

# Are small-sized firms really innovative? Understanding the Indian scenario

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*This article presents an understanding of innovation in the Indian context by considering the relationship between firm size and innovation. This is based on a major study on innovation where survey of Indian firms was undertaken by the research team to understand the process in the Indian context. In this article the focus is on the relationship between firm size and propensity to innovate. The interesting observation is that the small-sized firms focus mostly on minor or marginal innovations which are either not recognized or go unnoticed in the market. The purpose behind such initiatives is to enable them to sustain in the market. This brings in an interesting dimension of the process of innovation where the firms innovate not to create market, but to sustain themselves in the market. The article presents variation in the innovation activities amongst the firms depending upon their size.*

**Keywords:** Firm size, innovation propensity, innovation, novelty or newness.

THE size of a firm and its innovativeness have been a matter of contention among economists and social scientist for a long-time. It can be traced back to Joseph Schumpeter, who argued that large firms with higher market concentration or share are more likely to innovate because of their risk-absorption capacity, access to large capital base or resources, etc. Though this argument was validated later in several other works, there is a counter argument which claims small firms to be more innovative than the large ones. This article analyses the innovativeness of Indian firms and ascertains the size category of firms which show more involvement in innovation activities. We term the innovativeness of the firms as ‘propensity to innovate’, because in developing economies like India, which is characterized by very little innovative activities, innovation needs to be understood not in terms of percentage of innovative firms (by-product or process only) but by understanding the process and the support needed for activating the same<sup>1</sup>.

Innovation plays a significant role in the survival of firms and also a major factor in the economic growth. Innovation can result from the pursuit of individual knowledge and skill, like grassroots innovation emanating from the grassroots, i.e. communities and users<sup>2</sup> that are locally appropriate, and builds on indigenous knowledge; innovation from the makeshift approach – frugal innovation that responds to limitations in resources, whether financial, material or institutional, and using several methods which turn these constraints into an

advantage resulting into lower cost products and services<sup>3</sup>. Mainstreaming these innovations needs policies and framing of models for inclusive innovation and development<sup>4</sup>. In this article we focus on firm-level innovations, to ascertain firms of which size category show more involvement in innovation activities. Are small firms really innovative? What determines such behaviour?

Several studies have traced the historical evolution of change and analysed innovation behaviour of firms in India. For example, firm size having positive influence on R&D intensity<sup>5</sup>; rise in in-house corporate R&D expenditure during the 1960s and 1970s, where large firms with larger technological advances and sustained R&D did not yield steady flow of innovations<sup>6</sup>; R&D increased with firm size but only up to a certain level<sup>7</sup>; and innovation behaviour determined by R&D intensity (R&D expenditure/sales), which indicated predominance of product innovation during the period 1971–1981, with rare radical changes in manufacturing and the stimulus being Government policy measures, internal environment of the firm, organizational processes, urge for growth and product market<sup>8</sup>. Most of the innovation studies that have been carried out in the past are based on the R&D intensity/expenditure of the firm as a measure to identify its innovativeness. Analysing innovation behaviour based on R&D activities alone brings out a partial dimension of the same, as innovation not only results from pursuit of R&D but from interactive learning where different agents interact to share and produce new knowledge<sup>9</sup>. Different agents include social institutions, macroeconomic regulations, financial systems, educational facilities, communication facilities, infrastructure and market conditions along with technological capabilities.

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The above research questions will be analysed in the light of this broader definition of innovation using the dataset obtained from a nationwide survey sponsored by the Department of Science and Technology (DST), Government of India, on Indian firms – ‘Indian National Innovation Survey’. The survey findings provide relevant information on the various innovation initiatives undertaken by a firm.

### The issues

The Schumpeterian argument mentioned above finds support in other works as well<sup>10,11</sup>. Meta-analysis on a collection of the literature regarding firm size and innovation was done and the results indicated a positive relationship between firm size and innovation<sup>12</sup>. Another study postulates little support for the hypothesis of positive effect of firm size on R&D or innovation output<sup>13</sup>; however, with an exception to a particular sector which showed positive effect, concluding that a degree of rivalry results in rapid development of new product and absence of it mostly leads to small-value inventions<sup>13</sup>. There is also an argument of monopoly with regard to an existing product which retards new innovations<sup>14</sup>. However, when small firms operate in a competitive market condition, they become more innovative in order to create their own niche<sup>15</sup>. This is further revealed in an empirical work which supports the existence of a U-shaped relationship between R&D intensity and firm size, where the nature of innovation on both sides of the curve is different – major and minor innovations undertaken by large and small firms respectively<sup>16</sup>. This explains the Indian scenario where several small firms are dominated by few large firms. The large firms with greater access to capital and infrastructure are more likely to embark upon radical innovations and stay ahead in the market, while small firms are more likely to be involved in trivial innovations for survival in the competitive market.

### Methodology and data source

In 1992 the Organisation for Economic Co-operation and Development (OECD) adopted a new guideline – *Oslo Manual*<sup>17</sup>, for the first innovation survey in Europe, which used indicators for measuring the product and processes as an outcome of innovation activities. Thus, in such cases innovation is measured in terms of patents or other intellectual property rights as a result of their new product or process initiatives. On the other hand, in developing countries understanding innovation with this approach may limit the study as most of the firms in such countries fail to understand their potentiality to innovate<sup>18</sup>. As a result, in recent years there has been a shift in the understanding of innovation. The focus has changed from the objective measure of innovation (like product, process only) to innovation as a process encountered by

technological learning and utilization of knowledge. The *Bogota Manual* which was finalized in 2000, was the first to list a broader definition of innovation which includes not only R&D efforts resulting into product and process innovations, but also efforts regarding designs, installation of new machinery, acquisition of technology, organizational modernization and marketing<sup>19</sup>.

The process of innovation from start to end involves interaction among different domains like enterprise/firm, R&D, intermediaries, policy directives, market forces, etc. Each of these domains interacts with each other so as to facilitate an enabling system for innovation. A system with strong linkages between these domains would witness more or radical innovations than a system with relatively weak linkages. In the Indian scenario, the latter case is more evident where relatively weak linkages among the different domains limit innovation at large<sup>1</sup>. When firms mostly fail to recognize their innovation endeavours, innovation may be better portrayed as a process undertaken by a firm to enable innovation rather than simply percentage of innovative firms. So, to enumerate the innovativeness of a firm we have defined an indicator – innovation propensity, i.e. the inclination of a firm towards innovation, or how innovation active it is.

The dataset used in this study is sourced from the findings of the Indian National Innovation Survey – a DST-National Science and Technology Management Information System (NSTMIS) project initiated to map the innovation scenario of the country. The survey involved measuring innovation among industrial firms in India. This was necessary because firm-level data on innovation would enable better understanding of the innovation process and its relation to economic growth. The survey results would provide indicators as benchmark for measuring innovation and most importantly, in the formulation of evidence-based innovation policy<sup>20</sup>. The survey covered 9001 firms across 26 states and 5 Union Territories in India. Stratified random sampling was used to derive the sample to represent each states from the population of 208,415 firms as reported in the Annual Survey of Industries (ASI) 2009–10 (ref. 18). In the absence of data on turnover of the firms, the total workforce employed in a firm (as mentioned in ASI 2009–10) was used as a measure to classify the firms in terms of their size. For the present purpose, the firms have been grouped into five size classes, viz. below 10, 10–49, 50–99, 100–499 and 500 and above.

### Analysis and results

This section presents few facets to understand the innovation activity within firms of different size groups. The dataset obtained from the survey provides relevant information on the various innovation initiatives undertaken by the firms. These include technological changes in their respective production and operation system during the

study period (2007–08 to 2009–10). The activities include new products, new process technology, product quality and standardization, saving or more efficient use of inputs, using alternative materials, introducing new machines, etc.

For simplicity, the size categories are grouped as follows: micro firm (below 10 employees), small firm (10–49), medium firm (50–99), medium–large (100–499) and large firm (500 and above employees).

### *Innovation propensity*

This indicates the inclination of a firm towards innovation or how innovation active it is. Technically, innovation propensity is the ratio of the total number of innovative firms in a group to the total number of firms surveyed (sample firms) within the group. Here, ‘innovation propensity’ is used as an indicator to enumerate the innovativeness of the firms. Table 1 shows the innovation propensity of the firms categorized into different size classes. It can be seen that the firms with more employees or the large-sized firms are more innovative than their smaller counterparts. The innovation propensity of all the Indian firms that undertook any of the innovation activities is found to be 35.37% and medium, medium–large and large-sized firms mainly lie above this level. Interestingly, an increasing trend is seen between the innovation propensity and size of the firm, i.e. as the size of the firm increases, its propensity to innovate also increases, the exception being micro-sized firms which show more propensity to innovate than small-sized firms, thus making a slighting curved relationship between them. Thus it can be concluded that large-sized firms show more propensity to innovate than the small and micro firms. On the other hand, micro-sized firms show more propensity to innovate than the small firms.

### *Types of innovation*

To determine which type of innovation dominates these large-sized and small-sized firms, Table 2 provides a picture of the innovation types and innovations undertaken by the firms within the stated size categories. It enables us to understand in detail a particular type of innovation undertaken by firms of different size categories. For example, firms involved in only product innovation have been counted under ‘new product’ category, and so on. Here, only four types of innovation are highlighted because these are the most preferred by the firms. They include introduction of new machines, product quality, standardization, process innovation and product innovation. When these individual types of innovation are analysed, it is seen that about 6% of micro-sized firms do only product innovation followed by 4–5% of small and medium firms, whereas for the large firms which showed a greater propensity to innovate the case is different.

Only 2.7% of large firms are said to be involved in product innovation. A similar trend of micro and small firms dominating large firms is seen for other types of innovation like product quality standardization and introduction of new machineries.

### *Number of innovations*

Figure 1 shows firms of which size category are involved in more number of innovations. It also shows the share of firms involved in the number of innovations (single innovation or more than one innovation). It is seen that 56% of large firms are involved in more than two types of innovation and 19% in only one type of innovation. For the medium and medium–large firms, there is mixed involvement in all types of innovation; about 36% firms of both categories go for only one type of innovation, the share of firms for two types of innovation is lower and again 38% and 35% of medium and medium–large firms respectively, are involved in more than two types of innovation. It is interesting to note that majority of small- and micro-sized firms go for only one type of innovation and only a few go for two types of innovation.

### *Novelty of innovation*

Innovation may be defined as ‘application of knowledge in the production system, and realization of the benefits of the new application from the market’<sup>18</sup>. Realization of innovation in the true sense is captured by novelty or newness of innovation, whether a product or process innovation developed by a firm is newly introduced into the market ahead of others, or is only new to the firm. Figure 2 presents the newness or novelty of innovations and firms of different size categories. ‘New to the firm’ means introducing any new product or significantly improved product or process that is already available in the market but is new to the firm, while ‘new to the market’ is to introduce any new product or process ahead of all other competitors in the industry, which is completely new to the country or even the world. From the figure it can be seen that majority of innovations undertaken by micro and small enterprises are new to the firm only, which is indicative of the fact that the innovations by smaller firms are mostly minor and already exists in the market and that the firms innovate mostly to create their own niche and to catch up with the competition in the market. On the other hand, it is interesting to note that 36% of large firms claim their innovations to be new to the market, which is much more compared to 14% and 17% of micro and small firms respectively.

### *Accessing supportive facilities*

In an innovation system, firms are the primary actors responsible for transforming inputs into outputs with

**Table 1.** Innovation propensity and size class

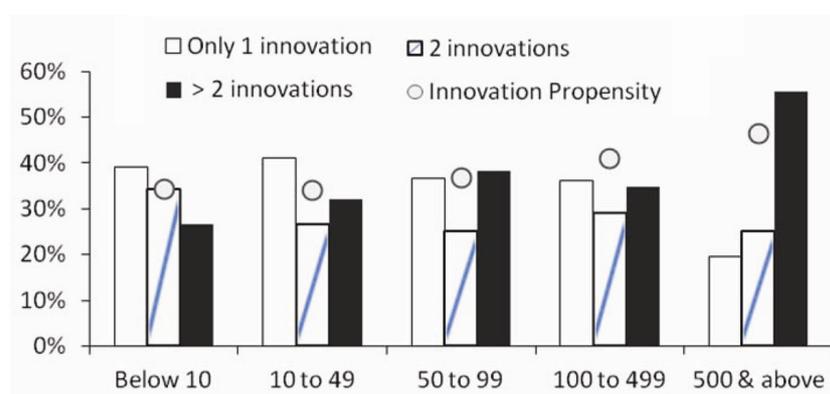
Size	Micro (below 10)	Small (10 to 49)	Medium (50–99)	Medium–large (100–499)	Large (500 and above)	India's average
Innovation propensity (%)	34.24	33.96	36.76	40.96	46.45	35.37

Source: Constructed from Indian National Innovation Survey<sup>18</sup>.

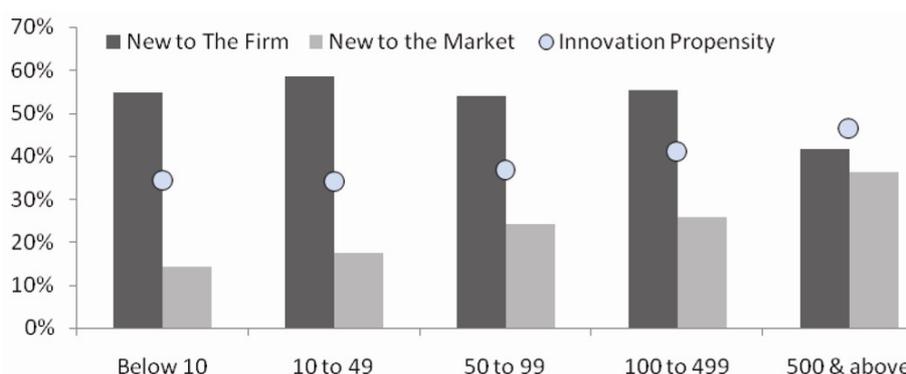
**Table 2.** Types of innovation

Firm size	New product (%)	New process technology (%)	Product quality standardization (%)	Introduction of new machines (%)	Innovation propensity (%)
Below 10	5.98	1.59	6.77	18.73	34.24
10 to 49	5.41	2.83	5.25	24.30	33.96
50 to 99	4.24	3.13	3.50	19.89	36.76
100 to 499	4.26	1.86	3.46	22.61	40.96
500 & above	2.78	1.39	2.78	9.72	46.45

Source: Constructed from Indian National Innovation Survey<sup>18</sup>.



**Figure 1.** Number of innovations. Source: Constructed from Indian National Innovation Survey<sup>18</sup>.



**Figure 2.** Novelty of innovation. Source: Constructed from Indian National Innovation Survey<sup>18</sup>.

organizational support from other agents like suppliers, users, producers, universities, public research laboratories, financial institutions, government agencies dealing with promotion and regulation, trade unions or technical associations, and inter-firm interactions and interactions between firms which become the source of innovation<sup>21</sup>.

Thus in a production system, innovativeness of a firm results from production dynamics on one side and the support available to the firm on the other. The support system essentially means bringing together different institutional arrangements to facilitate the process of innovation at various stages. An innovative production

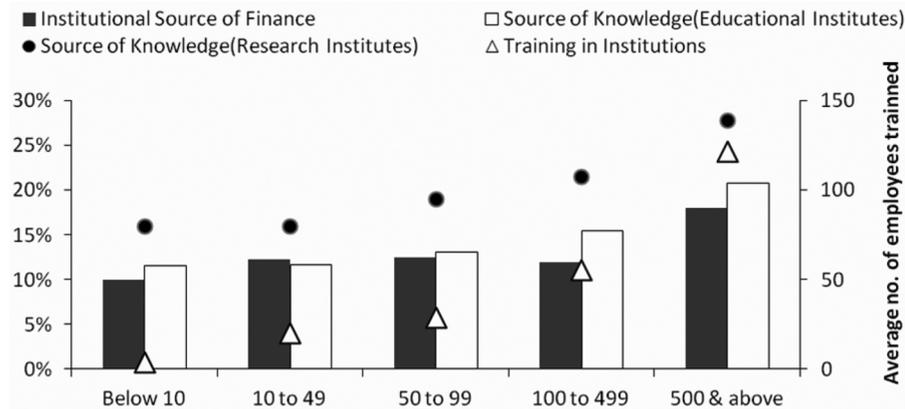


Figure 3. Accessing support system. Source: Constructed from Indian National Innovation Survey<sup>18</sup>.

dynamics creates demand for appropriate support to enhance its own initiatives toward innovation. Such type and nature of demand depends on the overall economic status of the firm as well as that of the state or region where it is situated, the industrial policies governing it and also the type of industry it is dealing with. To create an enabling innovation ecosystem, we require a large number of institutions to provide various technological and non-technological inputs for the promotion of innovation right from the inception to the end stage. Figure 3 shows firms of different size categories accessing different support facilities. The different facilities taken into account are – accessing institutional source of knowledge from universities, engineering colleges or institutes and polytechnics (source of knowledge – research institutes), linkages with government or public research institutes (source of knowledge – educational institutes), financial support via tax credits or deductions, grants, subsidized loans and loan guarantees (institutional source of finance), and imparting institutional training to individuals (training in institutions and average number of employees trained). We see that general access to institutional facilities among the firms of all size categories is rare, and it is mostly the large firms that avail majority of the support facilities, be it institutional source of finance or accessing information from research institutes, or providing training for human resource development. Very few small and micro firms access or avail these facilities.

Thus we find that micro and small firms which show lesser propensity to innovate than the large firms are mostly involved in single innovation at large. Though these firms score more in involvement in different types of innovation than the large firms, from the novelty factor it is seen that the innovations by these firms are mostly new to the firm, from which we can conclude that these firms innovate mainly to sustain in the market. One of the major reasons could be the systemic delink which holds back innovation or restrict the firms to make small innovations only. On the other hand, large firms which shows

higher propensity to innovate are also diverse in their innovation activity. They are involved in more than one type of innovation, and also their innovations are novel and new to the market, which means most of the radical innovations can be attributed to these firms only.

## Conclusion

This article presents empirical findings which support the existence of relationship between firm size and innovation. Size of the firm is classified based on the number of workforce employed as micro (below 10), small (10–49), medium (50–99), medium–large (100–499) and large (500 and above) firms. It is seen that as the size of a firm increases, its propensity to innovate also increases; the exception being micro-sized firms which show more propensity to innovate than small-sized firms. When innovation activities were analysed, those reported by micro- and small-sized firms were majorly introduction of new machineries, product quality standardization and new products. The novelty perspective showed that innovations by the micro and small firms were mostly new to the firm, unlike large firms revealing a larger share of innovation being new to the market. It can be inferred that large firms innovate to create new market, while small and micro firms are basically involved in minor or incremental innovations meant only for catching up with the rest. Also, there exists a gap between the large and small firms in terms of accessing the support facilities for mobilizing innovation activities. The large firms show prominent results in accessing financial aid, creating knowledge networks with universities, research institutes, and personnel mobility for skill acquirement. The micro- and small-sized firms innovate not to create market, but to sustain themselves in the market. They are less active in availing the institutional support facilities, which may be due to inadequate demand for these facilities or lesser awareness among them. Innovation policies to bridge this

gap and for augmenting the innovation propensity of the micro and small firms are needed. An adequate policy step would be to instil systemic linkages among different actors to facilitate an enabling and sustainable innovation ecosystem.

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ACKNOWLEDGEMENTS. This work is supported by NSTMIS-DST, GoI project 'Development of innovation indicators: National Innovation Survey'. I thank Shri Pradosh Nath (former scientist CSIR-NISTADS) and Dr N. Mrinalini (former scientist CSIR-NISTADS) for their guidance. I also thank Dr Praveen Arora (Head, CHORD, DST, GoI) for his support and Praveen Rawat for the discussions and comments.

Received 28 February 2016; revised accepted 23 September 2016

doi: 10.18520/cs/v112/i06/1121-1126