to compensate for missing intermediate markets, business groups are able to derive the advantages of risk pooling and cross-subsidy in order to overcome problems of lack of availability of finance and this feature probably also makes them more likely to undertake larger risks. This is of course very relevant for technology-based entrepreneurship which is likely to suffer particularly as a result of high riskiness and information asymmetries with regard to capital borrowing. In developing economies thus, we

should find business groups taking on such technology-based entrepreneurship and the evidence of the East Asian and South Asian experience certainly confirms this reasoning.³

2.2 Incumbent firms and the barriers to technology-based entrepreneurship

Shallow capital markets and poor intellectual property protection and enforcement may exert a significant influence upon the kind of business models chosen by technology entrepreneurs in developing countries. However, other constraints stem from the shallow nature of domestic demand in poor markets and the reactions of incumbent firms.

Technology products often face adverse demand in developing countries. This is because the relatively low income of consumers and firms often favours goods and services with low prices to goods of higher quality. Put differently, technology-based products do not find ready markets. Hobday and Perini (2005) note that ‘latecomer’ entrepreneurial functions differ in many ways from the conventional advanced country (or ‘leadership’) entrepreneurship which focuses developing new products and technologies. In particular they point out that latecomer technology entrepreneurs are more focussed on delivering incremental improvements to foreign firms and transnational corporations than to a large domestic market. Why should this be the case?

Even where such markets could be found, the successful exploitation of innovations needs much more than the capability to produce innovations and the funds to invest in R&D. One reason for this is the presence of incumbent firms who can imitate most innovations unless very strong intellectual property rights protect inventors. In a seminal paper, Teece (1986) highlighted the role of environmental conditions that influenced appropriability and the control over complementary assets required to commercialize a technology as the two principal factors that influence how much a firm will profit from an innovation-based strategy.

In particular, Teece (1986) argued that successful innovation often needed other complementary assets such as brand value, marketing networks, control of distribution channels, etc. which are often possessed by incumbent firms. Weak appropriability conditions such as those associated with weak IPRs when combined with control over complementary assets such as marketing and distribution will favour vertical integration by incumbents as the dominant strategy for the commercialization of innovation. Incumbent large firms, with their control of large distribution networks are best positioned to profit from technology commercialization strategies in such situations. In developing country contexts, entrants into the technology space with deep pockets may be able to invest in such complementary assets and so strong capital market positions may be more favourable to technology entrepreneurship. However, they may often be forced into situations where they negotiate with the domain firm, especially if they cannot fully appropriate the benefits of technology they have developed, which is likely to be the case with small incremental innovations. However, strong appropriability conditions (such as through tight IPRs) would favour business models based on licensing of technology by new and smaller entrants.

Thus, in some markets ‘first movers’ and incumbents prevailed in the market with certain innovations, while in other situations ‘followers’ and later entrants are able to gain the lion’s

³ See Amsden (1989); Amsden and Hikino (1994).

share of the profits. To quote from Teece (1986: 285):

‘... when imitation is easy, markets don’t work well, and the profits from innovation may accrue to the owners of certain complementary assets, rather than to the developers of the intellectual property. This speaks to the need, in certain cases, for the innovating firm to establish a prior position in these complementary assets [...] innovators with new products and processes which provide value to consumers may sometimes be so ill positioned in the market that they necessarily will fail’.

Thus, the management literature on technology entrepreneurship suggests that in understanding cases of successful and unsuccessful technology entrepreneurship in developing economies one needs to look beyond just the environmental conditions and the technological capabilities of firms which though important are not likely to be sufficient in explaining technology entrepreneurship in open, developing economies.⁴ Here too the Indian software industry provides a good example as more recent efforts at entrepreneurship have tried to better the outsourcing model by exploiting some niches in the semi-conductor market, but met with only moderate success.

2.3 Policies to promote entrepreneurship

Since Baumol’s work on productive and unproductive entrepreneurship the reform of the institutional environment is seen as essential to fostering productive entrepreneurship. However, institutional reform though easy to prescribe is far more difficult to achieve. Although many developing countries have instituted laws on private property, their enforcement remains limited—partly due to the prevalence of different customary norms and partly due to poor judicial systems. As a result, the quality of many potentially growth-enhancing institutions remains poor and whilst many policymakers do recognize that growth would be stronger in the presence of better enforced property regimes, they are often unable to implement the required reforms that would make the quality of their institutions better. Bardhan (2006) draws on the Indian experience to argue that political impediments often come in the way of institutional change in the form of vested interests, distributive conflicts and collective action on the part of disenfranchised groups in response to the proposed reforms. Put differently, it is unclear who should be the agents of institutional reform even if institutional reform were accepted as necessary to improve entrepreneurship. Perhaps in silent acknowledgement of this issue, policies to improve entrepreneurial performance in developing countries have often taken the form of the provision of finance to smallscale industries.

Yet whether or not special policies are needed to draw forth more entrepreneurship in the economy is an area of considerable debate. An optimistic view of the importance and necessity of entrepreneurship in developing economies comes from Hausman and Rodrik (2003). They point out that in the presence of uncertainty about what a country can be good at producing, there can be great social value to discovering costs of domestic activities because such discoveries can be easily imitated. However, as in the case of all externalities this would make entrepreneurship

⁴ The assumption of an open economy is important. Firms could of course, avoid the harmful effects of incumbent competition by lobbying for protection but this is a short term gain. In the longer term, the global market for technology-based goods is larger.

subject to underinvestment. Government policy should thus intervene to induce investment in entrepreneurship while at the same time rationalising excessive diversification once such investment has occurred.

In their own words:

‘Neither economic theory nor management science is of much help in helping entrepreneurs (or the state) choose appropriate investments among the full range of modern sector activities, of which there could be tens of thousands, once one moves beyond broad categories such as ‘labour-intensive products’ or ‘natural resource-based products’. Yet making the right investment decisions is key to future growth, as it determines the pattern of specialization. In these circumstances, there is great social value to discovering that cut flowers, soccer balls, or computer software can be produced at low cost, because this knowledge can orient the investments of other entrepreneurs. But the initial entrepreneur who makes the ‘discovery’ can capture only a small part of the social value that this knowledge generates... Consequently, entrepreneurship of this type—learning what can be produced—will typically be undersupplied, and economic transformation delayed’.

(Hausman and Rodrik, 2003: 4), <http://ksghome.harvard.edu/~drodrik/selfdisc.pdf>

This view stands in sharp contrast to Kirzner (2000: 82) who first emphasized the discovery function of entrepreneurship.

‘To the extent that [government policies] suspend or inhibit the market process, they are obstructing a process of discovery without offering any substitute for it. Let us not forget that the market process has the function of alerting market participants to opportunities which nobody has expected. To initiate governmental policies to grapple with externalities is, in effect, to pretend knowledge which no one can, in principle, honestly claim to possess’.

In the following sections we test the ideas reviewed in this section against the facts about the growth of the Indian software sector.

3 How Indian software firms overcame obstacles in the business environment

3.1 The mediating role of the dominant business model

Software outsourcing from India grew through the 1980s and 1990s despite weak laws to enforce contracts, poor intellectual property (IP) protection, inadequate capital markets and a policy regime that was generally market unfriendly. Software services exports from India have grown from a mere US\$330 million in 1993 to US\$17.3 billion in 2006, employing around 878,000 people.⁵ Estimates in Athreye (2005) suggest that in 2001, entrepreneurial firms accounted for about 38 per cent of sales revenues and 35 per cent of employment in the Indian software

⁵ Estimates from the National Association of Software Services companies (NASSCOM).

outsourcing sector. Six of the top 20 firms were entrepreneurial in origin. The techno-entrepreneurship that sustained the growth of the Indian software industry is thus both intriguing and inspiring for other countries that are poor, face adverse regulations and institutions.

The simple answer to ‘how did this happen?’ is that the industry exploited its initial advantage in low cost human capital by fashioning business models that leveraged this strength. As the newly emerging global IT industry boomed in the West, this led to a huge demand for trained engineers and technicians. Indian firms saw this economic opportunity and leveraged their cost advantage by occupying product market spaces and business models that avoided the penalties of their poor institutional environment and also head-on competition with incumbent firms. This occurred initially through the development of customized software designed for foreign multinational corporations (MNCs) within a business outsourcing relationship, in a manner very similar to the original equipment manufacturer arrangements of East Asian latecomer entrepreneurs in Korea and Taiwan (Hobday 1995). In the 1970s and 1980s the hurdles imposed by government regulations and institutional difficulties meant it was far easier for Indian software firms to move teams of engineers abroad—a practice that is sometimes referred to as ‘on-site services’ or more derogatorily as ‘body-shopping’. In this way, the intellectual property rights always belonged to the client firm and they could monitor the programmes directly.

The pioneering firm in establishing this model was Tata Consultancy Services (TCS), a subsidiary of the business house of Tatas. Despite being a large business group with deep pockets and entering into an industry (software) that was already reasonably well understood, TCS nevertheless had to behave like a pioneering firm because the industry was new to India. As a firm, it had to invest in many fronts—train engineers to learn software management skills as well as software languages; respond to changing technologies and negotiate with the government to obtain permission for exploring the business opportunity that presented itself. TCS understood well the problems of market creation. It chose outsourcing as a way to avoid addressing the issue of who would buy its services. In choosing this path, the company also recognized the potential that such contracts offered for technology upgradation and in 1975 partnered exclusively with Burroughs. In this respect, its strategy was similar to that of firms in the Four Dragon countries. However, in the 1978 the takeover bid for TCS by Burroughs also showed the limits of this early model. TCS and numerous later entrants would find contractual ways of avoiding this problem and use client diversification as an important means to obviate such takeover threats. However, survival came at a price. Client diversification also created obstacles to building up the firm’s own domain knowledge.

Although the basic outsourced business services model was established in the 1970s, it has continued to evolve through the 1980s and 1990s. The first steps towards a new form of the model were adopted in the 1990s when the offshore content of on-site delivery began to slowly increase. Some firms such as TCS and Infosys gained reputations for timeliness and product quality and started attracting more work (Banerjee and Duflo 2003). They also began to be trusted to do the work in India where they could deliver the same quality of software at an even lower price. As prices of telecommunications access came down through the 1990s, the offshoring of work became steadily cheaper and also utilized the large educated labour force better as firms could now practice a fine division of labour in software teams due to the much larger scale of such operations. These features started altering the market subtly.

Although the 1990s had brought in a wave of imitative entry from other Indian firms and foreign MNEs, factors like reputation and better process efficiency started creating some differentiation among producers. Data presented in Athreye (2005) show a marked separation of the top quartile from the median firm on measures such as employment size, turnover, and average labour productivity by 1997. There is also some evidence of increasing returns to labour with a productivity factor between 1.2 and 1.4. Thus, although the 1990s was a period of imitative entry there was an endogenous sorting of firms where those with better process management capability were also adopting more (profitable) off-shore modes of services delivery.

With full financial liberalization of the economy, firms such as Infosys also realized other advantages of operating in a global market. Being an entrepreneurial firm rather than a business house subsidiary, Infosys was vulnerable to periods of capital scarcity and this had been its experience in its first years of growth. To keep the potential of deep pockets for the future, they were the first to leverage their reputation as suppliers to list on international markets such as NASDAQ and the NYSE and then use their reputation for being professional companies and good corporate citizens in order to attract new US customers. They also voluntarily adhered to some corporate norms of US firms such as use of more transparent accounting practices and the use of employee stock options to stem attrition of their staff. These were both moves that business house subsidiaries could not imitate easily and one that further reinforced the reputation of Infosys for being a good corporate citizen, thus enhancing their reputation for professionalism. As the larger software services firms started gaining market share, new entrants in the late 1990s explored another new variant of the offshore model, viz. application of the software services delivery model to administrative functions of companies (the so-called BPO). A more recent wave has also focused on R&D outsourcing in the telecom domain. Each of these small variations of the off-shore delivery model has tried to utilize India's advantage of a large and educated labourforce whilst at the same time making use of developments in technologies (such as growing telecommunications reach) and the advantages of the global market for such services that had emerged. Thus, far from stifling entrepreneurial activity, the penalties of the domestic environment led Indian firms to be inventive in devising new value propositions to overcome that adversity. Indeed the dominant model has focussed entrepreneurial energies along a narrow path of proven success.

The business model of outsourced software services took nearly two decades to evolve fully and in this time several firms built up process capabilities complementary to the successful global delivery of software and other services. The search for new entrepreneurial opportunities explored the product space and incremental improvements were made to the outsourced service model which were very successful.

3.2 The roads less travelled: capability gaps exposed by business model experimentation

Not all the experimentation with business models was in the form of incremental improvements. The desire to have an Indian software product that would be a proud symbol of the nation's software process has been a wish of many politicians and business persons. Businesses have also been attracted to the much higher profitability of the software business model and through the history of the industry's growth there have been recurrent entrepreneurial efforts to uncover a viable product model. Though they represent the road less travelled, their moderate success also exposes capability gaps and institutional constraints that eroded value and increased risk.

The first known case of a software product from India was not surprisingly from TCS. TCS had always paid attention to tools in software writing, and in the early 1980s the organization saw an opportunity to sell some of those tools as products. During the interviews, a product called Case Packet was mentioned, which launched to good reviews in the technology business press and retailed for about US\$200,000. The company depended upon distributors for its marketing, and it was soon taken over by Computer Associates and never heard of again. Though TCS proved very capable of making products, as one of their managers summed it up ‘TCS did not create the product market, and that was the subtle difference.’

Another wave of experimentation was in the mid-1980s, following on the heels of import liberalization which greatly increased the installed capacity of PCs in India. Firms such as Sonata and Mastek, introduced products aimed at the domestic market for software. Sonata tried to develop software products while Mastek became the first company to use tools to speed up product development again for the domestic market. However, these product ventures largely failed—due to the small domestic market and lax IP laws. The lack of venture capital support also made the product model a very risky one for entrepreneurial firms to adopt due to the higher up-front investment implicit in the business model.

The late-1980s saw a renewed exploration of the product market but this time aimed at foreign clients rather than domestic ones and carried out by larger firms who had deep pockets for such sustained investment. The stimulus was the spread of distributed computing and the opportunity to write products previously constructed for mainframes around the new technology platform of LAN and interlinked PCS. Thus, Ramco (a business house subsidiary) tried to develop a ERP product and CITIL (a spin-off from the multinational subsidiary of Citibank, COSL) developed a financial product Flexcube around their customization of a pre-existing market product called COSMOS—a company they also acquired subsequently. COSL thus acquired the full IP rights for their package in a relatively short period of time.

Ramco’s product Marshall was overtaken by solutions by Western companies like SAP and other ERP product producers. When questioned about the relatively poor performance of Marshall, managers at Ramco conceded that it probably took longer for the company to produce the basic software infrastructure required for a successful product, while having been in the market longer, SAP could just translate to another technology platform quite quickly. However, they did manage to acquire a reasonable number of installations which helped the launch of their later product Ramco Virtual Works. Flexcube, however, emerged as the most successful product developed from India, although its ownership has kept changing. Its success was the result of a shrewd strategy which targeted customers in poor countries and among smaller firms that were unlikely to go after existing mainframe solutions. These firms were also less likely to become competitors or imitators.

In interviews, both firms emphasized the huge up-front investments needed and the important role for marketing capabilities in developing successful software products for overseas clients. A domestic market where firms were not using such products made the job of designing products for customers they did not know much harder.

The adoption of tighter IPR norms in 1995 gave rise to another burst of experiments with software products in the area of embedded software. Many telecom firms like Texas Instruments, Motorola and Nortel had located their research on digital signal processing chips in India and this gave rise to spin-off firms. Two prominent examples are Sasken (previously a joint venture with Nortel) and Ittiam. Both hold patents to their names and aim to earn revenues largely through licensing to large firms. Sasken combines outsourced R&D services with licensing and this gives the firm stable cash flows and the ability to scale. Ittiam operates a pure product model and has been blessed with a large trench of venture capital financing from Silicon Valley venture capitalists. They had filed for 11 patents in the first four years of their existence and their chips are licensed to an impressive list of client firms.

The lure of the product model is still strong but thinking about it has evolved and in the process exposed gaps in capabilities and in the environment.

3.3 Institutional reform and adaptation: the effect of entrepreneurship on the economic environment

The spectacular growth of the industry in the 1990s was also marked by an improvement in the institutional infrastructure surrounding the software outsourcing industry, which generally served to ease the constraints on the industry's further growth. These included capital and labour market reform, better access to finance, improved IP right protection and contract enforcement.

Capital market institutions did not understand how to evaluate the finance needs of the emerging software industry. Infosys, India's most famous entrepreneurial firm, was refused a bank loan when it was set up in 1981 and had to borrow the start-up money from the wife of one of the founders. It was probably not the only one. Faced with a situation where bank finance was not readily available and venture capital was not forthcoming, software firms were conservative in their own cash flow calculations but experimented with *importing the use* of capital market institutions in the US. Many software firms voluntarily listed on stock exchanges in the USA and in Europe with more stringent disclosure norms in order to raise money for investments and acquisitions. The compliance of some firms to international norms was a powerful force for improved corporate governance with the chairman of Infosys being involved in committees to promote these changes.

The combined effects of liberalization and the success of the software industry drew US venture capital into India after 1993. Dossani and Kenney (2002) show that a significant portion of the sevenfold increase in funds from 1993–98 was accounted for by the entry of foreign investors after 1995, through investment arms of foreign banks, and venture firms that had raised capital abroad. Indian Silicon Valley entrepreneurs encouraged new business plans within India and exploited the new exit routes made possible by the international listings of Indian software firms on NASDAQ, NYSE, and the LSE. According to recent estimates from the Indian Venture Capital Association, domestic and foreign venture capitalists invested US\$774 million in 2003 in India up from US\$590 million in 2002 (Nair 2004; Basu 2005).

Training and the supply of human capital also improved. As the software industry grew in the late 1980s and early 1990s, labour markets for software programmers became tight due to global market expansion and fierce competition. In this period, scores of privately funded and organized

educational and training institutions emerged to meet the demands for skilled labour, expanding supply beyond what could be produced through the state funded educational establishments. Desai (2003) shows that while engineering capacity increased six-fold from 61,000 in 1987–88 to 341,000, the supply of graduates with IT degrees saw a ten-fold increase, from 25,000 in 1987–88 to 258,000 in 2002–03.

Privately financed training institutes such as the National Institute of Information Technology Ltd. and Aptech Ltd., sprung up to provide software training throughout the 1990s—a dramatic institutional departure in a country where reliance on publicly funded training institutions had been the norm. As Table 1 below shows their incidence increased all over India, especially post-1995.

Intriguingly, all of these changes occurred *after* the software growth opportunity had been spotted by entrepreneurs with some initial success. India’s software firms did not wait for institutional reform. On the contrary, software success caused the reform to take place.

3.4 Creating business friendly policies

A very important agent for institutional reform was NASSCOM, the largest and most important business association for software services and now BPO. NASSCOM was set up in 1988, with just 38 members who collectively accounted for 65.0 per cent of the industry revenues. Many of these members were small companies, and the total industry revenue in 1988 was a little over US\$100 million. By 2003–04, the number of members had risen to more than 800, collectively accounting for about 95 per cent of the industry output of about US\$21 billion.

NASSCOM operates as a collective body representing the interests of the software sector with functions of lobbying, advocacy, and public relations (Kapur 2002). NASSCOM has been extremely effective in lobbying for policies favourable to the industry’s continued growth, collective marketing at a time when Indian companies did not have an international reputation for delivering quality service, and providing information on the industry for insiders and outsiders. Collective marketing involved organizing trade fairs and producing directories of firms and their areas of business for potential customers, bringing together demand and the eager small entrepreneurial firms.⁶ The difficulties of ‘selling’ India software at the time cannot be overstated as a founder-member of NASSCOM told us:

‘When I was out there in 1991, the country was bankrupt. We had three governments in one year, an assassination of a prime minister, and we were hawking our gold. You know, selling overseas was not a piece of cake.... if I have to present ten slides, the first eight had to be to sell India and the ninth one would say we do have an IT industry in India and unless the guy bought those nine slides, your tenth one about your company was meaningless. Because who are you anyway? So we had to building up the [Indian] brand from day one’.

⁶ Big business houses already had previous contacts and relationships with foreign vendors which they exploited.

The attitude of NASSCOM towards engagement with the government on policy issues is a dramatic break with past practice. Older industry associations, such as the Federation of Indian Chambers of Commerce and Industry and the Confederation of Indian Industry, had a more hands-off approach to policy engagement. NASSCOM engaged the Government with facts to ensure that business was given a free hand to take initiatives. This approach has made for better industrial policy and improved corporate governance. The NASSCOM lobbying model has been emulated in other fast growing sectors, notably biotechnology and automotive components, which speaks volumes for its effectiveness.

4 The benefits of entrepreneurship

4.1 Economic benefits

In many developing countries start-up entrepreneurs fail to make much headway in terms of employment growth, new technology adoption, and capital efficiency (von der Fehr 1995; Beck et al. 2003; Shadlen 2004). To assess this issue, we compared some quantitative measures of the business performance of software entrepreneurial start up firms with those of business house subsidiaries and foreign MNCs (see Table 2). Table 2 is based upon a survey of 204 software firms (132 entrepreneurial firms, 27 business house subsidiaries, 45 foreign firms). It shows that while the starting size (indicated by the median number of employees after the first year of business) for entrepreneurial firms was only marginally larger than that of domestic business house subsidiaries, both started smaller than foreign firms. Entrepreneurial firms grew to an employment size almost as large as foreign firms. A similar picture emerges when we compare size by turnover. Entrepreneurial firms showed a slower rate of growth than the subsidiaries of large domestic firms but grew at a marginally higher rate compared with foreign firms.

Turning our attention to initial capital outlays we find that entrepreneurial firms started with very small initial capital outlays compared to both domestic firm subsidiaries and foreign firms, especially the former. This may be related to the scarcity of finance that entrepreneurial firms face when they start up due to the high cost of capital. If we look at the ratio of the median turnover to median capital outlays as a crude input-output measure, we find that entrepreneurial firms are the most efficient in their use of capital. This ratio is more than two and a half times that for foreign firms and over three and half times that for subsidiaries of domestic firms. In a capital scarce economy, entrepreneurial firms appear to be doing a better job of conserving capital than non-entrepreneurial firms.

Thus, two surprising conclusions emerge from our survey: first, the employment growth of entrepreneurial firms was at least as good as that of MNCs, second, entrepreneurial firms are more efficient than both domestic and foreign firms in their utilization of capital for the most productive use. These findings should bring cheer to many capital scarce economies.

4.2 Business model benefits: the propensity to experiment

Our survey also compares the motivations of entrepreneurial firms entering the software business with business house subsidiaries and multinational firms (see Table 3). While the pursuit of a profitable business opportunity was the overriding motive for all firms entering the software

sector, the desire for independence and the possibility of technological innovation all figured highly in motivating entrepreneurial entry. By contrast, subsidiaries of domestic firms were more concerned with diversifying into more profitable areas and the desire to earn foreign exchange through exports.

Overall entrepreneurial firms had more creative space and were better placed to pursue their individual visions. Entrepreneurial firms were also more likely to experiment with new business models.

4.3 Impact of software entrepreneurship on other sectors

Each of the institutional developments described in the previous sections have impacted other sectors where the outsourcing business model was adopted. Capital market reforms, which began as part of a larger financial reform process, have gathered steam. The successful use of international capital markets by Indian software firms and the simultaneous listing of software firms on both the Indian and foreign stock exchanges have resulted in a realignment of disclosure rules and corporate governance procedures in the Indian capital markets.⁷

The emergence of third party BPO activities in India led by firms such as EXL Services, 24/7, Spectramind, Daksh e-Services, and Transworks, who all received venture capital funding for their seed capital, has impacted on manufacturing, health care, banking and financial services, pharmaceuticals, engineering, and textiles. As a result there seems to be a gradual convergence in India towards the US model of venture capital institutions, initiated and aided by the diaspora of technology entrepreneurs in India and their Silicon Valley partners.

The NASSCOM model of industry-government interaction has been adopted by new sectors relying on domestic entrepreneurship. Examples include the Association of Biotechnology Led Enterprises, which represents the biotechnology industry, and the older Automotive Component Manufacturers Association, established in 1958. The latter's activities since 1994 resemble the NASSCOM model quite closely. Indeed, a visit to the web sites of these organizations shows that their strategies and information content are similar to that provided by NASSCOM. This institutional reform has created more visibility about the desirability of more reforms and the part this process could play in supporting entrepreneurial growth in other services and knowledge-based sectors

5 Conclusions

Contrary to conventional wisdom, Indian software firms were able to circumvent government-led restrictions to growth and then lead institutional reform in India. Moreover, these firms are bringing about major changes to the way business is being carried out in many other sectors, producing a wide ripple effect which will, hopefully, continue and grow in the future. The impetus for institutional reform has not come from government, international institutions, or their

⁷ N. R. Narayanamurthy, Chief Mentor of Infosys, has been an important member of many of the corporate governance committees set-up for the reform of capital markets in India.

advisors, but primarily from the business sector itself, reversing the way development analysts normally think about economic progress.

We find very little evidence that imitative excessive entry in the software sector has slowed entrepreneurship down as suggested by Hausman and Rodrik (2003). Instead the response to competitive pressures from imitative entry has been to encourage new entrants to search for business models that add to variety. At the same, incumbent entrepreneurial firms have been able to hold their own by exploiting traditional economies of scale.

In the software sector, start-up entrepreneurs played a leading role in creating and disseminating new business models and changing restrictive institutional practices. Indian software firms saw the burgeoning demand opportunity in the international market place and imported new institutional norms from the advanced nations, especially the USA, bringing about improved capital inflows and enhanced intellectual property protection. The new entrepreneurs not only helped reform local institutions, but also began building new institutions and practices which are now diffusing to other industries. Through their strategies, Indian start-up firms are changing the way business is done in India. This process of reform was made possible by first tapping into the economic opportunity offered by the huge boom in demand for IT services in the world economy.

Survey evidence also shows that the new start up firms outperformed the advanced multinational corporations and the large local business house subsidiaries in terms of capital efficiency and were at least as effective in creating employment and developing the new skill base.

This particular story has great relevance to other sectors in India and for other developing countries. Entrepreneurs and their supporters need not wait for government policy or institutional reform—they will wait a very long time for this. Instead, they should reject any notion that ‘development is impossible’ because of government bureaucracy and difficulties of doing business. Firms and business associations should be inspired by the Indian case to take the development lead, identify the business opportunities ‘out there’ and use their creativity to circumvent any barriers to growth. Indian entrepreneurs could do it. So can others.

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Table 1: Regionwise break-up of privately financed IT institutes in India

Region	East	Central	North	West	South
Year					
1987–88	12	25	5	80	66
1995–96	13	42	26	80	76
2002–03	84	76	82	86	92

Source: Adapted from Arora and Gambardella (2004: figures 2 and 3) based upon data from the All India Council on Technical Education.

Table 2: Economic impact of various software entrants, 2003

	New start-ups & spin-offs	Subsidiaries of domestic firms	Foreign firms & MNE subsidiaries	All firms
Number of firms	132	27	40	204
Employment				
Median annual rate of growth of employment (per cent per annum)	30	42	26	29.7
Median number of employees at the end of first year of operations	15	12	22.5	18
Median number of employees in 2003	80	148	90	100
Revenues				
Median annual revenue in 2003 (in Rs. million)	80	268	100	90
Median (revenues/age)	11.43	43.67	12.5	12.86
Equity				
Median equity (initial capital outlay in Rs. million)	3	37.5	10	
Ratio of median revenues to median start-up equity	26.67	7.15	10.00	18.00

Source: Firm origins survey.

Table 3: Three most highly rated motivations for entering the software business

Motivation	Frequency of extreme scores
Entrepreneurial firms (N=132)	
Identified new business opportunity	100
Desire for independence	74
Stimulated by research possibilities and the desire to innovate technologically	70
Business house subsidiaries (N=27)	
Diversification into a more profitable growth opportunity	19
Earn foreign exchange through exports	13
Growing software needs of the parent company	11
Foreign firms (N=40)	
High quality of programmers	35
Lower cost of programmers	29
English as international business language	25

Source: Firm origins survey, 2003.

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