

An Investigation on Innovation Barriers in Manufacturing Firms

(Work in Progress)

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ABSTRACT

This study conducts to find out the key barriers of innovation in the manufacturing firms and evaluates the impact of the lack of environmental resources, organizational structure, government support and stability in firm innovation. Data was utilized through the enterprise survey data developed by World Bank (WBES'2013) of manufacturing companies in Bangladesh using the Marginal and Ordinary least squares (OLS) regression models. Results indicated that institutional aspects, land and finance support, energy and political factors are the main barriers to the propensity of a firm to innovate. The implication is that firms are likely to improve their innovation performance as they increasingly reconfigure their obstacles with regard to strategy development and technological investments.

Keywords: Innovation, Enterprise Survey, Barriers, Manufacturing Firms.

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INTRODUCTION

With the influence of certain changes in the business environment, such as the growing importance of services, knowledge, creativity, the developments in information technology, digitalization, globalization, and the surge of intellectual property, a new kind of economy has been created. In this new economy, value creation ability has shifted from tangible resources to intangible resources such as knowledge, creativity, unique organizational culture, corporate reputation, innovation, brand and design (Carmeli & Tishler, 2004; Surroca et al., 2010; Kor & Mesko, 2013). Many businesses have replaced their product and service concepts with more creative and innovative ways so as to achieve competitive advantage in the markets because of competitive pressure. The majorities of business firms in less-developed countries like Bangladesh are small and medium-sized manufacturing companies and face various challenges including skilled human and financial capabilities, a poor infrastructural base, and government policies and politics which debilitate their innovation activities. Despite all these challenges, they are still making enormous efforts in embarking on various innovative activities despite their limited potential.

Most of the previous empirical studies on the determinants of obstacles of Innovation concentrated on large firms, and therefore, empirical studies on small firms remain rare and scanty. Perhaps the conclusion to be drawn from the above studies may be misleading and inconclusive when applied to manufacturing firms. Therefore, the present study covered the above lacuna identified in the literature by analyzing the determinants of obstacles for manufacturing firm's innovative behavior using a Bangladesh enterprises survey dataset.

LITERATURE REVIEW

Innovation as an outcome emphasizes what output is sought, including product innovation, process innovation, marketing innovation, business model innovation, supply chain innovation, and organizational innovation. Firms should expect some forms of ex-post market power which prevents the limitation of the new products and processes and thereby allows them to recoup their research and development (R&D) expenses and move towards innovation. Innovation has always played a critical role in predicting the long-term survival of organizations (Ancona and Caldwell, 1987). More recently, there has been the development of new data sources like the Enterprise Data Survey (EDS) by the World Bank. These new data sources have induced many empirical studies, especially in the developed countries, on the determinants of a firm's innovation (Artes, 2009; Cohen & Levinthal, 1990; Fabrizio, 2009). These studies have identified a vast and complex set of firm-specific, industry-specific and economy-wide factors that are found to be influencing innovation activities both in developing and developed economies. However, the extent to which these factors are influencing innovation, particularly in developing countries like Bangladesh, still remains an open question.

Van Dijk, Den Hertog, Menkveld, and Thurik (1997) explained that innovation will provide firms with large monopoly profits that are necessary to finance R&D and pave the way for the expansion of businesses. Cohen and Levinthal (1990), Romer (1990), and Van Dijk et al. (1997) finds out those small firms sometimes can be more innovative because they are most likely to benefit from the local market and from any R&D subsidy by government. Sometimes, it differs significantly due to the

influence of factors like the environment and capability, among others. Adoption of new ideas is mostly caused by the interaction of some factors within or outside all forms of networking (Rogers, 1971).

In another study for Tunisia, Choi (2015) analyzed with a GMM model and found that firm size, age, availability of technical staff, and participation in export have significant influence on innovation. Ruiz-Hortega (2017) in their study of the determinants of radical innovation in the hospitality and tourist industries in Spain used a sample of 215 firms and found that the structural dimension of social capital has a strong negative effect on radical innovation. Lee (2009) used a World Bank survey for nine industries across seven countries. The intensity of competition was proxied by the degree of market pressure perceived by each individual firm in both local and international market and the study found that a firm's innovation habit depends primarily on its level of technological competence. Similarly, Alder (2010) using data surveyed from 40 developing and emerging economies found that firms with more advanced technology compared to their competitors have more product innovation.

METHODOLOGY

The data used in this study were drawn from the Enterprise Survey conducted by the World Bank (WBES, 2013) in Bangladesh. The sample consisted of 1442 business establishments surveyed from April 2013 through September 2013. The Enterprise Survey covers several topics of the business environment as well as performance measures for each firm. Enterprise Surveys currently cover over 130,000 firms in 135 countries, of which 121 have been surveyed, and data were collected on each firm's experience and enterprise perception of the environment in which they operated. The Bangladesh Enterprise Survey is nationally representative being obtained randomly from 1442 business establishments, mainly from the manufacturing sector.

To realize the principal objectives of the study, quantitative techniques were applied OLS regression. Marginal and ordinary least square regression is employed to estimate product, process, marketing, and organizational innovations and obstacles variables given that the variables are binary dummies. Later, we have conducted a Probit and Tobit model. Thus, the OLS regression model can be specified as in Equation 1 and equation 2.

$$\Pr(i = 1/X + x_i) = \theta(\beta_0 + \beta_1 FCS_i + \beta_2 HCV_i + \beta_3 FIA_i + \beta_4 ICS_i + \varepsilon_i) \dots \dots \dots \text{Equation [1]}$$

$$\lnnvv_i^* = \beta_0 + \beta_1 FCS'_i + \beta_2 HCV'_i + \beta_3 FIA'_i + \beta_4 ICS'_i + \varepsilon_i \dots \dots \dots \text{Equation [2]}$$

where, with regard to a firm i , $\Pr(i)$ is the propensity for the firm to innovate, $\theta(\cdot)$ is the standard normal cumulative distribution function (cdf), FCS_i is a vector of individual characteristics, HCV_i is a vector of human capital variables, FIA_i is a vector of innovative activity, ICS_i is a vector of industry characteristics, and ε_i is an error term.

RESULTS AND DISCUSSIONS

The current study was categorized by splitting industry types into categories: manufacturing and service sectors and service retail. The distribution of Firms in Bangladesh is depicted in Table 1 by their size based. This survey includes 1442 firms in Bangladesh, clustered by Dhaka, Rajshahi, Chittagong, Khulna where 34.53 percent (498) of them were small-scale firms. Table 1 also indicates that about 35.71 percent of the total firms operated at the medium scale, whereas 29.75 percent (429) of the total firms surveyed were large-scale firms. It is quite clear that the Bangladesh business environment is dominated by small-scale and medium size firms, but large-scale firm are on the race which is indicating as a developing countries' feature.

Table 01: Distribution of Bangladesh Firms Classified by their size

Firm type	Frequency	Percentage
Micro/Small	498	34.53
Medium	515	35.71
Large	429	29.75
Total	1442	100.00

Authors' Construction using WBES data

Table 2 express the product, process, organizational, marketing and R & D innovation by taking considering the firm size in Bangladesh. Moreover, firms are innovating in marketing strategies were the largest (71.5% of the total sample) scale followed by product innovative firms (36.3%), then process innovative firms (32.7%) and lastly organizational innovative firms (14.9%). Only 16.6 percent of the sampled firms invested in R&D. In addition, this table indicates that large and medium-scale enterprises were the most innovative where microenterprises were the least innovative. With regards to firm sector, manufacturing firms were the most innovative followed by service firms and lastly retailing firms. It could be inferred from this information that small- and medium-scale enterprises or manufacturing and service firms are the engine of innovation in Bangladesh.

Table 02: Percentages of Innovation by Firm Type and Sector

Type of Innovation	By Firm type (Percentage)
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	Full sample	Small/Micro	Medium	Large
Firm type				
Product	36.3	32.6	41.5	48.6
Process	32.7	28.4	38.2	46.7
Organizational	14.9	10.2	17.9	28.8
Marketing	71.5	65.2	82.9	91.9
R & D	16.6	12.4	21.3	30.8
By firm sector (Percentage)				
	Retail	Service (non-retail)	Manufacturing	
Product	25.2	34.5	39.6	
Process	52.7	31.9	36.7	
Organizational	10.3	13.1	14.9	
Marketing	38.9	71.1	72.6	
R & D	7.2	14.3	18.8	

Authors' Construction using WBES data

Table 3 contains the estimated ordinary least square models on the determinants of the barriers of innovation (product, process, organizational, and marketing innovation) at the firm level in Bangladesh. The OLS model of barriers to product innovation showed that the significant determinants of a firm's chances to minimize the barriers. Model 1 indicates that a percentage of acc_land and acc_finance are positively impact in obstacles to innovate a product by 7.7 and 6.17 respectively.

Moreover, corruption (8.3%) and politics 13%, also have significant percentage and positively related to firms' innovation. The model shows that retail and service firms are less likely to invent a process than manufacturing firms by percentage points. Model 3 in Table 3 also indicates that age, energy, employee education, lack of formal training are the significant obstacles of organizational innovation at the firm level in Bangladesh. Specifically, a percentage increase in the age and size of a firm causes the firm to innovate an organizational structure by probabilities.

Table 03: Barriers of Innovation using OLS model

VARIABLES	(1) ProductInno	(2) ProcessInno	(3) OrgInno	(4) MarkInno
Ln_age	-0.74359 (3.24474)	-0.28572 (3.27965)	-4.94527 (3.36256)	0.97190 (3.22700)
F_Ownership	-0.27736 (0.26744)	0.12481 (0.27032)	0.12292 (0.27715)	0.00667 (0.26579)
D_Ownership	-0.39943 (0.32609)	0.17263 (0.32960)	0.08972 (0.33793)	0.28396 (0.32398)
G_Ownership	0.66679 (0.51833)	0.18832 (0.52390)	0.19343 (0.53715)	0.31463 (0.51500)
Export	0.22595** (0.09348)	0.09998 (0.09449)	-0.04183 (0.09688)	0.18737** (0.09289)
Competitors	0.00383 (0.11200)	-0.10341 (0.11320)	-0.12402 (0.11606)	-0.36487*** (0.11507)
RD	0.27137*** (0.06416)	0.10911* (0.06485)	0.18692*** (0.06649)	0.26734*** (0.06374)
Ln_Size	0.01098 (0.02361)	0.03403 (0.02387)	0.05211** (0.02447)	0.01497 (0.02346)
EmployeeEdu	0.00066 (0.00107)	0.00019 (0.00108)	0.00096 (0.00111)	0.00090 (0.00106)
ln_FemaleEdu	0.15160*** (0.05192)	0.21921*** (0.05248)	-0.01171 (0.05381)	0.15832*** (0.05159)
F_Training	0.02780 (0.06106)	0.14293** (0.06172)	0.08291 (0.06328)	0.11032* (0.06069)
Micro = o,	-	-	-	-
Small = o,	-	-	-	-
Medium	-0.05111 (0.05699)	-0.08655 (0.05760)	-0.05154 (0.05906)	-0.08395 (0.06934)

Large	-0.04245 (0.08474)	0.05105 (0.08565)	0.09516 (0.08782)	
Acc_Finance	-0.12059 (0.07753)	-0.00564 (0.07837)	0.10985 (0.08035)	0.01705 (0.07703)
Acc_Land	0.06479 (0.06170)	0.25159*** (0.06236)	0.22622*** (0.06394)	0.25956*** (0.06130)
Corruption	0.05697 (0.08361)	-0.17183** (0.08451)	-0.04009 (0.08665)	0.04562 (0.08308)
Energy	-0.28000** (0.13084)	-0.11010 (0.13225)	-0.07164 (0.13559)	-0.15393 (0.13001)
Political_Ins	-0.13628 (0.13432)	0.03853 (0.13576)	-0.04788 (0.13919)	0.13260 (0.13346)
Small				-0.10276 (0.08439)
Large = o,				-
Constant	6.44391 (24.71443)	1.99770 (24.98033)	37.58781 (25.61185)	-7.50058 (24.57437)
Observations	390	390	390	389
R-squared	0.17306	0.22556	0.15831	0.25250

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

CONCLUSIONS

Major obstacles of a firm's innovation in Bangladesh, using the WBES dataset was kept as a prime intention of this study. To realize the objectives of the study, the binary techniques OLS regression models were used. The study produced some stylized facts regarding constraints of innovation in Bangladesh. It established that the major determinants of product, process, organizational, and marketing innovation along with the major barriers as like politics, infrastructure, and energy issues in manufacturing firms. The policy implications of the study are that any firm that desires to be innovative in any of product, process, organizational structure, or marketing should pay much attention to R&D investment with reducing barriers. Specifically, for firms to strengthen organizational innovation, they should also engage in minimizing the internal and external obstacles for innovation in Bangladesh context.

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