Trends in International Competitiveness of Indian Firms: Exploring Role of Technology and Innovation through select cases Comparative Cases[#]

Abstract

Rise of *emerging country multinational enterprises* (EMNEs), particularly from China and India, has attracting attention of leadership in industry, governments as well as academia. Some EMNEs are even attempting catch-up in emerging high technology industries. Key objective of this paper is to make sense of longitudinal trends in **competitiveness of Indian firms.** We begin by identifying overall trends in competitiveness of Indian firms based on analysis of secondary data. To explore the role of technology and innovation, we take a comparative case of two technology-based focal firms that had unique achievements and cooperative strategy with select institutions. The two firms were selected as polar cases in terms of their focus on emerging industries. While one firm was pioneering emerging industries such as solar, the otherstarted in more traditional industry. Quantitative analysis of the trends in competitiveness of the firms on select factors provides interesting findings. Innovation capability-based approach was found to be more sustainable as compared to output capability-based approach. Areas of high potential for further research are also identified.

Keywords: emerging country multinational enterprises (EMNEs), catch-up strategies, emerging technologies, industrial competitiveness, learning and innovation capabilities, export competitiveness

Conference Theme: Emerging Technologies and Development

Conference Sub-theme: Competitiveness of Indian Firms

Paper Type: Perspective paper

[#]K. S. Momaya, SJM School of Management, IIT Bombay, Powai, Mumbai 400 076
Email: momaya@iitb.ac.in Phone: 022-2576 7759

Introduction

Competitiveness is regaining importance as even stronger countries struggle to address problems of today's turbulent world made more complex by recurring eruptions of the volcano that rocked world in 2008. Whether ideas of restoring competitiveness in the USA (e.g. Pisano and Shih, 2009) or revisit by Japan (e.g. Yonekura et al., 2010), we are seeing most serious countries thinking freshly about competitiveness, even if not published explicitly. International competitiveness has been and will become important for India (e.g. Momaya, 2001, 2011), as it embraces the open economy model that is closer to laisezz-fair. It faces perhaps the worst of economic crisis post 1991 discontinuity. Despite many factor advantages and more two decades of liberalization, the employment, opportunities, incomes and quality of life (QoL) are improving too slowly(or actually deteriorated in several states or cities) and the gaps between ground reality and aspirations sparked by (misunderstood?) market economy are widening to unsustainable levels. The per capita GDP for India remains too low despite significant improvements in overall competitiveness (Table 1). While the 'golden age of capitalism' may be over as the followers or latecomers (e.g. Germany, Japan, Korea) have caught-up in industrial competitiveness with the prime movers (the USA, UK) by early 1990s (Miyajima, Kikkawa and Hikino, 1999; p. 6), sustained competitiveness of Japanese firms and cooperative strategies such as business-government relationships need careful learning, if Indian firms and country as a whole wish to catch-up on competitiveness.

For several reasons, Indian enterprises **firms** will have to play a bigger role for competitiveness challenges for India. One key reason may be sustained decline on international trade front, a well accepted factor of country competitiveness. Our research hints that countries that understood dynamics of competitiveness and were serious tried and achieved balances on key accounts such as trade early on. Glimpse of trends in trade statistics shows that India has been consistently setting higher records of trade deficit for years for too long, an alarming situation for the country that has world's largest youth. This is also adversely affecting current account and exchange rates, as reflected in downward spiral for rupee for decades. The consolation that remittances and FDI can address the current account deficit (CAD) has limitations and India may reach limits sooner than expected. Even if dominance of developed country MNEs (Siddharthan and Narayanan, 2010; p. 7) is reduced, there is enormous scope for Indian MNEs to catch-up on several fronts. Whatever pronouncements, governments in India have limited capabilities to facilitate game of international business and hence their role can be limited on faciliatating factors such as encouraging environment for innovation, competitiveness and exports. In current context in India, Indian firms can and should play a bigger role.

Arrival of eMNEs on world stage has been researched extensively internationally as well as in India (e.g. Karki, 200X, Siddharthan and Narayanan, 2010; Momaya, 2013? IJGBC). Most of researchers are optimistic that the arrival of Indian firms was beginning of a major trend that will help India do massive catch-up in competitiveness. For instance, Karki (200X),

compared it with phenomenal impact Japanese firms had on world markets. Siddharthan and Narayanan (2010) termed them as world players in high-technology industries. Several institutions and researchers in the West were also impressed by the catch-up of eMNEs with advance economy MNEs (AMNEs) even in emerging high technology industries, where their knowledge-based disadvantages are most severe (e.g. Awate, Larsen and Mudambi, 2012). One key objective of this paper is to make better sense of trajectories of international competitiveness of Indian and select Asian firms.

This perspective paper has a key objective of evolving fresh views on IC of Indian firms and identify areas of higher urgency. More specifically, we are interested in exploring trends in technology-based firms and role of focal institutions such as IITs.

The paper is organized as follows. The following section gives a glimpse of relevant literature. Data and methods in the next section are followed by discussion on findings to evolve propositions.

Brief Literature Review

The literature review for this perspective paper is brief, but efforts are made to make it more balanced. The concept of competitiveness is vast and having relevance across levels—country, industry to firms; the literature is available across disciplines from economics and management to policy. For the context of this paper, we will focus on firm level and hence on management only, particularly from strategic and technology management views. For better balances, we have been trying to identify indigenous research and best of not only the West, but also from the East.

Competitiveness

We use the term corporate competitiveness to cover industrial houses—member firms, their strategic business units (SBUs), supply chains. The fundamental competitiveness question at this level may be articulated as:

- What determine the success of firms around the world?
- What determines the scope and behavior of the firm?
- Why it decides to think beyond itself about ecosystem (suppliers, related and supporting industries, industrial commons {e.g. Pisano and Shih, 2009}) and country competitiveness? How the firms synergize with ecosyetems to make impactful contribution to ecosystem (e.g. IBM, Toyota, Nokia, Samsung)?

The case of Nokia and Finland highlights elements that help firms climb the ladder of competitiveness for self and the ecosystem. One way to understand the concepts may be called industrial competitiveness.

Industrial competitiveness is much more challenging area as it considers complex dynamics of interactions among not only competing corporates across a supply chain or industry value system, but also dimensions such as industry lifecycle, attractiveness, industry-academia-government cooperation and macro/international forcesthat can shape the long-term competitiveness of an industry. For instance, several Indian firms excelled in software (e.g. Ajitabh and Momaya, 2004; Narayanan and Bhat, 2010), but policy paralysis in India for several years can hamper their abilities to climb more challensing steps on ladder of competitiveness (Uma &Momaya,..). Even in the 'Golden Age of Capitalism' business-government relationships and policies used to play a key role across continents (Miyajima, Kikkawa and Hikino, 1999). It can play a major role for India, if it wish to break the vicious loops and 'competition sans competitiveness (e.g. Kathuria, 20XX, Momaya, 200?).'

Considering the fact thatInternational trade, exchange of HR, investments and exports represent key dimensions of internationalization factors of competitiveness of firms. In current context in India of record trade deficits, exports assume very high significance, and we have given very high consideration to export capabilities or performance in this paper.

Strategy

Researchers have approached competitiveness issues highlighted above from different perspectives. Growth has been in DNA of Indians, and growth strategies has been one perspective (e.g. Umamaheswari and Momaya; Bhattacharya et al.; Ghosh, 2010). In present context, growth strategies are necessary for most Indian firms. While many Indian firms have been good at several alternate paths to growth (e.g. through market penetration, diversification; Ghosh, 2010), international expansion, particularly through exports, is highly desirable, but found difficult for many.

Concept of opportunity-based and capability-based strategies provide an interesting approach to strategic choice. While both are relevant, the relative emphasis a firm gives to either is often decided by strategic intent (Momaya et al., 2013). Our research found vast and increasing gap between the firm focusing on either when we did a comparative benchmarking of select Indian and Korean industrial houses and in case of software industry also (e.g. Umamaheswari and Momaya, 2008). Firms focusing on opportunity-based strategies achieve output catch-up (Awate et al., 2012), but face major challenges to achieve innovation catch-up, as it demands broader and deeper knowledge bases, often the positions well build by AMNEs.

Data and Methods

Research Design

We adapt qualitative method for exploratory phase of this research and try to evolve propositions based on findings from analysis of longitudinal data. For a macro overview, trends in contribution of Indian firms in global samples were reviewed. For the purpose of the present study, competitiveness of Indian firms was adapted from generic definitions (Momaya, 2001) and defined as ability of the firms todesign, engineer, manufacture and market products or services and achieve growth. The growth is ultimately reflected on their abilty to improve positions in global business Olympics such as Global 500. Following this definition we will review trends in competitiveness of Indian firms in Global 500.

For the core part, I adapt comparative case approach (Yin, 2003; Siggelkow, 2007).The two firms were selected as polar cases in terms of their focus on emerging industry. We started with broad list of ET500. Later considering focus on technological innovation, we focused on innovative firms.Considering the context, we shortlisted top 4 firms with ratio of forex earning to net revenues of more than 0.5 on average of two snapshots. The years for snapshot were selected at 2000 and 2008. For polarity, we selected one firm that is very high on exports and other with high potential, but decline as seen in ratio of forex earning to sales.

Following criteria were used to select most relevant polar cases among the 8we shortlisted:

- Substantial revenues from manufacturing in India
- Track record (at least for last 12 years) of positive trade balances due to earnings in forex
- Longer term collaboration with technological institutes such as IITs

While one firm—Moser Baer--was pioneering emerging industries such as electronics and solar, the other—Bharat Forge--started in more traditional industry. Data was collected about the firms from secondary sources (including analyst reports, web pages). For structured data, among alternate data sources, Capitaline database was selected, as has been case by others (e.g. Pillania, 2008). Quantitative analysis of the trends in competitiveness of the firms on select factors provides interesting findings.

The financial volcano of 2008 and its continuing eruptions in many parts of world, including India, are making any longitudinal comparisions very risky, but nevertheless, I take it to make some sense. I will focus on international competitiveness dimension. While it can be evaluated on several factors of competitive Assets-Processes-Performance (APP; Momaya, 2001), I will focus on international performance taking balances as measured on net forex earning (Table X).

The data for analysis was taken from Capitaline, a common practices in such research (e.g. Pillania, 2008).

Emerging Finding & Discussion

Macro view of trends competitiveness of Indian firms hints at huge untapped opportunities. Measured in terms of contribution of Indian firms in Global500, the share of India is just 1.6 %, less than one tenth of its population share. While the USA still ranks No. 1 in terms of no. of firms and Japan also has crossed its peak, catch-up by China is astounding. While just 8 firms ahead of India in 2005 at 16, China has added massively to reach 89 firms in 2013 (Table 2). This jump of 73 over the period, whereas India stagnated at 8 has made China more than 10X ahead of India, hints at the potential for younger country such as India.

Our ongoing research hints that the opportunities for India can be even more exciting when we go beyond the number of firms into aspects of quality, technology, productivity, etc. For instance, employment, including in focal firms, will achieve high significance in tougher times. Only firm from India in Global500 sample to figure in the Top 50 Employers sub-sample in 2013 was State Bank of India (at rank 39; 295,696), where as China has 6 out of Top 10, with multiples of employees as compared to SBI. For instance, China National Petroleum had 16, 56, 465 employees in 2013. Gaps between firms from India, and China or other countries in factors of competitiveness such as exports, productivity, technology can be similarly vast.

Table 2 Trends in competitiveness of firms from select key countries

No. of firms in the sample of Global 500

Country	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2013**
The USA	176	170	162	153	140	142	132
JAPAN	81	70	67	64	68	71	62
CHINA	**16**	**20**	**24**	**29**	**37**	**46**	**89**
FRANCE	39	38	38	39	40	39	31
GERMANY	37	35	37	37	39	37	29
BRITAIN	35	38	33	34	25	29	26
SWITZELAND	11	12	13	14	15	15	14
NETHERLANDS	14	14	14	13	12	13	11
CANADA	13	14	16	14	14	11	9
ITALY	8	10	10	10	10	11	8
INDIA	**8**	**6**	**6**	**7**	**7**	**8**	**8**
Contribution from Asia in the Sample	105	96	97	100	112	125	159

Source: Developed by team at Technology Strategy Lab at SJMSOM, IITB based on data from Fortune Global 500, various years

Considering the limited improvement for India in Global500 over the period, one next level of larger sampler was also explored and hints at interesting findings. Global2000 sample (Forbes, 2012?) was adapted for the purpose and two snapshots for year 2006 and 2013. Data were collected for all firms from India in the sample for factors such as sales revenues, profits andassets, and aggregated. The significant jump in number of firms from 33 to 56 (Table 3) is a welcome trend. Revenue per firm has increased, while profitability has taken a little dip in tune with tougher times.

Table 3 Trends in contribution of Indian firms in Global 2000

Criteria \ Year of survey --->	**2006**	**2013**
Number of firms	33	56
Sales revenues (US $ B)	162.3	616.0
Revenue / firms	4.9	11.0
Profits (US $ B)	18.4	53.5
Profits as % of revenues	11.3	8.7
Assets	503.3	2030.4
Assets as % of revenues	310.2	329.6
Return on Assets	3.7	2.6

Source: Developed based on data collected from Forbes (2013)

In terms of percentage of sample--2.8 % of 2000 firms in 2013 as compared to just 1.6 % in Global500—reflects better performance by tier next to Global500. Detailed analysis hints that export oriented firms such as information technology majors Infosys, TCS, Wipro find place in Global2000 and some of them have capabilities to enter Global500 also in future. While public sector units dominate in Global500, none of them qualifies on screening criteria of international competitiveness, because they have very limited exports.

Having got a feel for macro trends, details in trends of competitiveness and role of capabilities is explored by analysis of comparative cases of the two firms: Bharat Forge and Moser Baer. Comparative views of the two firms gives interesting findings. Of quite comparative size in terms of net sales (800-1000 crore in 2004; see Table 4 and Appendix A2 for more details), both have tried to improve revenues, often through exports, significantly over the decade 2004-13, despite the economic volcano and domestic governance paralysis. Moser Baer started with admirable ‘revenue earning in forex as % of net sales’ of more than 85 % at beginning of the period, it has tried to sustain at more than 50 %, despite declining trend. Bharat Forge achieved more superior jump in ‘net sales’ over the period (295 % as compared to 97 % for Moser Baer), with more steady growth and achieved the peak in 2012;remarkable feat as it was achieved largely through exports in tougher times.

Table 4 Trends in growth and international competitiveness, Amounts are in Rs. crore

Criteria of Competitiveness \ Financial Year -->	201303	201203	201103	200903	200703	200503	200403
Net Sales							
Bharat Forge	3151.23	3685.98	2947	1995.6	1835.04	1167.06	796.67
Moser Baer	2139.36	1918.32	2110.61	1965.4	1731.91	1577.9	1085.52
Net Forex Earning							
Bharat Forge	1344.14	1546.44	1103.32	877.09	656.62	469.58	296.88
Moser Baer	715.77	278.77	483.36	518.25	444.17	601.3	557.83

Source: Developed based on data collected from Capitaline

Exceptional achievers in several respects, the two firms seems to have been following quite divergent paths for climbing up the ladder of competitiveness. While in Moser Baer is in emerging industry that demands continuous technological and other innovations, Bharat Forge has much mature strategic intent as seen from stances it takes. It explicitly highlights its focus on technology and engineering, development partner and trans-continental presence across a dozen manufacturing locations, serving several sectors including automobile, power, oil and gas, rail & marine, aerospace, construction & mining, etc. (Bharat, 2013). It offers full service supply capability to its global customers from conceptualization to product design, engineering, manufacturing, testing and validation, and claims to have the largest repository of metallurgical knowledge in the region, a remarkable achievements for the firm having roots in a traditional mature industry.

The divergent paths can be mapped on typology of capability-based and opportunity-based that we have been evolving. The Moser-Baer seems to be closer to opportunity-based path, whereas Bharat Forge seems to be closer to capability-based. Bharat Forge may be positioned in 'Hidden-Champion' quadrant in capability-performance matrix (for classification of SW firms, please look at Ajitabh and Momaya, 2004). The firm has steadily build capabilities to overcome barriers in home market, and sustained its march through clearer focus on internationalization (e.g. Pillania, 2008). This is best reflected in very admirable ratio of forex earning to expenses for Bharat Forge (Range 4.66-8.19, with average over the period 6.42; comparable nos. for Moser Baer are 1.34-2.51, 1,76). This distinctly differentiates the firms. These factual support to our longitudinal research imply the following proposition:

Proposition 1: *The firm adapting opportunity-based approach can achieve results on output capabilities, but catch-up on steps of competitiveness is less sustained and less impactful as compared to firm adapting capability-based approach.*

I posit that the differences in capabilities of the two firms are outcome of a conscious strategy (e.g. Awate, Marcus, Mudambi, 2008), particularly strategic intent. Some of these

choices are very important, as these are made at early stages of evolution of the firm and these are less reversible. I propose the balances—particularly trade balances—as a good predictor of potential innovation and other capabilities for the firm. Responsible firms keen to climb-up make it part of their culture. Going deeper into the financials of Bharat Forge, I found that for long time they have achieved and sustained favourable trade balances, as reflected in their high forex earning to expenses ratio (Table A1 and Table A2 in Appendix A2). Hence, the following proposition is formulated:

Proposition 2:*The capability-based choice is demonstrated quite earlier on balances and can be a good predictor of potential innovation catch-up and break-out to much higher steps of competitiveness.*

Both the firms have been facing stagnation and may need breakthrough innovations to scale-up to new heights. Peak of competitiveness drive within the period may be was around 2004 for Moser Baer and around 2010-11 for Bharat Forge (Table 4). Both the firms have capabilities and high potentialto climb up heights, including Global2000, and will need better 'break-out.' The technological and innovation management capabilities can be key drivers of break-out, as these firms have several base capabilities. Bharat Forge evolved several innovative cooperative initiatives (incl. one with IITB) to enhance capabilities of middle-level employees. Moser Baer had cooperative R&D with IITD and other institutions.

Disruptive innovations (incl. technological one) that Japanese firms lead and then followed up by Asian Tigers and most recently by Chinese firms (e.g. Li, 2013) can be of some help. The book emphasized the strategic importance of disrupting global incumbents by local entreprenures on the global basis, who can not only catch up with, but leapfrog, global incumbents. Elements of such disruptive innovations for Indian contexts are discussed in Momaya and Gupta (2013), Jain, Mukundan and Gupta (2013). Industrial houses in India may benefit enormously by strengthening ecosystem of corporate entreprenureship(e.g. Bharadwaj, Sushil and Momaya, 2008) within their firms and in cooperation with supplier networks, institutions and governments.

Case of an emerging industry—renewable energy—provides interesting clues. Indian firms such as Suzlon in wind energy and Moser Baer in solar energy were quite fast and successful at leveraging opportunities, but their capability building efforts fell short on phases of capability development, particularly absorptive capacity: Knowledge exploitation, acquisition, assimilation, transformation . Being early entrant, but not having endurance to climb-up seems to be a common barrier many Indian firms face.

While subdued little bit, due to two decades of low growth, Japanese firms still emerge remarkably strong in our research and seems to be building well for sustainability. Several Japanese focal firms have now more than half of their revenues from outside home market and

some daring ones such as Canon had80 % in 2012, quite an achievement for a $ 40 billion firm (Fortune, 2013; p. S4). Such firms sense global opportunities quite well and have quite mature technology / innovation management (TIM) capabilities and portfolio of proprietary technologies and products. Sources of competitive strength of Japanese firms may take a book to answer, but observations by Dore (1994) may have some relevance. Better balances between efficiency and equality achieved by Japan may be rooted in 'togetherness,' (some may also refer as 'Japaneseness' and a sense of their part of the country, is still an important part of their self-identify). Challenge for Indian eMNEs will be to build on such identity while progressing on ladder of internationalization.

Areas for Further Research

One key objective of the exploratory paper is to evolve areas for further research. The emerging findings based on our ongoing research on competitiveness (only a glimpse could be given here, for more readers are encourage to visit our IITB web-pages) hints at following areas of further research of high potential among vast untapped areas in competitiveness.

- Vast difference between uptrend in competitiveness of country (Table 1) and stagnation in corporate competitiveness (Table 3) is an exciting area of research. Even if we take case of China—exact reversal—as exception, we have seen much more synergistic or even business-lead competitiveness catch-up across levels in several countries. Neglect of balances, e.g. on export front (Table 2), hints at wastages that must be researched and addressed. These all hint at major gaps in values of our entreprenures, professionals, politicians and buraecrats and other human pillars and root causes may go deeper into education and family. Individual competitiveness is fine, but without organizational excellence that thinks about country also, India can not aspire to climb competitiveness ladder further in 20s (Table 1). These concepts provide fertile grounds for further research.
- Despite great visions (from time of independence to Vision 2020) and noble intentions, India and many Indian firms seems to be repeatedly caught in vicious loops (e.g. of imbalances on income, trade,…) that it finds difficult to break-out. Technological and innovation capabilities have often found to be a driver of break-out (e.g. Nobeoka, 2006) and also found to be differentiator between the two case companies in this paper (Momaya and Chanchodia, 2012?). Unfortunately, very few Indian firms seems to be improving maturity of systematic innovation from Juggad (Krishnan and ???????, 20??). Analysis for root causes for such vicious loops can be an exciting area of research.
- The two cases pointed out here are exceptional examples that tried to break-out and climb steps on ladder of competitiveness. Even they face tremendous challenges, but have drive to break-out. Understanding drivers of such break-out can be an exciting research that can benefit many firms working so hard to break-out.

- Differences in role of FDI in exports and strategies of international MNEs-- that is market-seeking in India and efficiency-seeking in China (Siddharthan and Narayanan, 2010)—are well highlighted in literature. The need of Indian MNEs to contribute significantly to address real competitiveness issues is urgent and may be appreciated by some stakeholders. The mechanisms of business-government cooperation, consistency and cohenerence among relevant industrial and export policies are less mature in India, partly because these are less understood. For instance, competitive countries have enormous maturity to help a domestic industry achieve full potential from domestic to global markets and manage industry lifecycle for maximum benefit of stakeholders (for an excellent case in Japan including role of MITI, see Suzuki (1999)). There is enormous scope for research in India to understand such dynamics and bring out findings that are implemented to enhance competitiveness.
- The scenario of millions of people finding new jobs and improving their lot in life with rising Chindia benefitting business (e.g. Sheth, 2008) seems to have stagnated (let us hope for a while only). The innovations by the Chindian firms (e.g. Momaya and Gupta, 2013) seem less equal to monumental tasks that lie ahead—the ascent towards a knowledge-based economy (e.g. Masuyama and Vandenbrink, 2003), the alleviation of widespread poverty and the restoration of environment health. How can Indian firms improve competitiveness with a fraction of carbon loads is an exciting area of research. This will need to be complemented by more sustainable institutions, infrastructure across levels from local, city, state and country.
- IITs often consider the nurturing of human resources (HR) as the most important direct contribution to firm's and industry'scompetitiveness. Our ongoing research is hinting at several major gaps in the "black box—how IITian contribute to industrial competitiveness". Review of a top leadership (Chair and vice-chair) of firms from India in the Sample of Global 2000 (Forbes, 2013), confirmed earlier finding about miniscule contribution of IITian (7 / 55; 12.72 % and none from IITB) to leadership. Even some of them may prefer to highlight their international education (e.g. PG from Harvard, Cambridge,…) more prominently than IIT education; may be due to more value-added experiences. Majority other may have limited technology background to conceive and effectively execute strategies for technology/innovation-based differentiation. There are several high potential areas of research here.
- Many leaders in P&B, industry and even academia use the word Indian firms very loosely. Time has come to evolve acceptable definitions for longitudinal comparability of research results. India may not be able to go to heights several countries in EU or East Asia have climbed in terms of maturity of their definitions and mechanisms, but we may begin by at least easy financial definitions that can technically give us clear separation for analysis. There is need for research to identify which firms have already shifted from Indian to international and which are moving rapidly towards international.

Concluding Remarks

Indian firms are working hard to overcome constraints and grow through internationalization. That demands industrial and international competitiveness. Several Indian firms are working systematically to climb steps on the ladder of competitiveness and aspire to be emerging country multinational enterprises (EMNEs). Rise of EMNEs from India and China has been attracting worldwide attention (e.g. Seth, 2008; Siddharthan and Narayanan, 2010; Li, 2013). While confirming the rise, this paper finds key differences in trajectories of EMNEs from India and other countries. Despite limited samples, the trends hint atsignificant premature stagnation for Indian firms, particularly on steps of international competitiveness. The polar cases give some clues to dimensions of the phenomenon.

The phenomenon‘catch-up for EMNEs’ has several dimensions and is quite challenging for Indian firms. Catch-up in market share, particularly in domestic market, with domestic incumbents or even advanced economy MNEs (AMNEs) is possible and several firms are doing it in India also. The same is often achieved by focus on output capabilities. It is ‘break-out to higher stages of competitiveness’ demanding integration of different capabilities that is achilles hill for Indian firms. Technological and innovation capabilities are very crucial for the break-out. There is enormous potential to enhance industrial competitiveness contribution of IITs; that will demand new perspectives on cooperative strategies(e.g. Momaya, 2008, 2011) including industry-academia collaboration.

Acknowledgements

The author wish to acknowledge support of the Ministry of New and Renewable Energy (MNRE), Government of India to National Centre for Photovoltaic Research and Education (NCPRE).Financial support from IIT Bombay, IRCC for competitiveness research project is acknowledged.Cooperation from professionals in Bharat Forge, Moser Baer and Suzlon, and several young researchers in the project is gratefully acknowledged. Particularly, Dr. R. Mukundan, Dr. Ruchita Gupta, Ms. GouriGargate, Pranusha, AnkurBasumataryand Raj Mohan at Technology Strategy Lab, SJMSOM, IIT Bombay, and Dr. R. Umamaheswari and other volunteers at the Strategy and Competitiveness Lab, DMS, IIT Delhi have been contributing.

References

Ajitabh and Momaya K. 2004, "Competitiveness of Firms: Review of Theory, Frameworks and Models", *Singapore Management Review*, First half, Vol.26, No.1: 45-61.

Aoki M. and Dore R. (eds.), (1994), The Japanese Firm: The Sources of Competitive Strength, Oxford University Press, New York.

Awate, S., Larsen, M. M., &Mudambi, R. (2012). EMNE catch-up strategies in the wind turbine industry: Is there a trade-off between output and innovation capabilities?.*Global Strategy Journal*, *2*(3): 205-223.

Bharat, 2013, Annual Report and elements of web page of http://bharatforge.com/ , last accessed on 12 July http://bharatforge.com/

Fortune, 2013, Sensing Global Opportunities, Fortune Asia Pacific Edition, No. 10, July 22, pp. S4-S5.

Ghosh A. (2010), Strategies for Growth: Help your business move up the ladder, IIM Ahmedabad Business Books, Random House India, Noida.

MiyajimaH.,Kikkawa T. and Hikino T. (eds.) (1999), Policies for Competitiveness: Comparing Business-Government Relationships in the 'Golden Age of Capitalism,' Fuji Conference Series, Oxford University Press, New York.

Momaya, K. (2001). International Competitiveness: Evaluation and Enhancement. New Delhi: Hindustan Publishing Corporation.

Momaya, K. (2011). Cooperation for Competitiveness of Emerging Countries: Learning from a Case of Nanotechnology. Competitiveness Review: An International Business Journal incorporating Journal of Global Competitiveness, 21 (2): 152-170.

Momaya K. S. and Gupta R. (2013). "Economic competitiveness and disruptive innovation: Exploring the macro and micro contexts in China and India", in Lee P. P. (ed.), Disruptive Innovation in Chinese and Indian Businesses: The Strategic Implications for Local Entrepreneurs and Global Incumbents, Vol. 97, Routledge, 2013: 33-49.

Moser, (2013),Annual Report and elements of web page of Moser Baer, http://moserbaer.com/ last accessed on 12 July.

Narayanan K. and Bhat S., (2010), Technological Efforts and Export Performance of IT Firms in India, in Siddharthan N. S. and Narayanan K. (eds.) , (2010), Indian and Chinese Enterprises: Global Trade, Technology and Investment Regimes, Routledge, New Delhi: 241-269.

Nobeoka K. 2006, MOT[技術経営]入門 (in Japanese), {Introduction to Management of Technology}, 日本経済新聞出版社, Tokyo.

Pradhan, J. P. (2007). Growth of Indian multinationals in the world economy: implications for development.

Sheth J. N. (2008), Chindia Rising, Tata McGraw-Hill, New Delhi.

Siddharthan N. S. and Narayanan K. (eds.) , (2010), Indian and Chinese Enterprises: Global Trade, Technology and Investment Regimes, Routledge, New Delhi.

Sun S. L. and Yang X., 2013, Transformative capacity and absorptive capacity: The rise of Chinese wind turbine manufacturers, in Li P. P. (ed.), Disruptive Innovation in Chinese and Indian Businesses: The strategic implications for local entreprenures and global incumbents, Routledge, Oxon, Oxford: 109-135.

Suzuki T. (1999), Industrial Policy and the Development of the Synthetic Fibre Industry, in MiyajimaH.,Kikkawa T. and Hikino T. (eds.) (1999), Policies for Competitiveness: Comparing Business-Government Relationships in the 'Golden Age of Capitalism,' Fuji Conference Series, Oxford University Press, New York.

Yin R. K. 2003.*Case Study Research: Design and Methods* (3rd edn). Sage: Thousand Oaks, CA.

Appendices

Appendix A1 Working definitions of key concepts

Several concepts are referred to at some places in the paper, but it may not be possible to give definitions at those places. Rather, I have preferred to give working definitions of key concepts below to help readersinterprete the concepts in a context.

Industrial Competitiveness

Industrial competitiveness has relevance at different levels: country, firm, institution and product. For our context, we start with definition at country level. Industrial competitiveness of a country can be defined as:
Ability of firms of the country to compete on various segments of an industrial value system across different industries by producing goods and services that meet needs of local as well international customers and grow to respectable positions. The competitiveness can be evaluated on several factors such as world-wide market shares in key industries as well overall trade balances.

Another important dimension at firm level we may call **Industrial Corporate Competitiveness.** Industrial competitiveness of a corporate may be defined as the ability of a firm to compete on key elements of an industrial value system from concept, design and engineering to manufacturing.

Corporate competitiveness
Ability of a firm to produce products and services of superior quality and at relevant costs than its peers, while trying to employ larger numbers and striving to improve their skills, capabilities. It has relevance to firms sustainable competitiveness performance as well as improving relevant competitiveness assets and processes (Momaya, 2001).

Innovation
Among plethora of definitions, we adapt following from Khalil and Shankar (2013):
It is practical implementation of an idea to create a product, service or process that is new to an organization.
Schumpeter defined successful innovation as atask*sui generis'*—a feat not of intellect but of will.

Technological innovation
The initiation of the technical idea, the acquisition of necessary knowledge, its transformation into usable hardware or procedure, its introduction into society and its diffusion and adoption to the point where its impact is significant.
Shilling (2008) has discussed several dimensions of technological innovation in context of new product development.

Appendix A2 Tables on trends in financial and international performance for select firms

Table A1 Comparative trends in growth, financial and international competitiveness

Financial year ending in -->	201303	201203	201103	200903	200703	200503	200403	Jump	% Jump
Bharat Forge								**2004-13**	**2004-13**
Net Sales	3151.23	3685.98	2947	1995.6	1835.04	1167.06	796.67	2354.56	295.55
Cost of production	2436.65	2770.2	2236.65	1638.16	1396.5	851.06	571.52	1865.13	326.35
Operating income / PBIDT	817.77	912.46	762.07	407.26	541.22	333.99	259.14	558.63	215.57
PBIDT as % of sales	25.95	24.75	25.86	20.41	29.49	28.62	32.53		
Capital Employed	4218.88	4157.6	3496.84	3294.8	2728.41	860.43	536.81	3682.07	685.92
Revenue earnings in forex	1608.97	1784.22	1256.89	1060.63	836.1	534.86	346.49	1262.48	364.36
Revenue expenses in forex	264.83	237.78	153.57	183.54	179.48	65.28	49.61	215.22	433.82
Moser Baer									
Net Sales	2139.36	1918.32	2110.61	1965.4	1731.91	1577.9	1085.52	1053.84	97.08
Operating income / PBIDT	328.33	229.27	634.86	533.96	414.25	658.9	408.01	-79.68	-19.53
Capital Employed	3248.59	3773.31	3875.46	4586.88	3660.32	3405.09	2323.77	924.82	39.80
Revenue earnings in forex	1339.42	1091.93	1305.57	1344.21	1409.47	1235.22	926.94	412.48	44.50
Revenue expenses in forex	623.65	813.16	822.21	825.96	965.3	633.92	369.11	254.54	68.96

Source: Developed based on data collected from Capitaline

Table A2 Comparative trends in international competitiveness, in terms of forex ratios

	201303	201203	201103	200903	200703	200503	200403
Revenue earning in forex as % of net sales							
Bharat Forge	51.06	48.41	42.65	53.15	45.56	45.83	43.49
Moser Baer	62.61	56.92	61.86	68.39	81.38	78.28	85.39
Ratio of net forex earning as % of net sales							
Bharat Forge	42.65	41.95	37.44	43.95	35.78	40.24	37.27
Moser Baer	33.46	14.53	22.90	26.37	25.65	38.11	51.39
Ratio of earning / expenses in forex							
Bharat Forge	6.08	7.50	8.18	5.78	4.66	8.19	6.98
Moser Baer	2.15	1.34	1.59	1.63	1.46	1.95	2.51

Source: Developed based on data collected from Capitaline