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Indian software industry: Distortions and consolidation of gains

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Abstract

Employment in millions and export earnings in billions are the two most visible gains from the Indian software industry. The industry has withstood low value, low skill, and high volume tag to grow in size over last two decades. Separation of Chip fabrication and design companies have brought in certain jobs related to chip designing activities in India, albeit, restricted to a few companies. The industry structure, however, remained the same – the long tailed structure characterised by the small number of large companies and large number of small companies. In terms of the knowledge hierarchy the Indian software industry ranges from large share of the low knowledge level activities to small volume of high knowledge level activities- the basic dynamics being outsourcing by the first world enterprises who dominate the global market in their respective field of business.

Given this scenario the present article locates the Indian software industry within the broad understanding of market and hierarchy, where outsourcing could be for knowledge complements or for knowledge of terminated specificity. Both types are part of a dynamic process of building up competitiveness through creation of enterprise specific knowledge. The main distinction between the two, however, is where the former is closer to the process of creation of enterprise specificity; the latter is closer to the market pool of knowledge. Examining within these parameters the present article argues that the Indian software industry is at the bottom of knowledge hierarchy, where the bottom is highly segmented. Being alienated from the domestic manufacturing sector such a structure creates duality in the labour market as well as in the overall industry structure of the country. The distortions thus created disable the process of consolidation from the employment and income gains from the growth of the industry.

The paper argues that the political process, that successfully thwarted the automation of Indian manufacturing sector, has caused an irreparable damage to the global competitiveness, and has to be reversed to capitalise on the gains of the software industry across the whole economy.

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I
Introduction

We begin with a few basic observed characteristics of the Indian software industry. It has been widely accepted that the structure of the industry is long-tailed, barring a few firms who are engaged in hi-tech areas; most of the industry is actually engaged in low-tech, low skill, high-volume activities (Nath and Hazra 2002). The industry, however, has contributed significantly (about 3%) to the GDP, and more significantly to employment generation at a comparatively lower capital investment, and minimal government support and intervention. Regarding employment generation another important aspect is creation of employment opportunities for large number of young graduates who otherwise considered as unemployable. The industry also has got fare share of globally known myths and heroes, and for the first time recognised for its ability in project management and execution in high technology areas. The emergence and the growth of Indian software industry also show the importance of human resources in the industrial development of a country.

Among many concerns about the vulnerability of the industry most talked about is its export dependence, and that too mainly on a single country, which is USA. While geographical diversification of the clients is one way to reduce such dependence, the vulnerability of the industry rests on the fact that the Indian counter part of the global software industry is actually at the receiving end of the technological knowledge hierarchy. The source of this vulnerability is the inadequate development of the hardware segment of the industry and also limited exposure to the core software technology. The present paper elaborates some of these observations and emphasises the need for correcting the distortions and consolidation of the gains. In the second section of the paper we broadly outline the implications of outsourcing on knowledge hierarchy. In the third section we discuss the location of the Indian software industry in the global knowledge hierarchy. The fourth section suggests the nature of distortions in the labour market of the Indian software industry. In the fifth section effective policies needed for the consolidation of gains is outlined.

II
Outsourcing and knowledge hierarchy

Following Coase (1937) we can use firms (as organisation/or hierarchy) and market as alternative institutions. Williamson (1975) argued that market failure is the source of transaction cost. Because of asset specificity and bounded rationality certain transactions have to be executed away from market. This is the beginning of organization. Transaction cost is the cost incurred for avoiding market. Lazonick (1992), on the other hand, makes a distinction between 'market coordinated' and 'organization coordinated' enterprises. According to Lazonick a value creating enterprise is necessarily 'organization coordinated' since its basic dynamics is to create asset specificity. On the other hand, an adaptive enterprise is market coordinated. Once enterprise specific assets are created by an enterprise the same does not remain specific for all future time to come. The advantage created by an enterprise is emulated or imitated by others in the business. A diffusion process begins. Over a time period the specificity will not remain an advantage to the initiator enterprise. It has to look for new specificity and create new advantage. What happens to the assets that have become common advantage of the industry? Instead of going for endless accumulation of assets of different vintages the enterprise would externalise activities associated with those assets and would adopt market-coordinated

transactions for them. Every enterprise, therefore, will have both organization coordinated and market coordinated transactions. This process of moving from organization coordinated to market coordinated transactions is associated with the process of creation of asset specificity and gradual termination of the same over a period of extractable competitive advantage from the asset specificity. Hierarchy and market are two ends of the same chain. The process of relegation of knowledge to market from hierarchy will have various forms of mix of both, in between two extremes.

The basic characteristic of this dynamics is that an enterprise acquiring or sourcing new knowledge, internalising the same by creating specific physical and human assets in the one hand and on the other hand it is deconstructing knowledge and disposing the same of towards market over a time period. We may call it front-yard and backyard of industrial organization. Front-yard is constituted of acquisition of new knowledge and backyard is constituted of the deconstructed and further. In case of *horizental diffusion* no such system is in place and any policy of gaining technological progress based on such diffusion would enable at best attainment of some 'production capability' and not 'technological capability' as distinguished by Bell and Pavitt (1993). As they have argued, "---'technological accumulation' in industrializing countries is seen as involving technology that is embodied in the stock of capital goods, together with associated operating know-how and product specifications required to produce given products with given techniques at the relevant production efficiency frontier".

III
Location of the Indian software industry

India is one of the main destinations of outsourcing for global (US in particular) software industries. In terms of the knowledge hierarchy discussed above, as main destination of the outsourcing the Indian software industry is thriving on the process of externalisation of knowledge by the firms in the developed countries. The Indian industry, therefore, can be broadly categorised as the backyard of the global software industry. Even in the backyard its position is nothing very enviable in terms of technological capabilities.

NASSCOM has attempted some kind of classification of the software companies according to 22 different technical areas of specialization and their expertise in 18 relevant application areas. Specialization ranges from the low technology Y2K, various enterprise resources planning (ERP) packages to complex CAD/CAM, telecom and chip design. It is interesting to note that the maximum number of firms specialize in web technologies, Internet and Intranet. More than 66 per cent of total firms fall in this classification. Other crowded areas of specialization are software product development, E-commerce/EDI, software maintenance and migration, RDBMS, ERP/MRP solutions, where at least 40 per cent of total firms are pursuing their activity in each category. Large numbers of firm cater to legacy problems, which are considered as low value-added software services. These include providing Y2K compliance, conversion projects (moving from one system to another), Euro and variety of data conversion. Such specializations are labour intensive and require low value added services such as low level of programming and coding, testing and maintenance. During 1998-99, exports of Y2K software solutions alone comprised about $560 million or 21 percent of total export (D'costa 2002).

This observation suggests that the software industry of India actually belongs to the bottom of the global knowledge hierarchy of the industry. At the bottom the

industry reveals again another interesting characteristics. The firms operate in a market where price competition rules. Large numbers of firm are offering the same kind of services and competing with each other on the basis of cost-price advantage. This is broadly the market place – the bottom of the knowledge hierarchy, where firms are market coordinated and firm specific knowledge generation is at its lowest. A NASSCOM survey shows that most of the firms try to grab a piece from different types of services in demand. As a result market gets segmented among large number of small players. The table below gives information about 479 firms providing services in 22 areas identified by NASSCOM. Although the data relates to the year 2000, there is no reason to believe any significant change in this scenario.

Table: Number of areas of operation

Number of areas of operation	No. of Firms
1 to 4	180 (37.58)
5 to 8	165 (34.45)
9 to 12	92 (19.21)
13 to 16	34 (7.10)
17 to 20	8 (1.67)
Grand Total	479 (100)
Source: Indian IT Software & Services Directory, NASSCOM (1999-2000)	

In the light of the above we can locate the position of the software industry of India. The industry has been working as the backyard of global (US in particular) software industry. The main features of this backyard are: (a) Firms are at the bottom of the knowledge hierarchy and operating in the environment of price competition. (b) The firm specific knowledge generation is minimum. This is evident from the fact that many firms are doing the same kind of job, and therefore, technological capability wise not distinguishable from each other. (c) There is very little skill specialisation by firms. One firm takes up varieties of jobs that are unrelated to each other. This also suggests that firms do jobs that do not need any specialised skill.

The concern about the location of the industry in the global knowledge hierarchy is overshadowed by the fact that the industry has emerged as the largest employment creator during the last decade. Having fare share of the global unemployment problem, the location in the knowledge hierarchy appeared as non-issue. However it is the question of sustainability and utilisation of the potentiality of the industry that bring in to the surface the distortions created by the present state of the industry and its long term implications.

IV
Nature of distortions

This has created two types of distortions: a) distortion in the product market and b) distortion in the labour market. The product market distortion is the result of backyard status of the industry and also the absence of linkages with the domestic

production system. Hazra's (2003) analysis shows that the inter-firm differences in the market share depend mainly on the access to export market. Hazra also shows that degree of competition, measured by the number of firms to compete with over a company's lifetime, does not explain firm's respective market share. This implies that firms are actually engaged in similar business, and the market share depends on the respective ability to supply at a ruling price. Following Lazonick these firms can be called laggards located at the backyards and devoid of technological innovation and ability to move up the value chain. The sustenance as laggards has been strengthened because of sustained resistance to automation of the domestic production system. The result was an island of industrial activity not rooted in the domestic production system, surviving as an appendage of overseas industries. At the same time because of the revenue generating might, the industry exerts huge influence on both social and physical infrastructure.

The labour market distortion is a corollary of the product market distortion. Comparative compensation package being much higher the software industry has created considerable bias in the career options, education systems, and wage differentials. According to a NASSCOM estimate during 2001 and 2005 on an average about 55% of the total IT professionals is constituted of engineering degree/diploma holders. According to another estimate as of March 2001, India had over 410,000 working software professional. Out of a total of 122,000 engineers trained each year, about 75,000 join the software industry. Universities, and IITs, are the principle sources of newly qualified personnel. In addition, private sector institutes train thousand of other technical personnel (www.indiainfoline.com).

Arora (2001) observed that although the software sector is human capital intensive, the Indian software industry does not require exceptional skills beyond academic training at the first-degree level. The bulk of the work to produce software in India is relatively non-technical in nature. It requires mostly logical and methodical work and familiarity with software development tools and languages. Fresh graduates from a good college after having few months of orientation will have the ability to take up a programming assignment. Indian software firms do not really require highly talented young software professionals for the activity they are involved in. Most of the firms hire graduates from private training institutes having diploma degree. Bulk of the engineering graduates who are not trained as software engineers or computer science, also join in software sector because of the marked preference for engineers of all types, not just software engineers or computer scientists.

The fall out is the distorted human resource allocation and under utilisation of the human resources. There is no proper estimate of the extent of such distortion and its impact on the overall productivity of the Indian economy. In the diagram-1 we have tried to provide a graphical presentation of the distortions created by wage differential.

The diagram depicts a positive relation between value chain and skill level required. Different skill levels refer to different wage rates and they are also positively related. Skill levels have corresponding ratio of high and low skilled manpower (H/L). If wage rate increases, value chain of operation remaining the same, we get higher H/L at a higher wage rate. The labor market distortion is $W_1W_2E_2E_1$. The implication is reallocation of human resources, social infrastructure, and income distribution.

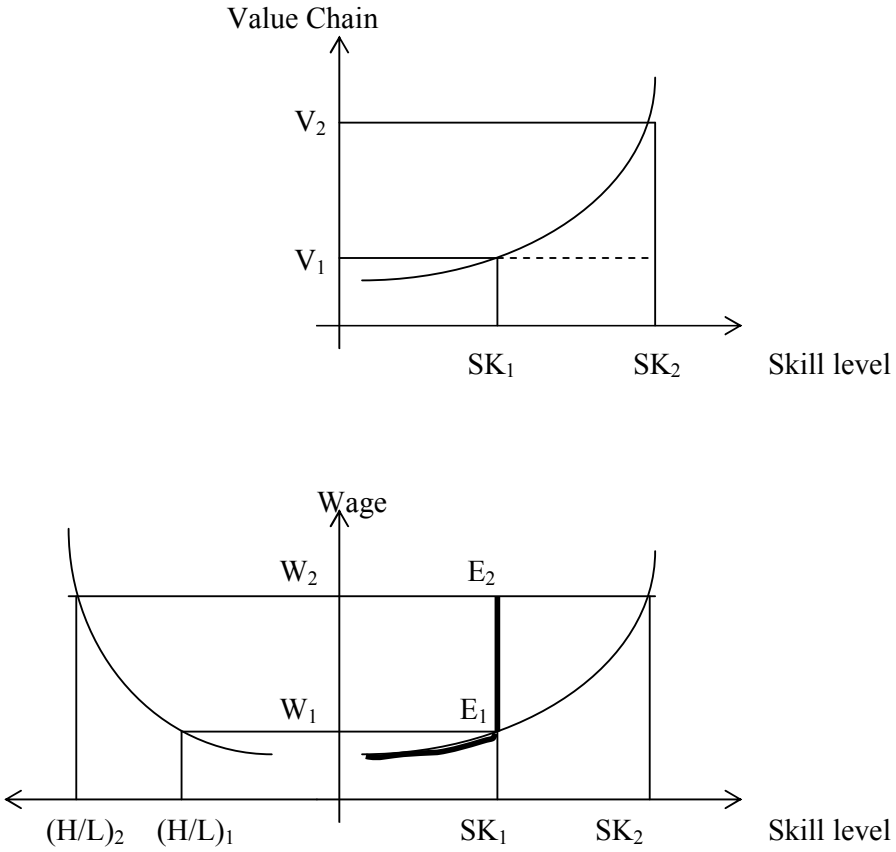

Diagram 1: Distortion in the labour market

V
Consolidation of gains

The software industry of India has singularly generated employment and income like never before by a single sector. The impact of the success of the industry in the economy as a whole has been secondary, mainly derived through the income effect that indulged conspicuous consumption. The high rate of profit earned by the industry has been generally invested in the expansion of the business overseas through acquisitions. Much publicised acquisition of Corus is proposed to be partly funded by capitalising on the market value of TCS, the software arm of the Tata conglomerate.

The industry's contribution to the productivity of the domestic production activities has been limited by the policies that constricted automation of the industrial production in the country. While success in the space research and missile programme are proofs of India's capability in the frontier technology areas, the same has neither been reflected and nor ever translated to the technological competitiveness in

industrial machinery production. As a result, although we can manufacture consumer goods like washing machine and highly complex textile machinery, the control panels of these machines have to be imported. Once considered as a blue chip company, HMT has been competed out of the market because it failed to integrate the new electronic devices in its product range.

The political reason against industrial automation has been the fear of job loss. The shortsighted political vision failed to appreciate the fact that even the existing jobs could be in danger unless aided application of new IT based technologies across the industry. The potentiality of creation of new jobs actually increases many folds than protecting jobs in the old production practices. If Indian software industry could create so much of job opportunities only by serving overseas clients, what would have been the scale of new job creation if we add the wide spread application of IT in the domestic production system?

A strong footing in the global software industry being achieved, the need of the hour, although quite late, is to hone the capability in the domestic production system. At the policy level a strong incentive structure has to be created for industries to plan for wide spread application of IT. Considerable investment has to be made for creating state of the art IT infrastructure and also raising the capability of the IT related activities up the value chain.

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