Global Journal of human-social science: H Interdisciplinary
Volume 19 Issue 8 Version 1.0 Year 2019
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460X & Print ISSN: 0975-587X

The Effects of Access to Finance, Competition, and Innovation on Female Ownership and Employment: Evidence from Bangladesh

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Keywords: access to finance; competition; innovation; female ownership and employment; world bank enterprise survey.

GJHSS-H Classification: FOR Code: 150308

Strictly as per the compliance and regulations of:

The Effects of Access to Finance, Competition, and Innovation on Female Ownership and Employment: Evidence from Bangladesh

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Abstract- This study identifies the effects of firm's access to finance, competition, and innovation on female ownership and employment in the manufacturing and service sector for Bangladesh. We applied IV model to World Bank enterprise survey data on 1180 manufacturing firms and 262 service firms in 2013. The results of the study suggest that overdraft facility significantly increases the possibility of female ownership, top managers and share of workers in the manufacturing sector whereas it reduces the probability of female-owned business in the service sector. Audit of financial statement is a key determinant of female ownership and employment in both sectors. Export-orientated firms are more likely to be owned by female than non-export-oriented firms both manufacturing and service sectors. Informal competition has significant positive association with female ownership and top management in manufacturing sector whereas it does not significantly affect female in service sector. Production, logistics, marketing and idea innovation significantly raises the possibility of female-owned business whereas R &D and management innovation decrease the probability of female ownership in manufacturing sector. The effects of these innovations on female top managers and share of workers isquite the opposite in this sector. For the service sector, R&D significantly affects female ownership and top manager whereas the effect of idea innovation is negative. Other innovations do not significantly affect female in service firms.

Keywords: access to finance; competition; innovation; female ownership and employment; world bank enterprise survey.

I. Introduction

Gender disparity is regarded as one of the pervasive phenomena all over the world in recent decades. Women lag behind men in almost all aspects of human society more especially in the developing world. Women constitute half of the world population, and sustainable development is not possible to achieve keeping this share of the population out of the mainstream economic activities. Female entrepreneurship and participation in the economic activities are not only significant force for the world economy but also crucial for achieving other goals of SDGs such as poverty alleviation, food security, wellbeing and health; quality education; and gender equality. Klasen (2002) argued that the consequences of gender inequality could be low wel-lbeing of the female as well as lower economic growth and development. In the business area, gender disparity exists from ownership to participation to the top management level and worker level.

However, in most of the developed and developing countries differences between male and female still exist pervasively in business entrepreneurship and labor market participation in both top and lower level. This significant gender difference is the result of the challenges faced by women. Access to finance; competition and innovation are the critical challenges for female in business and labor market (Caleb Kwong, Jones-Evans, & Thompson, 2012). Women get less financial facilities from the financial institutions than their male counterparts (Kon & Storey, 2003) which may affect female business ownership and participation in the top and low level in the labor market. The challenges of female entrepreneurs and managers are intensified through credit contrasts due to under-performance, lack of innovative capabilities and competitiveness. Financial institutions are reluctant to finance female-owned business due to the underperformance of these ventures which consequently affect the firm's potential profitability and performance.

Competition is another crucial factor responsible for gender difference in entrepreneurship and labor market. Women are perceived to be less risk-taking, assertive and ambitious than their counterparts (Booth & Nolen, 2012; Croson & Gneezy, 2009; Eckel & Grossman, 2008)which consequently lower the performance of the female-owned business as well as female participation in the top and low level. Innovative capabilities which are considered as the heart of an organization is another crucial factor that affects gender differences in entrepreneurship and workforce. In case of innovative capabilities female lag behind the male. Mueller and Van Deusen (2002) recognizedmen as innovators and women as adopters whereas Whittington and Smith-Doerr (2005) argued that men are more intended to create something new than their female counterparts.

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Moreover, men are preserved to be more assertive, risk-taking, and ambitions than the female counterparts Williams and Best (1990). Due to the lack of innovative capabilities female-owned and female-led business usually face greater challenge for pursuing innovation which also consequently causes underperformance and under the competitiveness of these ventures. Moreover, female-owned ventures face assumedly more challenges in promoting new products as well as expanding to new markets that may result in the lower competitiveness of the firms.

However, the significant research question that is not addressed by the previous studies is whether these factors such as access to finance, competition, and innovation have significantadverse effect on female entrepreneurship and participation in top management and low level. Most of the studies in finance-gender linkage focused on gender differences in access to finance. Although female entrepreneurs face several demand-side and supply-side barriers to access to finances, it is also argued that women mainly finance their ventures from personal savings, credit cards and borrows from family and friends rather than taking loans from banks or commercial credits (Bygrave, Hay, Ng, & Reynolds, 2003).Moreover, the financial constraints faced by the female also differs across countries and societies.

In the case of gender-competition and gender-innovation linkage, the studies focused on gender differences in competition and innovation. Although female lags behind in performing in the competitive environment and pursuing innovation in the firms the research question is whether these factors significantly affect female entrepreneurs, managers, and workers in business and labor market, although gender differences exist in competition and innovation, business competitiveness and innovative environment may vary across countries or regions which may have differential effect on female business and labor market. Gneezy, Leonard, and List (2009) found that avoidance of competition of female is higher in the patriarchal society than the matrilineal society. A number of research studies showed gender differences as significant catalyst in creating innovation as man produce a higher degree of patent compared to women (Agnete Alsos, Ljunggren, & Hytti, 2013).Marvel and Lee (2011) identified that educational background inflation network and regional location affect gender differences in innovation. However, whether innovation capabilities act as significant hindrance to female entrepreneurship and participation labor is still a crucial research gap.

Women constitute nearly half of the population of Bangladesh, and no sustainable development is possible without the active participation of women in mainstream economic activities. Although women entrepreneurs contribute significantly to sustainable economic development, their contribution and participation in Bangladesh are still insignificant (Chowdhury, Yeasmin, & Ahmed, 2018). In the case of female participation in top and low-levelemployment, the situation is also alarming. In Bangladesh, women hold position in the business, own companies, and global corporations but the ratio is too small due to several barriers in every sector(Shetu & Ferdous, 2017). Bangladesh is a developing country with a significant share of unskilled and semi-skilled labor and women constitute the majority of this labor. That is why they are employed in the labor-intensive sectors such as readymade garments in Bangladesh and paid low wage. Among the barriers to women entrepreneurship and employment, financial constraints, competition and innovation or lack of technical knowledge are considered as significant factors contributing to small number of female entrepreneur and employment in Bangladesh.

Considering the issues discussed so far, this study identifies the effects of firm's access to finance, innovation, and competition on the ownership and employment (top and low level) of the female based on firm-level data. This paper substantially makes several contributions to the empirical research of gender inequality in ownership and employment. First, the paper addresses the issue of gender inequality in three different of business such as ownership, top management, and owner level thus covers diverse areas of gender-related issues in business ownership and employment. Second, the study uses firm-level stratified survey data of WBES which provides more and robust insight into the gender issues in the firm's level. To measure female ownership in the firm level we focus on the question "Among the owners of the firms, are there any females?" and to measure female participation in top management we take into account to the response of the question "Is the top manager female?" The lower level participation of female is measured by the share of female worker in the firm. Third, the study focuses on three significant factors that may affect female ownership and employment at firm-level such as finance, competition, and innovation. Moreover, the study also identifies how different factors of finance, competition and innovation affect female ownership and participation. Four, we identified the effects separately for manufacturing and service sector to look into whether financial constraints, competition, and innovation have differential effect on female in manufacturing and service sectors.

We focus on single country perspective because gender issues significantly vary across countries depending on the cultural and economic heritage Alesina, Giuliano, and Nunn (2013). We focus on Bangladesh for several reasons. This country lies at an essential stage for economic transition and gets status from low income to developing country very soon. This country substantially improves in women

empowerment and participation in the workforce. The manufacturing sectors of Bangladesh are very dynamic, and it experiences a substantial and robust growth since the 1990s importantly driven by the readymade garments sector. On the other hand, the service sector of Bangladesh is still lag behind. Thus identifying the effects of finance constraints, competition, and innovation on female ownership and employment can provide significant policy suggestions.

The remainder of the study is arranged as follows. The next section discusses the literature in the related field. Section three describes the variables and research method of the study. The results and discussion of the analysis are provided in section four. The last section makes conclusions and provides policy implications.

II. Literature Review and Hypothesis Development

Access to finance is regarded as one of the major challenges for starting up of a business by the female(Klapper & Parker, 2010). Several studies identified several specific factors of low access to finance for women such as (SL Carter & Shaw, 2006)identified three key factors for gender diffrences in finance such as structural difference of business; discrimination from supply-side; and debt aversion attitude of the female. Women are more likely to start business in small and less profitable projects (Coleman, 2000; Muto & Yamano, 2009); informal or home-based sector (Hallward-Driemeier, Hasan, & Rusu, 2013); and female-type occupations with less capital intensive (D'espallier, Guérin, & Mersland, 2011); and less expections for profit(C Kwong, Brooksbank, Jones-Evans, & Thompson, 2006). These fetaures of the female-owned business make them less creditworthiness. From supply-side perscpective female face more difficulties in accessing cedit dur to credit procedure and criteria against women (Amatucci & Sohl, 2004; Sara Carter, Shaw, Lam, & Wilson, 2007) conventional measures of credit worthiness (Blake, 2006); and competitive force in the market (Cavalluzzo, Cavalluzzo, & Wolken, 2002). Finally risk aversion characteristics of the female affets their access to credit as they are considered more risk avrese that make them less ikely to access to finance (Caleb Kwong et al., 2012).

However, some studies also support neutrality or female favpurism in access to credit. In a recent study Moro, Wisniewski, and Mantovani (2017) found no biasedness of financial institutions against female managers, and they argued that female-managed firms obtain less financing due to the low application as they anticipate being rejected. Wellalage and Locke (2017) found less credit constraints faced by female compared to their male counterparts. Aristei and Gallo (2016) support gender-based discrimination regarding access to finance as credit denial probability between male and female cannot be explained by firms specific characteristics.

In this study, we observe access to finance and gender issue through a different lens. We identified whether access to finance constraints affect female-owned business negatively. The research question here is as follows:

Research Question (RQ) 1a: Financial constraints in different aspects reduce the probability of female-owned business.

Finance constraints also affect female participation in the top management. Top managers are responsible for grasping the profitable opportunities for firm's growth whish require challenging and creative thinking of the top management through utilizing the resources of the firm efficiently. Beckmann and Menkhoff (2008) found that female managers are more averse to competition and they act as market followers in selecting strategy rather than outperforming in the market. Niessen and Ruenzi (2006)support this view by identifying that female fundraisers perform neither very good nor very bad. This risk aversion and low confidence of the female in utilizing the firm's funds affect their access to finance. Our contribution to this strand of literature is that we uncover the research issue that whether firm's access to finance is negatively associated with the female top managers.

RQ 1b: Access to finance is negatively associated with female participation in top management. It means that higher access to finance reduces the probability of female top managers.

Firm's financial constraints also affect female share of worker in the firm. In the developing countries, a large portion of female workers are semi-skilled and unskilled who are paid low wage. The firms facing higher credit constraints will employ more female workers due to low wage paid to female.

RQ 1c: Credit constrains of the firms increases the female share of workers.

Competition is one of the crucial challenges women face in starting new business as well as representing in the top and lower level in the organization. According to Borghans, Heckman, Golsteyn, and Meijers (2009) women are more risk averse than men. Moen are willing to compete while women try to avoid competitionNiederle and Vesterlund (2011) suggest three different reasons for gender differences in competition such as women cannot or do not like to compete; they compete but not against men; and the differences in competition occurs not due to lower performance of women but higher performance of men in the competitive environment. Mobius, Niederle, Niehaus, and Rosenblat (2011) argued that men and women have difference in their beliefs as well as

updating their beliefs upon receiving information. Women update their beliefs less than men do upon receiving information. Competitive entrepreneurs invest more in their business and have more employees which improves the profitability and potentiality of the business. Amore and Garofalo (2016) identified that female significantly show high performance in low competition whereas they tend to underperform as the competition increases. The literature focusing competition-entrepreneurship linkage is very scarce. The contribution of this study is that it identifies whether competition is negatively linked with female entrepreneurship.

RQ 2a: High competition in the market reduces the possibility of female ownership in the business.

Gender difference in representation in the top managerial positions is also substantial. Niederle and Vesterlund (2007) women do not prefer competitive high profile or technical jobs because of high responsibility associated with these managerial positions and long working hours required for these jobs. He further argued that women remain absent in some professional positions and higher rank positions as they have lower abilities. Moreover, in the competitive environment men and women respond differently and women exhibit more risk aversion than men. Competition improves the performance of men but does not female performance. From the firm's perspective, it would be costly if the high level personnel cannot adjust to competition in the market. Several studies (Faccio, Marchica, & Mura, 2016; Huang & Kisgen, 2013; Tate & Yang, 2015) argued that at the top level of organizations women are significantly different from men in different aspects which may result in different corporate policies and financial returns. As women avoid competition and risk in the market competitive environment may result in low female representation in the top management.

RQ 2b: Competition reduces female participation in the top managerial positions.

Competition may affect the female workers different ways as it affects female top managers. As female underperform in the competitive environment compared to men high competition in the market may reduce the female share of workers in the organization. However, the critical issue is that whether firms compete for low cost or high differentiation and innovation. If competition is based on low cost high competition will result in higher female share of worker in the developing economies as female are paid low wage in these economies due to their low bargain power (Rahman, 2014). If competition is based on differentiation or innovation share of female worker will fall with growing competition as female are less innovative than men.

RQ2c: Competition has mixed effects on the female share of worker in the firm.

Innovation appears to be critical factor for firm's competitiveness and growth(Malerba, 2002). Shane and Venkataraman (2000) argued that entrepreneurial process require some level of innovation as it is considered as the heart of entrepreneurship. According to (Lee, Paik, & Uygur, 2016) innovative capabilities is a generalized issue and can be differentiated by gender andMinniti and Naudé (2010) argued that entrepreneurial phenomenon is also gendered. Thus entrepreneurship and innovation are closely related. Kirton (1976) argued that women are adapters whereas men are innovators. Female-owned firms face greater challenges in pursuing innovation (Estrin & Mickiewicz, 2011; Kelley, Brush, Green, & Litovski, 2011) as men are perceived to be assertive, ambitious, and risk-takers. Moreover, female-owned businesses also face higher challenges in introducing or pushing a new product in a new market that sign for low marketing capabilities of female (Sara Carter et al., 2007; Orser, Riding, & Manley, 2006). However, studies overlooked the effects of innovation on female entrepreneurship. In this study we identified that whether innovation in different aspects significantly reduces female owned business.

RQ3a: Innovation is negatively associated with female ownership at the firm level.

Innovative capabilities also affect gender differences in labor market. As women are more risk averse and thus less innovative, higher innovative environment more suited for men than women. (Niederle & Vesterlund, 2007) identified that women have lower abilities for technical and competitive jobs. Several studies (Bagshaw, 2004; Díaz-García, González-Moreno, & Jose Sáez-Martínez, 2013; Torchia, Calabrò, & Huse, 2011) argued that women improve management abilities decision- making process as well as innovation in an organization. According toBrown, Brown, and Anastasopoulos (2002) women tend to be more people oriented, consultative, democrative and inclined to interpersonal relation. Thus gender diversity in the management helps improve social relations, create open work climate and establish more diversified view of problems which consequently generates more diverse ideas (Milliken & Martins, 1996; Nielsen & Huse, 2010).

RQ 3b, c: Innovation in different aspects has mixed effect on female participation in top and lower level in the firm.

III. Methodology

a) Data

The data for this study has been collected from World Bank Enterprise Survey (WBES) 2013 for Bangladesh. The enterprise survey collected data for around 1180 firms, and they represent the randomly sampled of the registered firms of both manufacturing and service sectors including their subgroups. The survey was designed using uniform questionnaire, and the firms were selected following stratified sampling

method. The survey data covers almost all aspects of business in a country such as informality, corruption, financing, technology & innovation, gender, crime, firm characteristics, infrastructure, performance, regulation and workforce focusing on the firm level. The survey includes 1442 firms out of which 1180 are manufacturing, and the rest 262 are from service sectors. The survey also stratified the manufacturing and service sectors in different size and sub-sectors. The sample was stratified in three levels such as region, industry, and size of the firms.

b) Dependent Variables

Realizing the significance of gender issue in the business this study aims at identifying the effects of finance constraints, competition, and innovation on female ownership and employment. Based on WBES data, we used three different measures to focus on gender issues at the firm level. The first measure focuses on the ownership issue of gender and is based on the response to the question "Among the owners of the firm, are there any female?" The variables take value of 1 if there is any female owner in the firm and 0 otherwise. The second measure deals with the gender of the top managers in the firm based on the response to the question "Is the top manager female?" The firm with female top manager takes value of 1 and 0 otherwise. The third measure focuses on female employment in the firm by calculating the share of female workers in the firm which is a quantitative measure. The share is calculated by taking the ratio of the total number of female permanent worker and total full-time permanent worker of the firm. However for service sector the data on the number of female permanent worker is not available. So, we cannot calculate the share of female worker for service sector.

c) Independent Variables

We use three sets of variables as the leading independent variables such as access to finance, competition, and innovation. As proxy to firm's access to finance, we use credit purchase, working capital borrowing from banks, overdraft facility, line of credit from financial institutions and external audit of the statements. To represent competition in the market, we take informal competition; technology license; and export orientation of the firms. As proxy to innovation, the study considers product innovation (service innovation for service sector); process innovation or offering innovation for service sector; logistics innovation; management innovation; marketing innovation; idea generation; and R &D of the firm.[1]

d) Other Control variables

We use several firms' specific characteristics as the control variables based on WBES data. They are firm's size; location (business city/capital city/special economic zone); legal status; age; quality certificate; registration; sector dummy for subsectors to strengthen the linkage between the dependent and independent variables.[1]We also divided the firms into two broad sectors such as manufacturing and service to identify the differential linkage between dependent and independent variables for different sectors. However, the survey collected data on 1180 manufacturing and 262 service firms for 2013 in Bangladesh.

e) Methods

As the first two proxies of gender issue are represented by binary outcome which takes value of 1 for the firms with female owner (or female top manager) or value of 0 otherwise a qualitative response model is appropriate. In this study, we applied the probit model which can be derived as follows:

$$y^* = \beta_0 + x'\beta + e_i \quad \text{..........(1)}$$

Where y is an unobserved latent binary variable which can be observed

$$y = \{1 \text{ if } y^* = 1 \text{ and } 0 \text{ otherwise} \quad \text{..........(2)}$$

e_i is assumed to be distributed normally with a mean of zero. As provided by the above equations we have

$$p(y=1) = p(x'\beta + a > 0)$$

$$= p(-u < x'\beta)$$

$$= F(x'\beta)$$

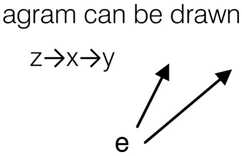
Where, F() is the c.d.f of –u.

As the third dependent variable is quantitative we can apply simple regression model as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + e_i \quad \text{..........(3)}$$

Where y indicates the share of female worker in the firm and $x_1$andx_2 indicate main dependent and control variables respectively.

Before proceeding to analysis, the econometric issue that should be given attention is the potential endogeneity arising from causality and omitted variable bias. It is assumed that the error term e is uncorrelated with x_iE ($e_{i/}$ x_i =0). However, if this condition of strict exogeneity fails, the Probit model (or OLS for non-binary outcomes) is inconsistent. An instrumental variable (IV) approach is highly appropriate model in the presence of endogeneity as suggested by Wooldridge (2015). Instrumental z is an observed variable such that it predict independent variable x but does not affect y directly or indirectly except indirectly via x as treatment effect. The path diagram can be drawn as



For example, in our model legal status of a firm is associated with firm's access to credit whereas it

[1] The detail description of the variables is provided in Appendix 1

does not affect female ownership or managerial position.

The IV probit model that uses instrument $\check{z}_i$can be written

$$\beta\hat{} = (\sum_{i=1}^{k} \check{z}'_i x_i)^{-1} (\sum_{i=1}^{k} \check{z}'_i y_i) = (\check{Z}'X)^{-1} (\check{Z}'Y) \quad \ldots\ldots(4)$$

Finally, the model is fitted using the iv regression as follows:

$$y_i^* = \beta_0 + y_i\beta_1 + x_i\beta_2 + \varepsilon_i$$

$$y_i = \delta_0 + x_i\eta_1 + z_i\eta_2 + \upsilon_i$$

Here y_i^* is the dependent variable for the i^{th} observation, y_i represents the endogenous regressors, x_i indicates the included exogenous regressors and $z_i$is the excluded exogenous regressors. x_i and z_i are collectively called the instruments. ε_i and υ_i are zero-mean error terms and the correlations between them are presumed to be nonzero.

The consistency and robustness of IV estimator are highly subject to the validity and relevance of the instrument. The use of weak instrument makes the regression results more inconsistent and results in many times larger standard errors compared to OLS. Cameron and Trivedi (2010)argued that the validity and relevance of the instrument rely to some extent on the persuasive argument, economic theory and the results of the prior studies. However different tests are also available to test the validity of the instruments.

In this study, we use three different dependent variables such as female ownership; female top managers; and share of female workers in the firms. Moreover, we also divided the firms into two broad sectors such as manufacturing and service. The main sets of independent variables are access to finance; innovation; and competition which also comprises different indicators. This makes the study difficult to identify the valid instruments. For this reason, we followed step by step procedures to find out the valid instruments. In the first step, we determine the correlation between the probable endogenous regressors and probable instruments to view the gross relation between them as suggested by Cameron and Trivedi (2010). The instrument with very low correlation with endogenous variables can be considered as weak instrument. We applied Durbin-Wu-Hausman test (also known as Hausman specification test) to check the endogeneity of the variables which has a null hypothesis that variables are exogenous. The rejection of null hypothesis indicates the presence of endogeneity.

Another critical issue of IV estimator is overidentified instruments. Adding too many instruments may cause over identified restriction which results in inconsistent regression results. We applied Sargantest to justify the validity of overidentifying restrictions. The test has a null hypothesis that overidentifying restriction is valid and rejection of null hypothesis indicates the absence of overidentifying restrictions.

The last critical issue is the use of appropriate weights while making inference on survey data. For the analysis of stratified random sampling data, we have to use weights to make inference about the population because individual observation may not represent equal shares of the population. When there is separate underlying model for each stratum (also known as stratum-specific coefficient) both weighted and un-weighted estimation will not significantly differ. Under stratified random sampling, unweighted estimates would beunbiased if sample sizes are proportional to the size of each stratum (Cochran, 2007; Deaton, 1997; Lohr, 2009). However, WBES sampling design was stratified and employed differential sampling. In this survey, the selection probability of each unit is not same, and each sample does not have equal weight. So, in the case of WBES data weighted estimate will provide more consistent results as it provides model-biased as well as designed biased estimates (Cochran, 2007). So we determined weighted estimations in all cases[2].

IV. Results and Analysis

Table 1 provides the descriptive statistics of the variables included in the analysis. In the manufacturing sector one-fifth of the firms are owned by the female, and only 6% of the firms have female top manager whereas in service sector female owned and female participated top management firms are 29.4% and 21.7% respectively. Most of the firms in both of the sectors are locatedeither in business city or capital city and around 80% of the firms are registered from startup in both sectors. A negligible percentage of the firms (less than 3%) have foreign ownership whereas almost 20% of the firms have a quality certificate.

[2] We use survey prefix command svy of stata to determine weighted estimate and provide appropriate standard errors.

Table 1: Descriptive statistics of the variables

	Manufacturing Sector					Service Sector					
Variable	Obs	Mean	Std. Dev.	Min	Max	Variable	Obs	Mean	Std. Dev.	Min	Max
Femaleowner	1180	.203	.402	0	1	Femaleowner	262	.095	.294	0	1
Femalemanager	1180	.059	.236	0	1	Femalemanager	262	.049	.217	0	1
Femaleworker	1177	.152	.225	0	.89						
Capitalcity	1180	.483	.499	0	1	Capitalcity	262	.637	.481	0	1
Businesscity	1180	.653	.476	0	1	Businesscity	262	.725	.447	0	1
Sectordum	1180	.3	.458	0	1	Sectordum	262	.461	.499	0	1
Registration	1180	.851	.355	0	1	Registration	262	.881	.323	0	1
EPZ	1178	.152	.359	0	1	EPZ	262	.057	.232	0	1
Qualitcertificate	1180	.228	.420	0	1	Qualitcertificate	262	.160	.367	0	1
TopMngrExp	1176	19.87	10.52	.5	60	TopMngrExp	257	19.03	11.38	.5	60
Size	1180	2.07	.794	1	3	Size	262	1.41	.635	1	3
Legalstatus	1180	1.61	.778	1	3	Legalstatus	261	1.37	.659	1	3
Foreignown	1180	.027	.162	0	1	Foreignown	262	.011	.106	0	1
Age	1177	21.90	13.51	2	125	Age	260	22.32	14.48	2	74
Lineofcredit	1180	.459	.498	0	1	Lineofcredit	262	.305	.461	0	1
Audit	1180	.474	.499	0	1	Audit	262	.362	.481	0	1
Purchasedoncredit	1176	29.52	29.20	0	100	Purchasedoncredit	255	30.95	29.26	0	100
WCBorrowing	1173	.398	.489	0	1	WCBorrowing	261	.268	.443	0	1
Overdraft	1180	.254	.435	0	1	Overdraft	262	.160	.367	0	1
Exportorientation	1179	.285	.452	0	1	Exportorientation	262	.053	.225	0	1
TechLicense	1180	.148	.355	0	1						
Informalcompetition	1180	.392	.488	0	1	Informalcompetition	262	.358	.480	0	1
ProductInnov	1180	.361	.480	0	1	ProductInnov	262	.248	.432	0	1
ManufacInnov	1180	.422	.494	0	1	ManufacInnov	262	.290	.454	0	1
LogisticInnov	1180	.416	.493	0	1	LogisticInnov	262	.297	.458	0	1
ManagementInnov	1180	.368	.482	0	1	ManagementInnov	262	.278	.449	0	1
MarketingInnov	1180	.344	.475	0	1	MarketingInnov	262	.271	.445	0	1
R&D	1180	.166	.372	0	1	R&D	262	.095	.294	0	1
IdeaInnov	1180	.333	.471	0	1	IdeaInnov	262	.187	.390	0	1

The summary statistics of access to finance variables show that manufacturing firms have higher access to finance than the service firms. 46% of the firms have line of credit, and 40% of the firms have working capital borrowing from banks in the manufacturing sector whereas these shares are 30% and 26% respectively for service firms. One-fourth of the manufacturing firms have overdraft facility whereas only 16% of service forms enjoy this facility. One of the big differences is the audit of financial statements. Almost 50% of manufacturing firms make audit of their financial statements whereas only 36% of service firms have audited financial statements.

In case of competitive factors, 40% of the manufacturing firms and 35.8%of service firms feel that they have to compete with the informal sectors. Manufacturing firms are more export-oriented than the service firms. However, manufacturing firms have higher innovative capabilities than the service firms in almost all aspects of innovation. On an average, around 26% of the service firms make innovation in several aspects whereas this share is around 40% for manufacturing firms. A significant difference also exists in R & D and idea innovation among the employees. 16.7% firms in the manufacturing sector have allocation for R&D whereas only 9.5% of service firms spend on R&D. Moreover, idea generation among the employees is promoted in one-third of manufacturing firms whereas only 18.75% of the service firms promote idea innovation.

Table 2: Estimation results of access to finance, and female ownership, top manager and share of female worker

Sector→	Manufacturing						Service			
Variables	Female owner		Female manager		Female worker		Female owner		Female manager	
	IV Probit	Marginal Effect	IV Probit	Marginal Effect	IV regress (2sls)	Marginal Effect	IV Probit	Marginal Effect	IV Probit	Marginal Effect
Capitalcity	.341 *** (.122)	.085*** (.030)	.270 (.196)	.035 (.030)	.041 (.036)	.041 (.036)	-.898** (.351)	-.158** .081	-.280 (.900)	-.034 (.078)
Businesscity	-.359*** (.133)	-.090*** (.033)	-.280 (.217)	-.037 (.033)	-.034 (.036)	-.034 (.036)	1.203** (.483)	.212** (.083)	.743 (1.254)	.092 (.077)
Sectordum	-.202 ** (.096)	-.050** (.024)	-.057 (.171)	-.007 (.023)	.153*** (.024)	.153*** (.024)	.721** (.377)	.127*** (.040)	.307 (.518)	.037 (.038)
Registration	-.172* (.0100)	-.043* (.027)	.806* (.436)	.106** (.042)	.039 (.024)	.039 (.024)	1.030 (.656)	.181** (.091)	.098 (.482)	.012) (.055)
EPZ	-.019 (.144)	-.005 (.036)	.316 (.238)	.041 (.026)	-.050 (.044)	-.050 (.044)	-.011 (.467)	-.002 (.0819)		
Qualitcertificate	-.459*** (.162)	-.115** (.046)	-.194 (.240)	-.025 (.035)	-.042 (.054)	-.042 (.054)	.160 (.278)	.028 (.044)	.344 (.345)	.042 (.049)
TopMngrExp	.007 * (.004)	.002* (.001)	-.007 (.008)	-.0009 (.001)	.001 (.001)	.001 (.001)	.023 (.018)	.004 (.003)	-.016 (.014)	-.002 (.002)
Lineofcredit	.012 (.144)	.003 (.036)	.075 (.171)	.010 (.021)	-.032 (.037)	-.032 (.037)	-.348 (.264)	-.061 (.062)	.110 (.487)	.013 (.072)
Audit	.001 (.152)	.0003 (.038)	.383* (.225)	.050** (.022)	.100*** (.030)	.100*** (.030)	.109 (.307)	.019 (.050)	.981* (.556)	.121 (.089)
Purchasedoncredit	.0004 (.001)	.0001 (.0004)	.0009 (.002)	.0001 (.0003)	-.0006* (.0003)	-.0006* (.0003)	-.002 (.005)	-.0003 (.0008)	-.007** (.003)	-.0009 (.0008)
WCBorrowing	-.100 (.145)	-.025 (.036)	-.139 (.169)	-.018 (.0223)	-.016 (.038)	-.016 (.038)	-.397 (.466)	-.069 (.065)	.134 (.300)	.016 (.032)
Overdraft	2.530*** (.082)	.634*** (.060)	1.699** (.721)	.2235 (.145)	.55*** (.114)	.55*** (.114)	-2.00** (.999)	-.352 (.349)	1.358 (2.384)	.168 (.469)
Constant	-.613* (.313)		-2.682*** (.712)		-.061 (.036)		-2.623* (1.452)		-2.196 (1.512)	
Log likelihood Instrumented Instruments DWH endog test Test of Overid	-990.82 Overdraft3 Legalstatus; Foreignown 126.41*** 24.29***		-811.39 Overdraft3 Size Legalstatus 5.868** 3.110*		Overdraft3 Size Age 30.46*** 44.89 ***		-147.8627 Overdraft Size legalstatus 12.99*** 2.58*		-129.19 Overdraft Size 3.3319* No overid	

Note: The table reports the estimated coefficients and their standard error in parenthesis. ***, **; and * indicate significance level at 1%; 5%; and 10% respectively. The table also reports log likelihood; instrumented; instruments as well as robustness check test results such as DWH endogeneity test and test of over identifying restrictions. We used survey prefix command "svy' of stata to determine weighted estimates and provide appropriate standard errors as WBES is a stratified sampling and weights of the samples are different. We applied IV probit for qualitative response dependent variable and IV regression 2sls for quantitative dependent variable.

The results of the study suggest that location has differential effect on female ownership in manufacturing and service sector. Firms located in the capital city have the greater possibility to have female-owned business whereas firms operating in the business city are less likely to have female ownership in the manufacturing sector. The effects are opposite for service sectors. So it can be said that female-owned service firms are more likely established in the business city whereas female-owned manufacturing firms are more likely located in the capital city. In case of both manufacturing and service sectors, the presence of female managers and share of female workers in the firms are not significantly affected by firms' location in Bangladesh.

The sub-sectors of manufacturing and service sectors can be a significant determinant of female ownership and employment. Sector dummy has significant negative association with female ownership for manufacturing sector whereas it has significant positive association with female ownership for the service sector. It infers that garments and textile sectors are less likely owned by the female than other manufacturing sectors whereas retail sectors have higher possibility to be owned by the female than other service sectors. Garment and textile manufacturing firms have 5% less possibility to be owned by female whereas retail sectors have 12.7% more female-owned firms than other service sectors. However, garments and textile sectors have significantly higher share of female workers

than other manufacturing sectors and it is supported by (Bhattacharya & Rahman, 1999; Rahman, 2014) that a large share of female workers of Bangladesh is employed in the garments sector due to low cost of female labor. Female participation in the top management does not significantly differ by the sector.

Firms' registration is another significant factor of female ownership and management, especially in the manufacturing sectors. Registration has significantly negative association with female ownership whereas its relationship is significantly positive with female managers for manufacturing sector. It indicates that registered manufacturing firms are less likely to have female ownership and have more possibility to have female managers than unregistered manufacturing firms. Moreover, registered firms have 4.3%less possibility to be owned by female whereas they have 6.17% more probability of having top female managers than unregistered firms. This result supports the view that a major portion of female-owned business in the developing countries is operated informally. Firms' registration does significantly affect the share of female workers in the manufacturing sector and female ownership and participation in the top management in the service sector.

Quality certification is found to be a significant hindrance to female ownership whereas top managerial experience can be a significant factor promoting female ownership in the manufacturing sector. Quality certified firms have 11.5% less female ownership than non-quality certified firms whereas one year increase in managerial experience will lead to increase of female-owned business by almost 0.2% in the manufacturing sector. The effect of quality certificate and top managerial experience is insignificant for other cases. However, the association of these firms' specific characteristics with female ownership and employment slightly differ while adding variables for innovation and competition due to the presence of correlation between the variables.

Among the access to finance variables overdraft facility is significant determinant of female ownership and employment in Bangladesh. Overdraft facility has significant positive association with female ownership, top management, and share of female worker in the manufacturing sector. Manufacturing firms with overdraft facility have 63.38% more female-owned firms and 22.35% more female in the top management than the firms without overdraft facility. Overdraft has significant negative association with female ownership in the service sector in Bangladesh which implies that female-owned service firms are more likely to be operated by own finance rather than overdraft. Presence of line of credit and credit purchase does not significantly affect firms' choice to female ownership and employment in both manufacturing and service sectors. Audit of financial statement is positively associated with female ownership and employment in both manufacturing and service sectors, and the association is significant for some cases. Firms with the audited financial statement are more likely to be owned by female and to have female top managers and workers in manufacturing sector. For service sectors the effect of audit on female ownership and employment is insignificant.

Table 3: Estimation results of competition, and female ownership, top manager and share of female worker

Sector→	Manufacturing						Service			
Variable	Female owner		Female manager		Female worker		Female owner		Female manager	
	IV Probit	Marginal Effect	IV Probit	Marginal Effect	IV regress (2sls)	Marginal Effect	IV Probit	Marginal Effect	IV Probit	Marginal Effect
Capital city	-.084 (.121)	-.018 (.027)	.266* (.136)	.07* (.036)	.012 (.045)	.012 (.045)	-.175 (.541)	-.054 (.133)	-1.21*** (.448)	-.222 (.202)
Business city	-.069 (.129)	-.015 (.028)	.202* (.112)	.053* (.029)	-.134 (.046)	-.134 (.046)	.354 (.717)	.110 (.153)	1.308 (.88)	.239 (.119)
Sectordum	-.92*** (.114)	-.205*** (.030)	.009 (.108)	.002 (.028)	.106 (.031)	.106 (.031)	.226 (.351)	.070 (.069)	.311 (.399)	.057 (.040)
Registration	-.197 (.131)	-.044 (.030)	.726 (.475)	.191 (.122)	-.103 .087)	-.103 .087)	.457 (.903)	.142 (.193)	.486 (.636)	.089 (.065)
EPZ	.311* (.169)	.069* (.037)	.170 (.272)	.044 (.071)	-.052 (.037)	-.052 (.037)	-3.2** (1.274)	-1.026 (.647)		
Quality certificate	-.64*** (.191)	-.143*** (.046)	.289*** (.111)	.076*** (.028)	-.085 (.048)	-.085 (.048)	-.980* (.605)	-.305 (.365)	-.004 (.607)	-.000 (.112)
Top Mngr Exp	.005 (.006)	.001 (.001)	.002 (.008)	.0006 (.002)	-.0004 (.001)	-.0004 (.001)	-.006 (.015)	-.001 (.006)	.002 (.022)	.0005 (.004)
Export orientation	2.71*** (.146)	.60*** (.053)	.512* (.286)	.135* (.073)	.167 (.07)	.167 (.07)	8.70*** (1.73)	2.708 (2.099)	-.459 (.576)	-.084 (.155)
Tech License	-.486** .227	-.108** (.05)	.164 (.130)	.043 (.034)	.007 (.036)	.007 (.036)				

Informal competition	.233** (.117)	.052** (.027)	2.21** * (.346)	.582*** (.10)	-.572 (.293)	-.572 (.293)	.172 (.221)	.053 (.045)	-1.617 (1.33)	-.296 (.507)
Constant	-.837 (.296)		-2.27 (1.16)		.498 (.266)		-1.075 (2.327)		-1.338 (2.295)	
Log likelihood Instrumented Instruments DWH endog test Test of Overid	-883.12 Export orientation Foreign own, Legal stat 310.93*** 8.50***		-960.96 Informal comp Age Size 4.84** 3.51*		Informal comp Age Legal status 18.44*** 2.96 *		23.759 Export orientation Legal status 23.90*** No overid		-188.94 Informal cop Size 2.908* No overid	

Note: see note of table 2

Export orientation of a manufacturing firm is a key determinant of female ownership and participation in the top management. Export-oriented manufacturing firms have 60% more possibility to be owned by the female and 13.5% more probability to have female top manager than the non-exporting manufacturing firms. Export orientation does not have significant association with female share of worker in the manufacturing sector. In case of service sector, export orientation significantly raises the possibility of female-owned business whereas it has negative but insignificant association with female top manager. The probability of female business ownership and female top manager increases by 5% and 58.2% respectively in the manufacturing sector when informal competition exists in the market. Informal competition does not significantly affect female share of worker in the manufacturing sector and female ownership and top manager in the service sector. Technology license has significant negative association with female ownership in the manufacturing sector and firms with technology license have 19.8% less possibility to be owned by female.

Table 4: Estimation results of access to innovation, and female ownership, top manager and share of female worker

Sector→	Manufacturing						Service			
Variable	Female owner		Female manager		Female worker		Female owner		Female manager	
	IV Probit	Marginal Effect	IV Probit	Marginal Effect	IV regress (2sls)	Marginal Effect	IV Probit	Marginal Effect	IV Probit	Marginal Effect
Capital city	-.184* (.111)	-.052* (.031)	.188* (.110)	.044 (.029)	.143 (.166)	.143 (.166)	-.075 (.598)	-.021 (.155)	-.314 (.301)	-.065 (.062)
Business city	-.052 (.119)	-.015 (.034)	.0583 (.1186)	.013 (.029)	.164 (.195)	.164 (.195)	-.011 (.748)	-.003 (.211)	.399 (.299)	.083 (.061)
Sectordum	.390*** (.105)	.111*** (.029)	-.343*** (.099)	-.081** (.036)	-.254 (.316)	-.254 (.316)	.389 (.271)	.109** (.055)	.483** (.215)	.101** (.044)
Registration	-.003 (.119)	-.001 (.033)	.345 (.387)	.081 (.071)	.129 (.138)	.129 (.138)	.639 (.669)	.179* (.107)	.696* (.400)	.145* (.083)
EPZ	.150 (.158)	.042 (.045)	-.0018 (.227)	-.0003 (.054)	-.162 (.209)	-.162 (.209)	-.100 (.347)	-.028 (.092)		
Qualitcertificate4	.076 (.153)	.021 (.043)	-.007 (.150)	-.001 (.035)	.034 (.160)	.034 (.160)	-.086 (.379)	-.024 (.112)	-.070 (.386)	-.014 (.080)
Top Mngr Exp	-.009 (.006)	-.002 (.001)	.006 (.005)	.001 (.001)	.012 (.007)	.012 (.007)	.014** (.007)	.004 (.003)	.005 (.008)	.001 (.001)
Product Innov (service Innovation)	.598*** (.130)	.170*** (.037)	-.517** (.237)	-.122 (.087)	-.751 (.583)	-.751 (.583)	-.401 (.505)	-.112 (.089)	-.304 (.320)	-.064 (.066)
ManufacInnov	-.003 (.147)	-.0009 (.041)	.023 (.133)	.005 (.031)	-.009 (.165)	-.009 (.165)	-.335 (.389)	-.094 (.152)	-.202 (.311)	-.042 (.064)
Logistic Innov (Offering innovation)	.224 * (.124)	.063 * (.035)	-.132 (.140)	-.031 (.038)	-.189 .(230)	-.189 .(230)	-.117 (.500)	-.032 (.1569)	-.123 (.335)	-.02 (.070)
Management Innov	-.270 (.170)	-.077* (.047)	.380* (.213)	.090*** (.034)	.359 (.260)	.359 (.260)	.194 (.399)	.054 (.103)	-.593* (.349)	-.124* (.073)
MarketingInnov	.410*** (.133)	.116*** (.037)	-.439*** (.156)	-.104*** (.032)	-.418 (.351)	-.418 (.351)	-.626 (.453)	-.175 (.177)	-.565 (.453)	-.11 (.096)

Idealnnov	.373** (.165)	.106** (.048)	-.380*** (.141)	-.090* (.050)	-.459 (.369)	-.459 (.369)	-.476* (.259)	-.133* (.079)	-.026 (.238)	-.005 (.049)
R&D	-2.80*** (.102)	-.799*** (.038)	2.71*** (.306)	.642*** (.246)	3.31 (2.44)	3.31 (2.44)	4.710*** (.869)	1.320 (.97)	4.605*** (.675)	.963*** (.1647)
constant	.135 (.373)		-1.122 (1.087)		-.151 (.095)		-1.28 (1.64)		-1.723*** (.498)	
Log likelihood Instrumented Instruments DWH endog test Test of Overid	-887.5 R&D Age Size 27.807*** 3.52287 *		-622.913 R&D Age Legal 8.05133*** 3.62329 **		R&D Export Age 93.854*** 6.05**		-78.005 R&D Legal status 21.143*** No overid		-64.70 R&D Foreign owner 5.04** No overid	

Note: see note of table 2

Most of the innovations have significant association with female business and employment in the manufacturing sector. Production; logistics; marketing; and idea innovation have significant and positive association with female ownership which infers that firms having innovation in these aspects have greater possibility to have female owner in the manufacturing sector. Firms with R&D expenditure and management innovation have 79.9% and 77%fewer female ownership respectively than the firms without R&D expenditure and management innovation in the manufacturing sectors. However, the effects of these innovation variables on female top manager and share of workers isquite the opposite. Production; logistics; marketing; and idea innovation have significant negative association with female top manager and female share of workers whereas R&D and management innovation is positively associated with female top management and share of worker. The results provide a crucial policy insight. The results suggest that production; logistics; marketing; and idea innovation raises the possibility of female ownership in manufacturing sectors whereas they reduce female participation in top management and lower level in Bangladesh. The results support the view that the dominant share of female labor force is unskilled and semi-skilled in the developing countries and consequently they cannot cope with the changes in the organization. This innovation reduces female participation in both top level and low-level employment. On the other hand, firms with R&D and management innovation have higher female participation in top management and low level although they are negatively associated with female ownership. It supports the gender diversity in the top management which suggest that gender diversity in the firms especially at top level improves problem-solving, creativity, and firms' performanc e (Østergaard, Timmermans, & Kristinsson, 2011; Ruiz-Jiménez & del Mar Fuentes-Fuentes, 2016).

However, except R&D and idea innovation none of the innovation significantly affects female ownership and participation in the top management in the service sector. R&D significantly increases the possibility of female ownership and top management participation of female whereas idea innovation has significantlyadverse effect on female ownership and top managerial position in the service sector.

V. Conclusion and Policy Implications

The purpose of this study is to identify the effects of access to finance, competition, and innovation on female ownership and female participation in top management and low level in manufacturing and service sectors of Bangladesh at the firms' level. We used WBES data of 2013 for Bangladesh on 1180 manufacturing firms and 262 service firms. Due to the presence of endogeneity in the variables we applied IV probit model for qualitative response dependent variable and IV regression 2SLS method for quantitative dependent variables.

This study provides several significant policy suggestions for the policy makers in the related field. Among the finance issues overdraft facility significantly affect the female ownership and top management in manufacturing sectors whereas it does not affect the female in service sector. It suggest that credit facility significantly increases female-owned business and female participation in the top management as these sectors are capital-intensive requiring high investment whereas service firms are more likely operated by self-finance. So, to increase female ownership and participation in top management more overdrafts should be provided for manufacturing firms.

Firm's export-orientation increases the probability of female-owned business in both manufacturing and service sectors and female participation in top management in manufacturing sectors in Bangladesh. So, facilitating export can raise female ownership in both of the sectors. Informality in the market is another critical policy issues for female ownership and employment at the firm level of the country. The presence of informal competition in the market raises female-owned business at firm level and female top managers in manufacturing sectors but does not affect the female in the service sector. On the contrary the effect of intensity of informal sectors competition indicates that high level of informality

reduces female business in service sectors as well as female participation in top management in both of the sectors. It suggests the policy insights that informality should be kept at tolerable level so that it can raise female business in manufacturing sector and at the same time does not have significant adverse effect on female business in service sectors and participation in top management in both sectors in Bangladesh.

Firms' innovation is another critical policy issue for female ownership and employment in Bangladesh. According to the results, innovation in production, logistics, marketing, and idea raises the probability of female owned business in manufacturing sector whereas they reduce female participation in top m management and lower level. It evidence that like other emerging economies female labor mostly constitute unskilled and semi-skilled labor force in Bangladesh and that is why they cannot cope with the change and innovation of the firms. On the contrary, firms promoting R & D and management innovation have higher likelihood of female top managers and female share of workers although they reduce female ownership in the manufacturing sector. It supports the view that gender diversity in the firms raises management quality in both top and lower level as female thinks differently from men in different aspects. So, special consideration should be given to innovative capabilities of firms to raise female ownership and employment. For the service sector the scenario is different. Except R & D and idea innovation none of the other innovations significantly affects female ownership and top managers in this sector.

VI. Declarations

Acknowledgements

The authors acknowledge the contribution of anonymous reviewer and the PhD fellows for enriching the article. Moreover, the authors are grateful to Md Shohidul Islam for improving the language of the final manuscript.

Funding

Not applicable.

Availability of data and materials

All the data and relevant material are available to corresponding author upon request.

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Appendices

Appendix 1: Definition of the variables

Symbol	Variable description
Dependent Variables	
Femaleowner	takes value of 1 if there is any female owner in the firm and 0 otherwise
Femalemanager	The firm with female top manager takes value of 1 and 0 otherwise
Femaleworker	The share of permanent female worker to total full time permanent worker of the firm
Firm specific characteristics	
Capitalcity	takes value of 1 if the firm is located in the capital city and 0 otherwise
Businesscity	takes value of 1 if the firm is located in the business city and 0 otherwise
Sectordum	For Manufacturing sector, takes value of 1 for garments and textile sector and 0 otherwise For Service sector, takes value of 1 for retail sector and 0 otherwise.
Registration	takes value of 1 if the firm is registered from start up and 0 otherwise
EPZ	takes value of 1 if the firm is located in an export processing zone or other industrial park and 0 otherwise
Qualitcertificate	takes value of 1 if the firm has An Internationally-Recognized Quality Certification and 0 otherwise
TopMngrExp	
Foreignown	takes value of 1 if the firm has foreign ownership and 0 otherwise
Legalstatus	takes value of 1for sole proprietorship, 2 for partnership and 3 for shareholding companies
Age	Year difference from year of establishment to survey year 2013
Size	takes value of 1for small firms, 2 for medium firms and 3 for large firms
Access to finance variables	
Lineofcredit	takes value of 1 if the firm has a line of credit or a loan from a financial institution and 0 otherwise

Audit	takes value of 1 if the annual financial statements of the firm are checked and certified by an external auditor and 0 otherwise
Purchasedoncredit	takes value of 1 if the firm has credit purchase and 0 otherwise
WCBorrowimg	takes value of 1 if the firm has working capital borrowing from banks and 0 otherwise
Overdraft	takes value of 1 if the firm has an overdraft facility and 0 otherwise
Competation Variables	
Exportorientation	takes value of 1 if the firm exports and 0 otherwise
TechLicense	takes value of 1 if the firm use technology licensed from a foreign-owned company and 0 otherwise
Informalcompetition	takes value of 1 if the firm compete against unregistered or informal firms and 0 otherwise
Innovation Variables	
ProductInnov (service Innovation)	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"
ManufacInnov	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"
LogisticInnov (Offering innovation)	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"
ManagementInnov	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"
MarketingInnov	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"
IdeaInnov	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"
R&D	takes value of 1 if the answer is "Yes" and 0 if the answer is "No"