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**Gender of the top manager and innovativeness of the firms:
Evidence from Russia**

Abstract

This paper examines whether firms with female top managers perform better than male led firms along a number of measures of innovativeness. To that end, we use the dataset provided by the 2012 wave of BEEPS for Russia. Our main results, based on probit estimation approach, suggest that having a female top manager reduces innovation performance. However, female top managers are associated with better innovation performance conditional on using outside assistance from consultants. Possible explanations for the negative relationship are rooted in social and biological factors. Specifically, women tend to exhibit more risk-averse behavior than men and innovation usually requires risk taking. Additionally, gender-based discrimination in Russian society may create obstacles for women to perform better in terms of innovation. The positive effect of female management on innovativeness, conditional on external consultancy, may be explained by the law of diminishing marginal returns. Specifically, women may have lower human capital required for innovation and outside help from consultants is likely to generate higher marginal output in the form of higher probability of innovation compared to men.

JEL Codes:

Keywords: gender, innovation, Russia, discrimination, BEEPS

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1. Introduction

Literature suggests that higher female participation on boards is an important factor in the overall performance (Murray, 1989; Carter, Simpkins and Simpson, 2003). On one side, gender diversification leads to improved decision making, evaluation of more alternatives, improved firm image and even increased creativity and innovation (Daunfeldt and Rudholm, 2012). Furthermore, female board participants tend to have better communication and networking skills which may improve firm relationship with investors, suppliers and even customers. Mahmood et al. (2012) state that, women tend to have different professional experience as compared to male partners and female directors usually hold advanced degrees and have better mobility in working conditions. On the other, gender-diversified boards tend to slow decision making (Lau and Murningham, 1998). Thus, the extant literature has mixed results on the role of leadership gender in firm performance.

However, the mainstream explanation for gender differences is rooted in macroeconomic differences. Those papers covering well advanced economies and relatively large companies found significantly positive effects of female appearance in senior management and on board level (Schubert et al., 1999; Carter et al., 2003; Erhardt et al., 2003; Campbell and Minquez-Vera, 2008). On the other hand, papers focused on emerging economies tend to find no or negative relationships between female leadership and firm performance (Mahmood et al., 2012).

The objective of this paper is to explore the role of the gender of the top managers on firms' innovation performance. There is also a growing body of literature that studies the underlying factors of innovativeness. Fagarberg et al., (2012) provide an overview of the extant literature and report that, although early studies of innovation date back to Schumpeter (1934), a big chunk of the innovation literature has developed after the 1970s, most of them in recent decades. Still the literature on the former Soviet countries, for which the main argument behind the transition to market economy in the 1990s has been that competition and private initiatives would drive economic growth, remains thin. Therefore, this paper aims to extend this literature by exploring what effect having a female top manager has on innovative behavior of firms in Russia.

To that end, this paper uses the dataset of the recent wave of Business Environment and Enterprise Performance Survey (BEEPS) conducted for Russia in 2011 with support by the European Bank of Reconstruction and Development as well as the World Bank. This wave of the survey was chosen for our analysis because it collected information with extended focus on innovation. This rich dataset provides extensive firm level information as well as multiple measures of innovation.

Firm level innovation, as argued by Hall (1999) and Shearmur (2012), has been a key driver of economic development and growth since the industrial revolution. Gorodnichenko and Schnitzer (2011), based on time-varying firm-level dataset, find strong evidence that financial constraints hinder domestically owned firms' capacity to innovate and make it harder to catch up to the technological frontiers. Idris (2009), studies management characteristics and innovation perspectives of female entrepreneurs and allocate female leaders into four categories: mother, boss, teacher, chameleon. Those female entrepreneurs' perspectives on innovation were based on what category they belonged to. Overall, those female entrepreneurs tended to implement innovative actions but their methodologies of implementation as well as their risk taking behavior differed by groups. Furthermore, Idris (2009) argues that existing theories and empirical results on female entrepreneurs do not take into account challenges females have to face in social life such as social lifestyle, marital status, limited physical stamina and lack of capital that play a significant role in their business lives and decision making.

Although, innovation is a widely researched topic, to our knowledge, the literature on the role of gender is very thin. Especially so for post-communist transition economies which differ from the developed economies in many aspects. Thus, the main task of this research is to find out whether arguments about emerging economies that women being less prone to take risks and thus less innovative find support in empirical data from Russian Federation. Specifically, the paper aims to estimate how the presence of a female top manager plays a role in innovative behavior of the firm. Our analysis finds female top managers to be less innovative than male peers across a set of innovation measures. These results support the literature arguing that females are risk averse and less confident in their decision-making. Surprisingly, however, we find that for certain measures of innovation female top managers tend to make more innovation decisions using external assistance from consultants.

The rest of the papers is structured in the following way. The next section provides an overview of the related literature. Section 3 explains the methodological approach of the analysis. Section 4 discusses key findings leading to the conclusions.

2. Related Literature

This paper is related to two different strands of academic literature: on gender differences in entrepreneurial activity and determinants of innovation in firms.

Gender

Gender is an important explanatory factor of individual behavior in business and society. Indeed, women are more risk-averse in their investment decisions (Mahmood et al., 2012), more pro-social in intra-household allocation of resources (Khan and Noreen, 2012), more responsive to their constituents as elected leaders (Adams and Ferreira, 2008), etc. However, only recently have governments started specifically adopting gender-friendly legislation for businesses. For example, governments have recently started introducing legislations to increase shares of women on the boards of directors as they remain at very low levels (Daunfeldt and Rudholm, 2012). In particular, in 2006 the Norwegian government imposed gender-based quotas for shares of women on the boards of directors to at least 40% with the dissolution of a penalty for noncompliance. Spain, France, Iceland followed the suite by imposing such laws as well, with Netherlands, Belgium, and Italy standing next in line (Daunfeldt and Rudholm, 2012).

Despite growing figures of females in corporate governance, who on average account for 18.3 percent of staff in top management and 35.3 percent in firm ownership in the world, female participation in senior management is still believed to be underrepresented (The World Bank, Enterprise Surveys, 2011). This has led to more intense debates on women's participation in senior positions not only in the business world but also among academic researchers. Of particular importance for academics is the so-called "glass ceiling effect", according to which females in senior positions have to spend much more effort for career success than their male peers because of, formal or informal, gender-based discrimination. As a result, women on top turn out to be relatively more empowered, more skilled and have more expertise than men in similar positions. However, existing theories propose mixed arguments which suggest that invisible discrimination in top executive positions and boards leads to separation of groups by gender and it may result in slower decision making as well as continuous debates. These hypotheses have been empirically tested quite extensively and the literature documents female appearance in top executive positions and its effect on firms' financial performance, measured by returns on equity, returns on assets, returns on sales, returns on capital invested, etc. More recently, papers have also started to focus on non-financial indicators of firm performance under female leadership employing such dependent variables as easiness of governance control as well as enhanced internal and external relations.

There is rich theoretical literature that studies the effect of female governance on enterprise performance using financial and non-financial measures of performance, although the results are

mixed. Murray (1989), Carter et al., (2003) developed the theory that gender diversity on board of directors might be associated with better performance and innovativeness. They found a positive relationship between gender diversity and firm performance. On the other hand, Miller et al., (1998) and Williams and Reilly (1998) contrast the argument stating that higher gender diversity on board level may lead to more conflict and slower decision making. This argument is in line with that of Arrow (1951), who predicts that a heterogeneous decision-making group incurs higher costs in term of time and effort. Many other studies analyze gender diversity in senior management and its impacts on firm's financial performance (Terjesen et al, 2009, Dezso and Ross, 2008, Francoeur et al, 2007, etc). Presence of females on corporate boards can also have positive effects on board decision making changes, governance easiness and firm reputation (Rhode and Packer, 2010; McGregor and Tweed, 2001; Idris, 2009). Ellis and Keys (2003) argue that more diverse boards have better relations with suppliers, customers and employees. Nevertheless, according to Adams and Ferreira (2008), diversity effect on board level is more complex than is theorized. Their empirical results indicate that female directors have better attendance and women are more prone to join monitoring committees. However, they also find that, although gender-diverse boards put more effort on monitoring to improve firm performance, enforcing gender quotas in boardrooms may decrease shareholder value in firms with strong governance. Mainly because such enforcement leads selection of females with lack of sufficient expertise and other board specific skills.

Indeed much of the literature has produced mixed results of this sort². For example, positive influence results for gender diversity in top management of firms is found by Carter et al. (2003), Erhardt et al. (2003) and Campbell and Minquez-Vera (2008). In particular, Campbell and Minquez-Vera (2008), based on panel data from Spain, find that board diversity (measured by percentage of females as well as the Blau and Shannon indices) has positive effect on firm value (measured by a proxy of Tobin's Q). Similar results are obtained by Smith et al. (2005), Francoeur et al. (2007), Campbell and Minguéz (2007), Terjesen et al. (2009) and Dezso and Ross (2008). The latter, however, argues that female participation on board level only has significant positive effect on firm performance when women are below CEO positions. Strom et al. (2009) report that presence of female CEOs and female chairpersons is positively related to the performance of microfinance institutions. At the same time, female directors have no impact or may even generate weaker governance indicators. Smith et al. (2006) document that firm performance, measured by net turnover, increases with participation of females in top management while net assets do not. Quite a few papers fail to detect any relationship between firm

² See Smith et al. (2005), Martin et al. (2008), Francoeur et al. (2007) and Campbell and Minguéz (2008) among others.

performance and gender diversity in top management (Shrader et al., 1997; Smith et al., 2005; Rose, 2007; Eklund et al., 2009) while others find negative relationships (Bohren and Strom, 2007; Adams and Ferreira, 2009; and Ahren and Dittmar, 2012).

There is plethora of empirical results proposing that female executives have no or negative impact on financial performance. Mahmood et al. (2012) suggest that female leaders have negative impact on firms' financial performance in Pakistan, a conservative society and emerging economy. This is in line with Smith et al. (2006) and Ahern and Dittmar (2011) who argue that stereotypes about women (being emotional, aggressive, risk averse, less confident and undereducated) plays a significant role in the case of emerging economies. Indeed, such perceptions coupled with social norms lead to "glass ceiling" effect and can be the key driver of the negative results for female leadership in firms (Schubert et al., 1999; Johnson and Powell, 1994). According to Johnson and Powell (1994), under controlled economies female subjects do not tend to make generally less risky financial decisions, while under uncontrolled economy, they do. Somewhat similarly, Joecks et al. (2005) theorize that relationship is negative until a certain threshold value of the female share in board level which they estimate to be about 30 percent. In those companies where female members of the board compose less than 30 percent, they find a negative relationship between female involvement in boards and better financial performance.

Idris (2009) studies the management performance of female entrepreneurs in terms of innovativeness and finds that women leaders have higher tendency to employ 6 categories of innovations that are product, service, supply, market, process and administrative innovations (Damanpour, 1991; Johnnessen et al., 2001). Importantly, they argue that the extant typologies of management styles do not adequately explain female behavior in terms of innovation.

Innovation

One of the earliest definitions of innovation dates back to the theories of Schumpeter (1934) after which many scholars explored the aspects of innovation (Damanpour, 1991; Meyer and Goes, 1988; Kimberley and Evanisko, 1981; Kelly and Kransberg, 1978; Mohr, 1969). Schumpeter (1934) denotes existence of five types of innovation: introducing new methods of production, acquiring new source of supply, modifying the organization of industry, introduction of new goods and opening new market. Following Schumpeterian theories, Evangelista and Sirilli, (1995) and Cooper et al, (1994) defines innovation in the context of services that are new to the firm. On the other hand, Meyer and Goes (1988) and Greer et al. (1983) redefine innovation as significant deviation from accepted practical

method for diagnosis, prevention and treatment as determined by concluded by judgments of experts on the field. In other terms they define innovation as discovery or invention with considerable differences from prior techniques. For empirical analyses, papers commonly employ accounting measure- R&D expenditure (Grabowski and Mueller, 1978; Ben-Zion, 1984; Griliches, 1986; Chauvin and Hirschey, 1993; Cohen, Levin and Mowery, 1987; Bosworth and Rogers, 2001). On the other hand, Jensen and Webster (NA) in their paper test biases in measures of innovation and they argued that use of R&D expenditure as proxy for innovation has some limitations. The most important issue is that there is no mandatory reporting for R&D expenditure which thus may call for systematic problems with data. And Jensen and Webster (NA) further argue that there is no strict documented definition of R&D and R&D expenditure reports by firms may vary according to firm's strategic motives. They further push the argument that is supported by empirical literature that potential systematic biases associated with use of R&D are that (1) small firms under-report R&D relative to large firms and (2) public companies are more likely to report R&D owing to higher level of regulatory scrutiny.

Another more widespread measure of innovation that was used by large number of researches is new product or service development, or new improved product or service. In this aspect some scholars use patent data (Breschi and Lissoni, 2001; Feldman and Lendl, 2011; Thompson & Fox-Kean, 2005). Xiao et al. (NA) in their paper use product innovation which is defined as market introduction of new or significantly improved good or service. Romero and Martinez-Roman (2012) also use product innovation as indicator of innovation. In their empirical analyses they employ dependent dummy variables that takes a value of one if the firm carried out any product and process innovation including any incremental improvements. On the other hand, these dummy variables do not truly describe innovativeness behavior of the firm since only one course of action towards product or process innovation has the same value with firm of highly innovative profile.

Gorodnichenko and Schnitzer (2011) employ the BEEPS dataset with time varying firm-level information to explore the impact of financial constraints on innovation activities. They find that financial constraints are significantly and negatively related with innovative activities. Despite critical attention of academia and business world to gender parity in senior management, research papers that study innovative behavior of female led companies in case of emerging and transition economies are not sufficient. Most of the studies are of developed economies' largest corporations. Cases of microenterprises and small and medium enterprises (SMEs) still need to be analyzed. Furthermore, currently available studies in gender diversity in business cover only the most

important factors for business owners which are mainly about firm performance that is measured by financial ratios. Yet, studies solely devoted to management characteristics of women and governance policies such as innovativeness still lacks. Studies in this area however, can be vital tool in understanding management nature of female top managers and their competition strategies, risk taking attitude and governance style as a whole. And thus, this paper focuses on the management nature of female top managers in comparison to males in competitive environment.

3. Methodology

Data

This paper employs data from the European Bank for Reconstruction and Development (EBRD) and the World Bank (WB) database of the fifth round of Business Environment and Enterprise Performance Survey (BEEPS) conducted in Russia in 2011 and 2012. The questionnaire survey covers 30 regions (federal subjects) as well as 7 additional regions (federal subjects) and 4220 business units based on stratified random sampling to ensure representativeness. Three levels of stratification were used in Russia: industry, establishment size and region. Unlike the regular BEEPS waves, which are more general in nature and cover numerous countries in transition, this survey is focused on innovation in Russia and includes a plethora of questions related to innovation practices that enable us to effectively conduct empirical analysis. Specifically, the Innovation Module devoted to innovative activities of respondent firms asks a list of questions, 5 of which are our dependent variables for empirical research. For our empirical research, we use 5 types of innovation measures that are: new product or service, new management methods, new production process methods, research and development expenditure, and new marketing methods. These measures of innovation are dummy variables that take value of 1 if action was taken one year before questionnaire was made and takes value of 0 if no action was taken. Selected endogenous variables for this empirical research are well in line with an earlier paper by Gorodnichenko and Schnitzer (2011) that used these measures as proxy for firm-level innovation.

The following questions are used for dependent variables:

- (1) Implementation of any new or significantly improved goods or services within last three years-
“Product Innovation”
- (2) Implementation of any new or significantly improved methods of production or supply of products or services within last three years – “Process Innovation”

- (3) Introduction of any new or significantly improved management practices and methods in last three years- “Management Innovation”
- (4) Introduction of any new or significantly improved marketing methods in last three years – “Marketing Innovation”
- (5) Any incurred expenditures on research and development (R&D) with last three years- “R&D”

Since our BEEPS dataset is for Russia only, possible cultural biases of respondents are limited to Russia only. Nevertheless, these measures of innovation have many advantages over patents and R&D expenditures, especially when studying non-OECD countries. In particular, using R&D expenditure as the measure of innovation is biased against small firms. Furthermore, using R&D expenditure as innovation is not good measure as investment in R&D does not always yield innovation. More clearly as Gorodnichenko and Schnitzer (2011) say “R&D does not necessarily lead to innovation, while R&D is more input rather than output”. Patents are also not appropriate measure of innovation as discussed above. In some cases, not all innovations are patented and sometimes firms prefer to keep those innovations secret.

For R&D, we use a binary variable that takes the value of 1 if the respondent firm had expensed any R&D costs during the last three years and takes the value of 0 otherwise. In this context, these exogenous dummy variables ignore the magnitude of innovativeness since any level of innovation is treated as yes or no. Specifically, firms that have introduced or improved many product or services, implemented innovative activities more than once and spent substantial expenditures on R&D are treated as equally innovative as firms conducted those innovation practices only once. This can be limitation of our research paper.

Apart from controlling and general information, questionnaire covers information about infrastructure and services, sales and supplies, degree of competition, innovation, land and permits, crime effect, finance, business government relations, use of consulting services, labor, business environment, performance, expectations, and perception of obstacles. Large scope of information in the questionnaire, particularly innovation module, and availability of latest information makes the database highly appropriate for use of this study. Data is in EBRD web page and publicly available.

Description of variables

Descriptions of variables used in the analysis are given in Appendix 1. Apart from the endogenous variables mentioned above, we employed the following exogenous variables from BEEPS to determine

which factors shape innovation activities on firm level. They are female top manager, *FemTopMan*; female owner, *FemOwner*; female owner top manager, *FemOwnTopM*; female top manager years of experience, *FemTopMExp*; female owner top manager years of experience, *FemOwnTopManEx*; and finally female top manager hiring external consultant firm, *FemTopManHireCons*. In order to compare the effect of years of experience between two genders, we employ variable illustrating top manager years of experience, *TopManExp*. Our main independent variable, female top manager, is a dummy variable and takes the value of 1 if top manager of the firm is female, or takes 0 otherwise and 20% of respondent firms' top managers are females. The next main variable is female owner that is also dummy variable that takes value of 1 if owner is female or 0 if not, and it represents 31% of respondents. Top manager experience is a floating variable that shows the number of years of experience of the top manager in that position and on average top managers' years of experience was 14. Other variables that illustrate females are generated variables and we created them as result of combination of two or three variables. Female top manager years' experience is combination of female top manager and top manager years of experience that shows how many years of experience female top manager has in that position and on average they have 7 years' experience. The variable female owner top manager is dummy variable created as combination of two variables and means firm owner is top manager of that firm at the same time. Sixteen percent of firm respondents' top managers are firm owners. Another variable that illustrates the role of females demonstrates years of experience of female top manager who is firm owner as well. This dummy is the combination of three variables: female top manager, female owner and top manager years' experience. The last variable, female top manager hiring external consultant that intends to describe innovative behavior of female top managers is a combination of two variables: female top managers and if the firm hired external consulting firms. This dummy shows if female top managers are prone to make innovative activities by hiring external consultants and on average 12 % of respondents hired external firms. Other variables are employed to explain effect of external factors to innovate and we use some other controlling variables that are generally accepted for empirical research. *Shmainprodtotsal* is floating variable that illustrates percentage share of main product in total sales. Average percentage share of main products among respondent firms is 88%. *ForeignTech* is a dummy variable that takes value of 1 if firm uses foreign technology, takes value of 0 otherwise. On average, only 7.5% of respondent firms use foreign technology. There are also dummies that indicate where the respondent firm competes for its main product or service and they are local market, *lmarket*; national market, *nmarket*; and international market *imarket*. As usual for all dummies these three also take values of 1 if main product or service of

firms is sold in one of those markets, otherwise take 0. Consistently with Gorodnichenko and Schnitzer (2011), we employed control variables: firm size that is in three dimensions *FirmSmall*, *FirmMedium* and *FirmLarge*; firm age, *fage*; location, *businesscity*, and type of ownership that are *FirmBranch* if firm is part of larger firm and *ForeignOwned* if the respondent firm is owned by foreign private individual. This paper measures firm size by number of employees. However, data categorizes firm size into four dimensions that are micro firms, small firms, medium firms and large firms depending on number of employees. Thus, we make three dummy variables that are *FirmSmall*, *FirmMedium* and *FirmLarge*. *FirmSmall* represent firms with number of employees between 5 and 20. *FirmMedium* illustrates those that have more than 20 less than 100 workers. *FirmLarge* includes companies with more than 100 employees. Firm age is a floating variable illustrating age of the respondent firm. *Businesscity* is control dummy variable for location that takes value of 1 if firm located in business city, 0 otherwise. This variable accounts for the common variables that illustrate if firm locates in urban or rural area. For types of ownership, we use two dummy variables of *FirmBranch* demonstrating if firm is branch of larger firm and *ForeignOwned* illustrating whether the respondent firm is owned by private foreign individuals. These two dummies take value of 1 if firm is branch and owned by foreign individual or take 0 otherwise.

Central assumption of this paper is that females in top management have negative influence on innovation. The literature on this topic is somewhat mixed. There are excessive number of empirical tests that have resulted positive relationship between two factors. On the other hand, there is growing body of study arguing the negative influence of gender diversity in senior level. Following the studies of developing economies our main assumption is women are not benefit to top management in terms of innovative activities. For empirical test of this assumption, we will use firm specific exogenous variables to investigate if my hypothesis is true. On this regard, we build our first hypothesis:

Hypothesis 1: Presence of female top managers negatively affects innovative activities of the firm.

Our second assumption is that, female leaders' years of experience has positive influence on innovative practices of enterprise. We expect that, as the years of experience rises, they become more self-confident, acquire more expertise and thus their attitude toward taking risks may change. We assume that the more experienced the women are the more empowered they become and as result, they may improve risk-taking behavior. In this context, we rely on literatures in sphere of women empowerment, which says the more women are experienced the more they are empowered (Khan and Noreen, 2012) Thus, or second hypothesis is:

Hypothesis 2: Years of experience of female leaders has a positive effect on innovation practices of the firm.

Model

Taking into account that all dependent variables are dummies, we use probit estimation model in our regression analysis³. Descriptive statistics of all variables used in the analysis are provided below. The empirical specification is:

$$Y = \beta_1 + \beta_2 * FemTopMan + \beta_3 * FemOwner + \beta_4 * FemOwnTopM + \beta_5 * FemTopMExp + \beta_6 * FemOwnTopManExp + \beta_7 * TopManExp + \beta_8 * FemTopManHireCons + \beta_9 * Shmainprodtotsal + \beta_{10} * ForeignTech + \beta_{11} * lmarket + \beta_{12} * nmarket + \beta_{13} * imarket + \varphi_s + \omega_a + \vartheta_l + \pi_o + error$$

Where, Y is defined as five types of innovation measures employed for empirical test. Y is dummy variable that takes value of 1 if firm reports innovative activity (product, process, methods and etc) and zero otherwise. Those variables are taken from BEEPS data about firm's performance in last three years prior to 2012. In addition to list of controlling variables such as, firm size (φ_s), firm age (ω_a), location (ϑ_l) and type of ownership (π_o), we included following variables to control for a firm specific factors that are considered to be crucial by the literature (Gorodnichenko and Schnitzer, 2011) and our expectation based on research objectives:

Having female top manager (*FemTopMan*), main variable in our empirical study, is expected to have negative relationship with innovativeness based on empirical papers that studies developing economies (Mahmood et al., 2012; Smith et al., 2006) case study where gender quote legislations were introduced (Ahern and Dittmar, 2011). Nevertheless, empirical studies in case of developed economies have results positive influence on performance (Carter et al., 2003; Erhardt et al., 2003; Campbell and Minquez-Vera, 2008). Thus, we will test if negative sign is true for transition economy, Russia.

Intuitively, having female owner (*FemOwner*) is also part of our research objective as in general paper aims to study role of female leaders. We expect negative influence of female owners on firm innovative activities following the Schubert et al., (1999) who say females in uncontrolled economy are risk averse, emotional and less confident.

³ In Stata we used Dprobit command to generate the coefficient of marginal effects

Years of experience of top managers in both genders (*TopManExp*, *FemTopMExp*, *FemOwnTopManExp*) are expected to result in positive relationship with innovativeness. We argue that, as the years of experience increases, top managers in their positions feel themselves more confident and risk taking attitude behavior may also increase. Khan and Noreen, (2012) argue that age may increase women empowerment. In this context, years of experience may also increase women empowerment, thus we expect to see positive relationship between these exogenous variables and innovativeness.

Female top managers relying on external consultancy (*FemTopManHireCons*) explores if female top managers are tend to innovate through consultancy with external agents. We expect this variable to have positive effect on innovation as proposed by the literature on risk-averse behavior of females (Schubert et al., 1999). We also expect that those firms who use foreign technology are more tend to make innovative activities or they bring those technologies to as intention to innovative trial. Thus, we employ variable *ForeignTech* that is a dummy variable.

Then we use other drivers of competitive environment that are share of main product in total sales and markets for main product. These variables capture competitive pressures. The variable *Shmaintotsal* is floating variable that shows proportion of main product in total sales in percentages. Literature on business studies argues that, heavy reliance of revenues on main product is risky because products are not difficult to imitate. In this context, firms are encouraged to develop product even when market demand for particular product is high. Therefore, we employed this variable to examine how female leaders implement business knowledge. Dummy variables *lmarket*, *nmarket*, and *imarket* are the destinations where a firm competes for its main product. These variables take value of one if firm competes in those market for its main product, zero otherwise.

4. Results and discussion

Empirical analysis in this paper employed five dimensions of innovation activities that are new product or service, new management methods, new manufacturing processes, new marketing methods and expenditure on R&D. Descriptive statistics for our sample is reported in Appendix 2 and the estimation results are reported in Appendix 3 and further. In the following sections, we explain the results empirical test on the influence of female leaders and other employed exogenous variables to different aspects of innovation.

Product and/or Service innovation⁴

Results of empirical tests show that, female top manager has negative effect on innovation practices of firm while influence of female owner is insignificant. Results are robust to various specifications. Moreover, in the case of having female top manager who is also owner of the firm relationship is negative. These results are in line with those of Mahmood et al. (2012) who suggest women are more risk averse than male partners as introducing new products are also taking risky action. On the other hand, our expectation regarding number of years of experience was not supported. Results indicate that, there is negative or insignificant effect of the years of experience of female top managers while years of experience of top managers in general has positive significant influence on new product development. Furthermore, one of competitive pressure that is supposed to lead to innovative actions in some cases, higher share of main product in total sales, has significant negative impulse on new product innovation. We think that, stable and high proportion of revenue from particular product leaves top management relaxed and lets to pay less attention to product development. Usage of foreign technology however has all time significant positive impact. As we argued above, foreign technologies may be used by foreign firms that are found more innovative by Gorodnichenko and Schitzer (2011) or they may be brought with already intention of doing innovative actions. In this case, they already incur R&D expense that accounts for innovative activity. All control variables that used in empirical tests showed significantly positive effect on new product of service development. More clearly, competition destinations, business city location, ownership type (foreign ownership) showed positive influence on product or service innovation. In particular, national market turns out to be influential factor for product innovation, while innovation driving force of international market found no support. Businesses located in business cities seems to implement product or service innovation more frequently as results show support that business cities are innovation driving force.

Management methods Innovation⁵

In new management practices, roles of female top managers and female owners seem to be insignificant, while the effect of female owners being top managers negatively significant or insignificant effect. Years of experience of female top managers and those who are also firm owners have significant negative influence on new management methods, in consistency with product and service innovation. This may develop the arguments that women are less confident and not well educated (Adams and Ferreira (2004). As argued in literature, top manager years' of experience in

⁴ See Appendix 3

⁵ See Appendix 4

general has positive effect on new management methods innovation. Foreign technology usage as usual always stayed significantly positive. In terms of market to compete in, if firm competes in national market level then it positively significantly relates to new management methods innovation. Other control variables that are firm age, types of ownership that are being branch of larger firm and being owned by foreign private individual effects ranges from significantly positive to insignificant while locating firm in business city has no effect to management innovation techniques.

Marketing Practices Innovation⁶

Innovative behavior of firms in terms of introducing new marketing methods and policies seem not to depend on effect of gender of leaders. Our empirical tests do not support our hypothesis in this note. All representative exogenous variables of female leaders and their years of experience show to have no effect on new marketing activities. Stable driver of marketing activities seem to be the fact that firm has obtained foreign technology while larger share of revenue from main product in total revenue tend to lessen marketing activities. National market still remains as home for innovation as our empirical results support that argument that market players on national level tend to be innovative. All other controlling variables' influence on marketing innovation, except for firm size, range from positive to insignificant.

Manufacturing Process Innovation⁷

Introducing new methods of production or supply seems to be affected by role of gender. Female top manager as expected has negative influence on innovative activities in terms of introducing new methods of production and supply. Having female owners however, seem to be insignificant factor to drive innovation behavior. In addition, the relationship between years of experience of female leaders and innovative behavior of enterprise appears to be negative as supported by empirical test while experience of top manager in general has positive influence. Moreover, the fact that firm uses foreign technology and share of main product in total sales is high has the same effect on process innovativeness as other aspects of innovation of the enterprise, positive and negative respectively. Furthermore, test shows that player of market on national level tend to implement process innovations more than local market participants and those who operate in international market. Being branch of larger company and being owned by foreign private individuals also seems to support process innovation initiatives while locating business in business city has no effect. Firm age, as expected, turns out to be positive impulse for process innovativeness as firm age increases.

⁶ See Appendix 5

⁷ See Appendix 6

Research and Development Efforts⁸

Incentives to drive innovative behavior in terms of investing in R&D are alike with incentives to create other innovation aspects used in this paper. In particular, having female leaders have the same effect on innovativeness and years of experience of their firms has negative influence. Other drivers of innovation, high share of main product in total revenue, usage of foreign technology have negative and positive effects respectively as usual. Test for included control variables also gave previous results.

Conclusion remark on results

Empirical results reported in Appendix show that all other explanatory factors holding constant, having a female top manager negatively affects to innovative behavior of firm for all dependent variables except for marketing innovation. The only measure of innovation where female top managers do not generate statistically significant effect is the new marketing methods. Under the effect of other exogenous variables we consistently find having female leaders is strongly negatively related to innovation incidences as predicted by first hypothesis. These results are consistent with early theories and studies conducted in context of developing economies (Mahmood et al., 2012; Smith et al., 2006; Ahern and Dittmar, 2011). Specifically, their arguments about role of stereotypes which says women are emotional, risk averse, less confident and not well educated seems to find support in our data in the case of Russia. Likewise, female owner being top manager of her firm has negative influence on all aspects of innovativeness used in this study. Therefore, our hypothesis 1 is supported. Age, particularly number of years of experience of women leaders was expected to have positive effect on firm performance, as argued by Khan and Noreen, (2012) age has positive effect on woman empowerment. Nonetheless, our empirical findings contrast the literature on women empowerment showing that, the effect of number of years of experience of business female leaders has negative or insignificant effect on innovation incidences. Therefore, our second hypothesis is not supported.

On the other hand, results show that, women leaders are more prone to make innovative decisions by hiring external consultants and obtaining foreign technologies. The fact that female top managers hire external consultants has positive significant impact on management innovation and investing in R&D, while equipping foreign technology has positive impact innovation of all types used in this paper. As we argued above, obtaining foreign technology may be associated with innovation by definition. Furthermore, firm size that is special and continuing interest to those who study innovative activities of businesses, has positive effect on innovation. Analysis indicates that medium and large size

⁸ See Appendix 7

firms tend to be more innovative than smaller firms. Medium sized firms are prone to make new process and management innovations and spend on R&D while large firms are more capable of innovative activities in all aspects of innovation except for new marketing methods. This result is in line with Romero and Martinez-Roman, (2012) who find that larger firms have more capabilities and resources including technical, human and financial, available for innovation. Furthermore, results of this paper support arguments by Gorodnichenko and Schnitzer (2011) who argue that, domestically owned firms are less innovative than foreign owned ones. In this note, Acemoglu et al., (2006) state that, domestic firms are more engaged in imitation and adaptation of tested innovations instead of investing in R&D.

However, literature says that under controlled economy, perceptions about females being risk averse in terms of financial decisions were not supported (Schubert et al., 1999). We argue that, Russia being one of major transition country, has not enough controlled economy to enable female top managers and female entrepreneurs to feel self-confident in their decision making. Furthermore, negative effect of the top manager being a female on innovation is likely to be due to the social norms which are discriminatory towards women. Therefore, to enable women to unleash their innovative potential gender policies should target gendered social norms.

Conclusion

Theoretical predictions of the literature regarding the presence of women in top management of firms have been tested using BEEPS 2012 wave firm level survey. BEEPS dataset contributed unique advantages to our empirical test. First, as discussed above, dataset is the most recent data publicly available with special attention to innovation practices of firm in Russia that can enable us to measure innovativeness of respondent firms using different measures of innovation. The evidence from BEEPS used in our study consistently showed that in that sample female top managers are found to be less innovative than male peers in all aspects of innovation used in our study. In other words, our results supported the literature arguing that females are risk averse and less confident in their decision-making. On the other hand, female top managers tend to make more innovation decisions using external assistance from consultants in some aspects of innovation used in our study. Possible explanation can be fundamental theory in economy- the law of diminishing marginal returns. More specifically, less human capital females possess may generate higher probability of conducting innovation practices with the assistance of external consultants in our sample.

In addition, we found that foreign owned firms in our sample seem to be more innovative than domestically owned ones in all aspects of innovation employed in our empirical study. Furthermore, firms that are part of larger companies, firm branches are also found to be associated with innovation. We argue that it must be due to easier access to finance and expertise. In this context, Acemoglu et al., (2006) argued that, domestic firms tend to be imitators and prefer to use and implement tested innovation practices. Gorodnichenko and Schnitzer (2011) argue that less innovativeness of domestic firms in transition economies are mainly due to severe financial constraints they face. Foreign owned companies however, usually have easier access to external finance to finance their projects. On the other hand, Schubert et al. (1999) argues that risk-averse behavior of females is mainly due to level of control of national economy. Under controlled economies, they did not find women to be less risk takers, while under uncontrolled economy results are opposite.

This paper suggest that, transition in emerging market economies can benefit from policy implications that facilitate female involvement in business sphere overall and their representation in senior level of firm management. This we assume, could lead some modification of social stereotypes that we think is creating the so-called “glass ceiling effect” in career development of females. In addition, implementation of policies that support innovative practices of firms most sensitive to financial frictions could bring benefits to transition economies as suggested by Gorodnichenko and Schnitzer, 2011.

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Appendix 1

Variables description	
Variable name	Variable label
NewProduct	Dummy variable equals to 1 if there was Introduction of new or improved products, equals to 0 if not
NewProcess	Dummy variable equals to 1 if there was new or improved process for production, equals to 0 if not
NewManagement	Dummy variable equal to 1 if there was new or improved management practices, equals to 0 if not
NewMarketing	Dummy variable equals to 1 if there was new or improved marketing methods, equals to 0 if not
RandD	Dummy variable equals to 1 if there was R&D expenditure, equals to 0 if not
FemTopMand	Dummy equals to 1 if there was Female Top Manager, equals to 0 if not
FtopYrsExp	Fem top Manager Years of Experience
FemOwnTop	Dummy variable equals to 1 if female owner is Top Manager, equals to 0 if not
FOwnTopExp	Female Owner Top Manager years experience
FemOwner	Dummy variable equals to 1 if there was female owner, equals to 0 if not
FirmsizeSmall	Dummy variable equals to 1 if firm size is small [5;19 employees], equals to 0 if not
FirmsizeMedium	Dummy variable equals to 1 if firm size is medium [19;100 employees], equals to 0 if not
FirmsizeLarge	Dummy variable equals to 1 if firm size is large [100 and more employees], equals to 0 if not
Topmanexp	Top Manager's number of years of experience working in this sector
FTopHireCons	Dummy variable equals to 1 if female Top Managers hire external consultant, equals to 0 if not

Shmptotsales	Share of main product/service in total sales of last year
ForeignTechd	Dummy variable equals to 1 if firm used foreign technology, equals to 0 if not
Lmarket	Dummy variable equal to 1 if main market for main product/service is local market, equals to 0 if not
Nmarket	Dummy variable equals to 1 if main market for products is national, equals to 0 if not
Imarket	Dummy variable equals to 1 if main market for products/services is international , equals to 0 if not
Fage	Firm age
Businesscity	Dummy variable equals to 1 if firm is located in business city, equals to 0 if not
FirmBranch	Dummy variable equals to 1 if firm is branch of larger firm, equals to 0 if not
ForeignOwned	Dummy variable equals to 1 if firm is owned by foreign private individuals, equals to 0 if not.

Appendix 2

Descriptive Statistics					
Variable	Obs	Mean	Std. Dev.	Min	Max
NewProd	4200	0.2497619	0.4329267	0	1
NewProcess	4199	0.236723	0.4251215	0	1
NewManagem~t	4197	0.2420777	0.4283921	0	1
NewMarketing	4186	0.2522695	0.434367	0	1
RandD	4185	0.1142174	0.3181132	0	1
FemTopMan	4196	0.2006673	0.4005473	0	1
FemOwner	4149	0.3142926	0.4642895	0	1
FemOwnTopM	4131	0.1619463	0.3684461	0	1
FemTopMExp	4094	2.711773	6.946866	0	53
FemOwnTopM~p	4034	2.263014	6.493582	0	53

FemTopManH~s	845	0.1207101	0.325983	0	1
TopManExp	4095	14.2315	9.338117	1	60
FirmSmall	4220	0.3495261	0.4768768	0	1
FirmMedium	4220	0.5485782	0.4976935	0	1
FirmLarge	4220	0.1018957	0.302547	0	1
FirmBranch	4220	0.0739336	0.2616939	0	1
ForeignOwned	4194	1.942775	12.73081	0	100
ForeignTech	4186	0.0759675	0.2649778	0	1
Shmainprod~l	4125	87.74958	18.73349	3	100
Lmarket	4207	0.699073	0.4587156	0	1
nmarket	4207	0.2890421	0.4533714	0	1
Imarket	4207	0.011885	0.1083812	0	1
Fage	4185	10.62031	10.4373	0	173
businesscity	4220	0.0684834	0.2526036	0	1

Appendix 3 Regression results for new product innovation

	New product			
Female top manager	-0.095***	-0.1139*	-	0.1087***
Female owner			0.0334*	-0.017
Female owner is top manager				-0.0146
Female top manager experience			0.869	-
Female owner top man exp				0.1054
Top man exp				
Fem top man hiring exter consultant		0.0615		
Share of main prod in total sales		-	0.0032***	
Foreign technology used		0.1584**		
Compet on local market				
Compet on national market				
ComepetInternational market				
Firm size small	-		-	-
	0.0953***		0.0931***	0.1021***
Firm size medium	-	-0.09	-	-
	0.0873***		0.0847***	0.0922***
Firm size large		0.116*		
Firm age	0.0025***	0.0015	0.0023***	0.0027
Business city location	0.0932**		0.0910**	0.0903**

Branch of larger firm	0.063*	-0.011	0.0588*	
Owned by foreign	0.0011*	0.0016	0.0012*	0.0013*
Female top manager				
Female owner				
Fem owner is top manager	- 0.0931***	- 0.1227***		
Fem top man exp		- 0.0042***		-0.0056*
Femown top man exp		0.0023		-0.0007
Top manager exp	0.0042***		0.005***	0.0062***
Fem top man hiring external consultant				0.003
Share of main prod in total sales				- 0.0029***
Foreign technology used				0.1834***
Compet in local market				0.044
Compet in national market	0.1252***			0.1992
Compet in intern market	-0.084			
Firm size small		- 0.0961***		
Firm size medium	-0.0006		- 0.0887***	0.016
Firm size large	0.0815**			0.122*
Firm age	0.0015*		0.0024***	
Business city location	0.056*		0.0859**	

Branch of larger firm

Owned by foreign	0.0009*	0.0012*
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Appendix 4 Regression results for new management methods innovation

New Management				
Fem top manager	-	-0.0269	-0.0164	
	0.038*			
Female owner			0.0186	-0.0078
Fem owner is top manager			-	-0.1024
			0.0555**	
Fem top manager experience				
Fem owner top man exp			-0.0018	-0.002*
Top man exp				-0.002*
Fem top man hiring exter cons				0.0927
Share of main prod in total sales				-0.0022* -0.002***
Foreign tech used				0.1746** 0.166***
Compet in local market				
Compet in national market				0.1394***
Compet in international market				0.1112
Firm size small	-	-0.102***		-
	0.0989***			0.1022***
Firm size medium		-0.0614**	-0.0648**	-0.0652**
Firm size large				
Firm age		0.0013*	0.0012*	0.0012*

Business city	-0.0147	-0.015		-0.0332	-0.0154
Branch of larger firm	0.1169***	0.1227***		0.063	
Owned by foreign	0.0014**	0.0013**		0.0008	
Fem top manager			0.0205		0.0205
Female owner					-0.0008
Fem owner is top manager					-0.0008
Fem top manager experience	-0.0026*			-0.0015	-0.0015
Fem owner top man exp		-0.0026*	-0.0078*	-0.002	0.0008
Top man exp	0.002*			0.0022**	0.0027***
Fem top man hiring exter cons	0.1312*				0.0325***
Share of main prod in total sales	-0.0024**		-		-0.002***
Foreign tech used	0.1623**		0.1648**		0.1886***
Compet in local market					-0.0101
Compet in national market			0.1306**		0.0839
Compet in international market			0.1641		0.1641
Firm size small			-0.0873		-
Firm size medium	0.04**		-0.0808		0.1155***
					-0.0734**

Firm size large	0.1202***		0.0
Firm age	0.0008	0.0016	0.0
Business city	-0.0225	-0.046	-0.0
Branch of larger firm			0.0
Owned by foreign	0.0016**	0.0004	0.0

Appendix 5 Regression results for Marketing innovation

	New Marketing			
Fem top manager	-0.0103	-0.0035		-0.0104
Female owner			0.0105	0.0271
Fem owner is top manager				-0.027
Fem top manager experience				-0.0174
Fem top manager			-0.0008	-0.0006
Fem owner top man exp				0.0002
Top man exp				
Fem top man hiring exter cons		0.0553		0.0519
Share of main prod in total sales		-		-
		0.0038***		0.0039***
Foreign tech used		0.1733**		0.1829**
Compet in local market				
Compet in national market				
Compet in international market				

Firm size small	-0.0605*			
Firm size medium	-0.0445*	0.019	0.0183	
Firm size large		0.0759**	0.0751**	
Firm age	0.0013*	0.001	0.001*	
Business city	0.0193	0.0194	0.0175	
Branch of larger firm	0.0782**	0.0879**	0.0865**	
Owned by foreign	0.0016**	0.0015**	0.0014**	
Fem top manager		0.0425		0.16
Female owner				0.05
Fem owner is top manager				-0.24
Fem top manager experience	0.0007		-0.0015	-0.00
Fem owner top man exp	-0.001	-0.0018	-0.002	0.01
Top man exp	-0.0017	0.0005	0.0028***	-0.00

Fem top man hiring	0.0545	0.0503	0.0303***	0.06
exter cons				
Share of main prod in total sales	- 0.0038***	- 0.0038***	- 0.0024***	0.0039
Foreign tech used	0.1685**	0.1772**	0.1922***	0.177
Compet in local market			0.0186	0.04
Compet in national market		0.0825*	0.0901	0.08
Compet in international market		-0.0615		-0.04
Firm size small	-0.0807	-0.0969	- 0.0783**	-0.081
Firm size medium	-0.0479	-0.0706	-0.0575*	-0.064
Firm size large				
Firm age	0.002	0.0014		0.00
Business city	0.0139	-0.0049		-0.01
Branch of larger firm				-0.07
Owned by foreign	0.00068	-0.0004		-0.00

Appendix 6 Regression results for Process Innovation

	New Process			
Fem top manager	-	-	-0.0098	-0.0925**
	0.0745***	0.0647***		
Female owner			-0.0031	0.0444*
Fem owner is top manager				-
				0.0872***
Fem top manager experience				0.0002
Fem owner top man exp				-0.0033**
Top man exp				
Fem top man hiring exter cons			0.0577	
Share of main prod in total sales			-	-
			0.0037***	0.0019***
Foreign tech used			0.1706***	0.1378***
Compet in local market				
Compet in national market			0.0783*	0.1024***
Compet in international market			-0.0816	

Firm size small		-0.087***		-0.09***	
Firm size medium		-0.055*	0.0232	-0.0597*	
Firm size large			0.0849		
Firm age		0.002**	0.002	0.0018**	
Business city		-0.0156	-0.007	-0.0139	
Branch of larger firm		0.0996***		0.1025***	
Owned by foreign		0.001*		0.0011*	
Fem top manager					0.0
Female owner					0.0
Fem owner is top manager	-0.0897**				-0.1
Fem top manager experience		-0.0006	-0.0049*	-0.0043*	-0.0
Fem owner top man exp	0.0021			-0.0005	0.0
Top man exp			0.0033***	0.0043***	0.00
Fem top man hiring			0.0192	0.0029	0.0

exter cons				
Share of main prod in total sales	-0.002***	-	-	0.003
		0.0034***	0.0021***	0.003
Foreign tech used	0.157***	0.1867***	0.1788***	0.182
Compet in local market			0.0412	
Compet in national market			0.01669*	0.145
Compet in international market				-0.0
Firm size small			-	0.0
			0.1102***	0.0
Firm size medium	0.0347*	0.0085	-0.0723**	-0.0
Firm size large	0.1058***	0.0353		
Firm age	0.0014*	0.0018		0.0
Business city	-0.0187	-0.0055		
Branch of larger firm				0.1
Owned by foreign	0.0008	0.0017*		0.0

Appendix 7 Regression results for Expenditure on research and development

Research and Development				
Fem top	-	-0.0296*	0.1412	

manager	0.0475***			
Female owner			-0.0184*	-
			0.0509***	0.0509***
Fem owner is top manager		-0.1537*		-
				0.0622***
Fem top manager experience				
Fem owner top man exp				
Top man exp				
Fem top man hiring exter cons				
Share of main prod in total sales			-	
			0.0029***	
Foreign tech used			0.0885***	
Compet in local market				
Compet in national market		0.1414***	0.1296***	
Compet in international market		0.0962*	0.056	
Firm size small		-	-	
		0.0505***		0.0696***
Firm size medium		-0.0358*	0.0208*	-0.0527**
				0.0229***
Firm size large			0.0673***	0.0903**

Firm age		0.0008*		0.0013**	0.0013**
Business city		0.0369*	0.0365*	0.0651**	0.0651**
Branch of larger firm		0.0568**	0.0539**	0.0553**	0.0553**
Owned by foreign		0.0003	0.0002	0.0007*	0.0007*
Fem top manager					0.1529
Female owner					-0.0172
Fem owner is top manager	-0.037**				-0.105
Fem top manager experience		-0.0003			0.0002
Fem owner top man exp		-0.003*	-0.0049		-0.0033
Top man exp		0.0023***	0.0002		0.0002
Fem top man hiring exter cons			0.0036	0.006*	-0.0562
Share of main prod in total sales	-	-	-	-	-
	0.0013***	0.0029***	0.0015***		0.0028***
Foreign tech used	0.0882***		0.1382***		0.1*

Compet in local market		0.1021*		-0.1023*	
Compet in national market	0.1294***	0.1971***		0.0357	0.1991***
Compet in international market	0.0553	0.0309			0.035
Firm size small				-	-
				0.0697***	0.0651***
Firm size medium	0.0208*	0.0367		-	0.035
				0.0506***	
Firm size large	0.067***	0.0856			0.0916
Firm age	0.0008*				0.00006
Business city	0.0365*	0.0412			0.045
Branch of larger firm		0.0278			0.0254
Owned by foreign	0.0002	0.001			0.0008