

Title: Analyze female leadership in three measurements: innovation, accessing credit and performance from BEEPS data.

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Abstract

Using the Business Environment and Enterprise Performance Survey (BEEPS) IV-V Panel published in August 2017, I analyze female managers' performance under three measurements: innovation, accessing finance and performance. I found that there is no evidence that female managers are less innovative and also face more obstacles to access financial sources in relative to male. It debunks the myth about skeptical female leadership. However, female executives underperform than male in performance index: total annual sales and total annual sales in some regions due to "female-self-selection" generated by constraint-driven gaps and preference-driven gaps.

1. Introduction:

This myth about female managers' underperformance is well-known in every society around the world, especially in business. Supporters of the myth argue that female has gender unsuitable inherent to become a leader such risk-averse, closed minded and conservative resulting in less innovative and underperformed. Also, the female often faces cultural constraints such as difficulties cultivating business networks and finding financial resources; and family-related constraints such as young children care and pregnancy. This gender discrimination has negative impacts on a role of human capital and allocations of resources, not utilizing human and physical capital to reach potential GDP growth for each country.

These reasons would account for the lower level of performance among female managers, as opposed to male counterparts in business. In particular areas such as innovations and accessing credit, the woman is less likely promoted to top managers who are in charge of innovative technologies or financing. The board of directors more likely rejects female's proposed plans and ideas and even consider them ineffective and unfeasible. It even becomes worse in companies where the female employee is the minority, and in fact, across countries almost companies have the number of female employee being underrepresented.

The less female workers, the less female executives and the fewer female successful evidence on innovation, financing and performance. Even though today there are more and more general papers against these gender biases and support gender equal opportunities in societies, particularly in the business environment, there has been little rigorous empirically research on the specific case female innovation, accessing financial resources and performance indexes in comparison to male. Majority of papers on this topic use data from developed countries to find the relationship between gender and entrepreneurial performance. However, the world is

changing fastest ever with main engines in developing countries; therefore, we should pay more attention to the cases in these emerging countries. In this paper, I give a brief analysis of female managers' performances on innovation, accessing credit and performance indexes, using data from many countries from four regions, namely, Central Europe and the Baltics (CEB), South-eastern Europe (SEE), Eastern Europe and Caucasus (EEC), Central Asia (CA) region. In details, I investigate the gender differences on three measurements: innovation, accessing finance and performance.

In line with other authors' findings have done in developed countries, I find that there are no significant gender differences on innovations and accessing credit in developing countries. This debunks the myth about skeptical female leadership and advocate for equal opportunities for female executives, encourage to reduce overall gender gaps in business. However, female managers underperform in performance index: total annual sales and total annual sales in some regions because the female has a tendency to concentrate in some specific industry sectors, which have poor productivities. The choice is highly affected by "female-self-selection" generated by constraint-driven gaps and preference-driven gaps in societies.

The paper proceeds as follows: Sect. 2 includes related literature and Sect. 3 a data description. Section 4 contains results and in Sector 5 I give a conclusion. Finally, Section 6 provides my references.

2. Related literature

In the past, there are fewer consensuses on the gender performance. Brush (1992); Rosa (1996) introduce their papers giving evidence of female underperformance whereas Du Rietz and Henrekson 2000; Bardasi (2007) suggest that there is no gender gap in entrepreneurial performance. Furthermore, other authors provide a significant gender difference between female- and male-owned companies in size of sale and assets (Coleman 2007) and find that female manager generate fewer sales turnover compared to male in a given sector (Lescocco and Robinson 1991; Chaganti and Parasuraman 1996). About survival rates, Bosma 2004 indicates that male enterprises have more survival probabilities in relative to female in the paper investigating in Dutch businesses. It is in line with Lohmann and Luber (2004) finding of remaining self-employed rate of entrepreneurs after 5 years, it gives evidence that female figure is less than male 20%.

On the other side, in recent years there are increasingly many papers back female executives' performances and somehow advocate gender equality in business. In a paper conducted in Australian enterprises investigating rates of return on equity and assets, Watson (2002) indicates that the rates are the same for both genders. In term of productivity, the evidence founded by Bardasi (2007) shows male performance is not higher in relative to female among African companies. Also, Kepler and Shane (2007) do empirical research on nascent entrepreneur's data

show no significant differences in business outcome among these companies. In line with above papers, Fischer (1993); Chaganti and Parasuraman (1996) job creation under top female managers are at least as high as those under male leadership.

Explanations of female's underperformances in all above papers are concluded into two main reasons: constraint-driven gaps and preference-driven gaps (Klapper and Parker 2010). Constraint-driven gaps consist of cultural and institutional structures. The woman often faces constraints in accessing bank credit (Mayoux 1995), and furthermore, Bardasi and Getahun (2009) provide evidence that Ethiopian female executives face more barriers than male counterparts in finding financial loans from banks, resulting in higher cost of finance. This evidence is in line with findings of Muravyev (2009) using Europe and Central Asia data show that probability of securing a bank loan is 5.4% higher in male-owned enterprises. Also from Eastern Europe survey data such as Lithuania and Ukraine, there are sustainable obstacles against female leadership in accessing credit (Aidis 2007). However, there are many published papers find no significant evidence for gender gaps in finding financial resources (Cavalluzzo 1998; Blanchflower 2003; Storey 2004; Cavalluzzo and Wolken 2005)

Preference-driven gaps suggest that female face gender barriers in business due to their inherent nature. Their obstacles include becoming entrepreneurs to have flexible work time in order to take care young children, pregnant interrupting their careers, risk-aversion, and industry selection based on female preferences. Boden (1999) use Contingent Work Survey data in the US to find impacts of having young children on the probabilities becoming female entrepreneurs but no impacts on the male. In general, societies perceive female as risk-averse which is a negative indicator of business success and this perception is cemented by many papers show that female take fewer risks than men (Jianakoplos and Bernasek 1998; Barber and Odean 2001; Dohmen 2006). Preference-driven gaps also can be explained by industry selection based on female preferences. Observed data shows that female has a propensity to concentrate on specific small-scale sectors, making gender gap larger among all other sectors. Unfortunately, those female sectors have a low return to scale - in other words, less efficiency, small investments, and few innovations (Mayoux 1995). It is easily seen that male dominant all big industrial sectors requiring high-end technologies such as Automation, Computer science, and Engineering, enlarging the gender gap in innovations. In World Corporate Top R&D Investors: Industrial Property Strategies in the Digital Economy report from OECD data, there are only 3,3% of overall patents invented by female inventors in the United States in 1980 and increased to 9,7% in 2010. In general, all societies across the world perceive female less innovative than male.

3. Data description and Summary statistics

In this essay, I use data from The Business Environment and Enterprise Performance Survey (BEEPS) IV-V Panel published in August 2017, consisting of many countries from four regions,

namely, Central Europe and the Baltics (CEB), South-eastern Europe (SEE), Eastern Europe and Caucasus (EEC), Central Asia (CA) region.

The data is a collective firm-level survey from direct interviews with managers of manufacturing and service enterprises across countries to investigate the quality of the business environment and the constraints to private sector growth. BEEPS gives companies' feedbacks about the current status of private sectors growth and the interaction between private sectors environments and enterprises in participating countries. BEEPS is also a precise indicator tracking business environment changes and an important guideline for governments making essential reforms.

The sample includes only registered firms operate in manufacturing and service sectors and firms in each country are stratified by size, location, by two-digit industry level in case of large economies. The data allows me to pool the countries into five region-specific datasets mentioned above by the similarity of business environment and geography. Furthermore, the data enables me to identify the gender of firms' top managers and the elements of innovation, bank loans held by firms and performance indicators. Hence, in this essay, I make a comparison between female and male managers' performance these three measurements.

Data have some weakness such as numerous missing values to some variables of interest, making less available observations when running regressions with fixed effect on sectors and regions and resulting lightly higher standard errors making less precise implications; however, I only run regressions with more than 200 observations. My analytical sample has 13,418 firms for Eastern Europe and Caucasus (EEC), 4,440 firms for Central Europe and the Baltics (CEB), 4,769 firms for South-eastern Europe (SEE) and 3,341 for Central Asia (CA) region. Then I drop the firms having missing information on my used variables.

Table 1: Summary statistics (mean)

Variable	EEC		CEB		SEE		CA	
	Male	Female	Male	Female	Male	Female	Male	Female
howmanyproducts	5.97304	7.67769	7.72475	6.70677	8.54474	10.7676	5.74089	5.85057
ln_rd	12.79462	11.81887	11.65511	10.17266	10.77841	10.28007	13.72865	14.80081
ln_sale	16.08978	15.86361	16.17865	15.23042	15.41305	15.31555	17.78757	17.77325
ln_lp	12.59634	12.90905	12.65872	12.04339	12.29245	12.3201	14.29129	14.79113
ln_loan	15.38202	16.07278	13.95508	12.40155	13.90994	13.23827	19.27109	17.84665
rejectednewloan	0.156484	0.16358	0.124711	0.138462	0.158145	0.186667	0.223247	0.124224
empl	119.767	56.5602	98.858	64.6891	71.1584	45.8096	84.9052	51.6624
age	49.542	43.71906	45.10387	48.5043	47.85686	47.87608	38.15095	26.40669

Table 2: Two sectors with highest female managers ratio

Sector	EEC	CEB	SEE	CA
wholesale	26%	14%	18%	13%
retail	33%	46%	44%	46%

4. Results

I measure innovation gaps between female- and male-manager in terms of the number of new or significantly improved products or services introduced over last year (howmanyproducts) and expenditures on R&D within establishment in last fiscal year (ln_rd); performance gap in terms of total annual sales of a firm in last fiscal year (ln_sale) and sales per an employee in last fiscal year (ln_lp); accessing financing gap in terms of total value of outstanding loans of a firm (ln_loan) and whether a firm applies for any new loans that were rejected in last year (rejectednewloan).

In the paper "How do female entrepreneurs perform? Evidence from three developing regions" (Elena, Shwetlena, Katherine 2011), these authors test whether female managers underperform in innovation, performance and accessing financing in relative to male, which is similar to my research question, but over three different regions such as ECA, LA, SSA. However, their regression, shown in table 1 in their paper, only consists one independent variable as female manager dummy. This simple regression has the weakness making the coefficients may be biased; therefore, we may be more likely skeptical about these results and the probabilities of implementing misleading references.

To test whether their interested coefficients being biased, I build the table 2, shown below, using the same regressions but with more specifically relevant control variables for these dependent variables (see in appendix).

In Table 3 shows coefficients of the female-manager dummy with three OLS methods presented in each column with numbers of controls increases progressively from column 1 to column 3. In column 1 and 2, I replicate the authors' simple regression with my own data, using only one independent variable as female-manager dummy (column 1) and also include country fixed effects (column 2), respectively. Finally, in column 3, I use my own OLS method, using female-manager dummy with country and sector fixed effects, and other specifically relevant controls depending on each dependent variable.

Comparing the number of significant coefficients in column 1 and 2 to column 3, I know these coefficients in first two columns, which are generated by the authors' simple regression, are biased. Almost the significant coefficients in column 1 and 2 become insignificant ones in column 3, whose regression includes more specifically relevant controls. It is important to notice that

many coefficients in performance measurement, consisting of annual sales of a firm in last fiscal year (\ln_sale) and sales per an employee in last fiscal year (\ln_lp), are biased, meaning that female managers underperform not that much as the authors found. Only CEB region shows female managers are less productive as male counterparts.

As far as my regression concerned, I acknowledge that there is a tradeoff between adding more controls and low-level efficiency. In other words, a regression with few controls will likely have biased interested coefficient due to omitted variables; meanwhile, a regression with many controls, even relevant ones, will have higher standard errors (low-level efficiency), resulting in more likely having insignificant coefficients (type II error). However, obtaining unbiased estimate always be the priority. Another problem is that adding many controls will have a less available observation. Even though econometrics theories said that a sample with more than 30 observations is enough for using a t-test, my regressions almost have more than 200 observations. Therefore, my criterion choosing controls are based on these concerns. I choose enough relevant controls with the concerns about type II error and a number of available observations.

The column 3 shows, in general, there are no statistically significant gender gap in innovation and accessing finance measurement. In the innovation measurement, there are almost insignificant gender gaps in four regions, except in R&D expenditure in SEE. Also, in accessing financing measurement, there is no statistical evidence that female faces more obstacles than male in all four regions. However, in performance measurement, there are the only female executives in CEB underperform in relative to male, especially significant in a total sale. Therefore, the story that female managers are less productive than male counterpart is, indeed, still real, but less as strong as the authors (Elena, Shwetlena, Katherine 2011) mentioned when I add more relevant controls.

An explanation for this female underperformance is that female manager indeed concentrates in a few sectors, as opposed to male, where are "poorly performing" industrial sectors. It is consistent with constraint-driven gaps and preference-driven gaps which makes a "female-self-selection" into some specific sectors where they supposed to be suitable for women. My data shows that most female managers work in wholesale and retail industries.

Table 3: Innovation gap, performance gap and accessing financing gap between female- and male-manager, with specifically different controls (OLS regressions coefficients of female-manager dummy)

[illegible]

5. Conclusion

In conclusion, in societies' perceptions, female manager faces many obstacles in business such as difficulties cultivating business networks, finding financial resources and proposing innovative ideas. These difficulties come from constraint-driven gaps and preference-driven gaps. From BEPPs data, I find out that there is no evidence that female manager is less innovative and face more obstacles in accessing finance sources than male counterpart, but in one region, female executives underperform in performance measurement such as sale and productivity, sale per an employee. The suitable explanation is that due to constraint-driven gaps and preference-driven gaps, female tends to choose their careers narrowly in a few specific sectors supposed to be suitable for them, where, unfortunately, have low-productivity performances naturally. This "female-self-selection" into industrial areas increasingly widen the gender performance gap and strengthen the biased societies' perception skeptical about female managers.

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Appendix

Model is used in column 3 in table 3.

$$y = \alpha + \beta D_{female_manager} + controls + country\ fix\ effect + sector\ fix\ effect + \varepsilon$$

These controls are chosen based on the concerns that they are determinants of dependent variable y and are correlated with female manager dummy. Also, adding these controls does not drop many observations in the data. I acknowledge that there are still some omitted variables in error terms, and therefore, I use country fixed effect and sector fixed effect to eliminate unobserved heterogeneity.

These dependent variables are chosen as proxy indicators for these measurements based on the availability of the data. They are the best choices from the data.

The number of new or significantly improved products or services introduced over last year (howmanyproducts) and expenditures on R&D within establishment in last fiscal year (ln_rd) are used as a proxy variable for innovativeness. Higher number of new improved products or services shows more firms' successful innovations. High R&D expenditure shows more effort that a firm puts in an innovation process.

Total annual sales of a firm in last fiscal year (ln_sale) and sales per an employee in last fiscal year (ln_lp) are used as a proxy variable for performance. Total annual sales of a firm shows the firm's performance in a year. Sales per an employee in last fiscal year is a good proxy for labor productivity.

Accessing financing gap in terms of total value of outstanding loans of a firm (ln_loan) and whether a firm applies for any new loans that were rejected in last year (rejectednewloan) are proxy variables for the probability of obtaining financial resources. The total value of outstanding loans shows the firm's success in funding. The dummy rejected new loan show somewhat the obstacles that firms face when applying for a loan.

These controls are chosen based on general economic theories and the papers mentioned in literature reviews.

The age of the firm could be a plausible answer because we all know that the younger firm will generate smaller sale and profit than mature firms and also face more operating obstacles at the beginning of its business life. Table 1 tells us that all average, female firms are younger than male firms across all four regions, especially in CA with a huge age gap. Female managers in younger firms have fewer experience years being leadership positions resulting in lower business performances such as small sales, small value added per an employee and lower rates of return. On the other hand, the younger female firms could tell a story that female firm's rate of surviving in business competitions is much lower than male firms. The age of the firm plays an important

role to explain the performance gap between genders, so age variable should be included as an independent variable in the regression.

One of the reasons explaining female underperforms in the performance gap could be the fact that female managers have tendencies to choose their careers in narrowly specific sector industry sectors which are "poorly performing" industries. In table 2, female managers concentrate almost in two sectors such as wholesale and retail. There are many reasons and factors explaining why these sectors are poorly productive; however, these factors are hard to capture in the data, generating unobserved heterogeneity for the regression. To cope with the unobserved heterogeneity, I include sector fixed effect in the regression.

I also acknowledge that there are several differences between all four regions. BEEPs data consists of the larger number of firms in many countries, and each country has their own characteristic which maybe not captured in BEEPs data as variables. This issue also creates unobserved heterogeneity for regression analysis. To eliminate this problem, I also use country fixed effects, included in the regression.

Accessing the financial resources such as bank credit is the key factors to help firms to survival and business success. Some empirical research (Cater and Rosa 1998; Coleman 2007) indicates that female firms face more constraints to obtain bank loans than male firms. This problem is even bigger in some large-scale industries which require large investments to have advantageous competences over competitors. Therefore, the accessing finance measurement could explain the performance gap between each gender, even within industrial sectors. Taking financial variable into account in the regression is important.

However, I acknowledge that the gender of managers has impacts on both the supply and demand of loans in banking processes. For instance, female may be less likely to apply for bank loans due to the fact that they are more likely risk-averse. Cultural barriers could be a problem because, in some societies, female managers are perceived as less creditworthy than male. For example, regarding property rights, banks could ask more collaterals than male without reasonable reasons. Therefore, I include many collateral variables in my regression.

We consider the number of employees as a proxy for firm's size measurement. As the table 1 shows, female's firms have the number of employees much smaller than male's firms, meaning that female's firm size is indeed smaller than male's one. In general, a small firm more likely has disadvantages in business competitions than a large firm. Furthermore, small firms with small profits are hard to make significant investments in innovation boosting their productivities and face more obstacles in applying for bank loans. For these reasons, the regression should add numbers of employees variable as a control.

For innovation measurement:

Dependent variable	Controls
howmanyproducts	<p>New product/service: Added new functions to existing product/service (newfunctions)</p> <p>New products/services new to one of the establishment's markets? (productsnewtothefirmmarket)</p> <p>New organisational/management practices or structures introduced over last 3 (organizationinnovation)</p> <p>New marketing methods introduced over last 3 yrs (marketinginnovation)</p> <p>Give employees time to develop or try out a new approach/idea about products (timetoemployeestoinnovate)</p> <p>% annual sales accounted for by new or significantly improved products/services (innovativeannualsales)</p> <p>Purchase/license inventions (purchaseorlicenseproduct)</p> <p>Introduced new methods of supplying products/services over last 3 yrs (productionprocess)</p> <p>Expenditures on R&D within establishment in last fiscal yr (LCU) (ln_rd)</p>
ln_rd	<p>New product/service: Added new functions to existing product/service (newfunctions)</p> <p>New products/services new to one of the establishment's markets? (productsnewtothefirmmarket)</p> <p>New organisational/management practices or structures introduced over last 3 (organizationinnovation)</p> <p>New marketing methods introduced over last 3 yrs (marketinginnovation)</p> <p>Give employees time to develop or try out a new approach/idea about products (timetoemployeestoinnovate)</p> <p>% annual sales accounted for by new or significantly improved products/services (innovativeannualsales)</p> <p>Purchase/license inventions (purchaseorlicenseproduct)</p> <p>Introduced new methods of supplying products/services over last 3 yrs (productionprocess)</p> <p>No. of new/significantly improved products/services introduced over last 3 yrs (howmanyproducts)</p>

For performance measurement:

Dependent variable	Controls
ln_sale	age = 2017 - yearofestablishment no. permanent, full-time employees of this firm at end of last fiscal year (empl) for the most recent loan, what was the value at the time of approval? (lastvalueloan) No. of new/significantly improved products/services introduced over last 3 yrs (howmanyproducts)
ln_lp	age = 2017 - yearofestablishment no. permanent, full-time employees of this firm at end of last fiscal year (empl) for the most recent loan, what was the value at the time of approval? (lastvalueloan) No. of new/significantly improved products/services introduced over last 3 yrs (howmanyproducts)

For accessing financing

Dependent variable	Controls
ln_loan	for the most recent loan, what was the value at the time of approval? (lastvalueloan) type of collateral required for the most recent loan? land, buildings (landcollateral) type of collateral required for the most recent loan? Equipment (equipmentcollateral) type of collateral required for the most recent loan? Accounts (accountscollateral) type of collateral required for the most recent loan? personal assets (personalcollateral) type of collateral required for the most recent loan? Other (othercollateral) Outstanding personal loans used to finance establishment's business activities (personalloanstofinance) in last fiscal yr, did establishment apply for new loans/lines of credit? (lastyearapplyloans)
rejectednewloan	for the most recent loan, what was the value at the time of approval? (lastvalueloan)

	type of collateral required for the most recent loan? land, buildings (landcollateral)
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