

Arlette Beltran*

Abstract

This study explores whether companies' experience benefits when the firm's CEO and owner are both women. It employs data from the 2009–2014 World Bank Enterprise Surveys (WBES) to measure firms' performance through growth in sales and productivity. Potential endogeneity was corrected by using the UN Gender Development Index and the average fertility rate as they comply with the exclusion restrictions. The paper uses the Control Function method with a Probit first stage estimation and an OLS main equation. The findings suggest that a female owner strengthens the female CEO's business skills and leads to better firm performance than when the CEO is a woman and the owner is a man.

Keywords: firm performance, gender, statistical discrimination, cross-country data

JEL Classification: L25, M51, J16, O10

1. Introduction

In recent years, businesswomen have made considerable contributions to global economic development. Despite the fact that in many countries women are finally recognized for their financial abilities, creativity, and capacities for problem solving and teamwork, they still face considerable obstacles when attempting to reach the highest ranks of business leadership (OIT, 2015). Women are generally understood to carry more family responsibilities than men and are often perceived as lacking the business experience required for the positions they hold. What is more, the literature often shows that women tend to run smaller, less profitable, low-growth, or informal firms; see Kepler and Shane (2007), Morris *et al.* (2006), and Cliff (1998).

In their recent work, Flabbi *et al.* (2014) argue that economic interaction among individuals of the same gender will result in a more accurate perception of the individuals' signalling of abilities. That is to say, a female boss will show greater capability in assessing the productivity of a female employee than she would be of assessing a male employee's productivity. Thus, according to this theory, the presence of gender matching in a given firm will translate into an improvement in overall performance.

* Arlette Beltran, Academic Department of Economics, Universidad del Pacífico, Lima, Peru (beltran_acl@up.edu.pe).

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Relatedly, this study seeks to empirically substantiate whether matching a female CEO with a female owner will improve the performance of the firm, namely, whether the dynamics of gender matching will reinforce the business performance of a female CEO compared to when the owner is a man. In order to do this, this paper utilizes the World Bank Enterprise Survey (WBES), which allows for the analysis of firm data, both at the sector and national level. The paper makes contributions by: 1) adding insights into gender dimensions of the production function of a company; 2) incorporating a potential multiplier effect on firm performance that arises from gender matching between owner and CEO; and 3) providing causal empirical evidence that relies on less volatile performance measurements than typical financial indicators of related work (Dobbs & Koller, 2005).

The paper is organized as follows: Section 2 presents a review of empirical literature and provides a basic framework that supports the research hypothesis; Section 3 describes the data and variables included in the analysis; Section 4 proposes and explains the methodology and empirical procedure; Section 5 shows the general results; Section 6 discusses main findings; lastly, Section 7 offers concluding remarks.

2. Theoretical Background

2.1 How the gender of firms' leaders impacts firm performance

Various studies have linked the presence of women in positions of leadership with firm performance indicators. Some of these works suggest that this relationship is negative or not statistically significant, while others argue just the opposite. Offering an example of a negative relationship, Ahern and Dittmar (2012) examine the link between a firm's value and the characteristics of its executive board. The study analyses the effects of exogenous variation created by new legislation passed in Norway in 2006, which mandated that at least 40% of a company's executive board members must be comprised of women. Their work surveyed 248 firms listed on the Norwegian stock exchange in 2001-2009 and found a negative relationship between the changes imposed on boards by the law and firms' values as measured by Tobin's q . Their work concluded that in these cases, firms' values had fallen due to the deterioration in the quality of their executive boards and due to the fact that, although highly educated, the new female directors were less experienced than their male counterparts. Relatedly, Bardasi *et al.* (2011) argue that the performance differences by gender of ownership may also be attributable to real restrictions, such as lack of access to credit or limited business networks. Their study also suggests that additional constraining factors may exist, such as women's motivational biases to reach a more balanced domestic and professional life. These researchers use the World Bank Enterprise Survey from 2005 to 2007, as well as various measurements of firm performance, such as sales revenues, employment growth, and value added *per* worker, to conclude that women face significant gender barriers as entrepreneurs, which are both real and motivational, and that overall, these obstacles negatively affect firm performance. Similarly, Dezső and Ross (2008), using Standard and Poor's ExecuComp database for 1992-2006, which includes data for the top 1,500 U.S. firms, demonstrate that the relationship between female participation in managerial positions (excluding CEO) and firm performance (measured by Tobin's q),

is positive and strongly statistically significant. However, the same study also finds that the presence of a female CEO is not systematically related to firm's performance and even appears to yield a negative correlation. Dezsó and Ross (2008) conclude by suggesting that there may be something particular about the position of CEO and the "female management style" that, in combination, do not produce positive results for firm performance.

Contradictory to the above findings, Post and Byron (2015) have conducted a meta-analysis of 140 studies and examined whether a country's legal and socio-cultural environment may explain the conflicting results found in the relationship between a firm's performance and female presence on executive boards. Their results suggest that firms with greater female board representation tend to have higher financial yields. In the case of market performance indicators, the relationship with female board representation tends to be strongly positive for firms in countries with greater gender parity. In addition, Navarro and Gallo (2014) use the World Bank Enterprise Survey to analyse how the presence of a female general manager affects the performance of 130,000 companies from developing countries. They use six performance indicators related to sales, employment, and productivity. They employ a two-stage ordinary least squares estimation in order to address potential endogeneity that includes two instruments: 1) female ownership of the firm; and 2) the UN Gender Equality Index. They find a positive and statistically significant link between the presence of a female CEO and growth in sales *per* employee, and in productivity. Finally, Campbell and Mínguez-Vera (2008) examine the linkage between the presence of women at executive boards and firm performance. Their study utilizes panel data to analyse the relationship between the value of the firm, measured by Tobin's q , and four indicators of female board participation: a dummy variable that measures the existence of one or more female directors, the percentage of female directors, and the Blau (1977) and Shannon (1948) indices of gender diversity. Their sample is comprised of 68 non-financial firms listed on the Madrid continuous market, from January 1995 to December 2000. Overall, their results consistently show that gender diversity has a positive effect on the value of a firm.

As seen above, various studies arrive at conflicting conclusions or suggest there may be no empirical link between gender and firm performance whatsoever. A shortcoming of current literature is that many studies tend to use databases comprised of partial surveys of firms in specific countries, which rarely allows for cross-national comparison in different regions of the world. In contrast, an advantage of the research presented in this paper is that it draws upon a cross-national database. Additional constraints of extant literature is that many studies mainly focus on the impact of gender diversity of top manager positions on performance of the firm, but very few studies have analysed the effects generated by female participation on the general labour force. The exception is Flabbi *et al.* (2014), which focuses on the complementary role of women in different positions at a firm, but does not explore potential synergies that may result from gender-related issues expressed during interactions between management and the ownership, which is what my study seeks to address.

2.2 The complementary role of women in different positions of a firm

In order to incorporate the gender impact in the firm production function, this paper uses an approach based on Phelps (1972) and proposed by Flabbi *et al.* (2014), in which women CEOs impact the distribution of the salary difference between male (m) and female (f) workers. This provides a theoretical link to performance of firms. Following Flabbi *et al.* (2014), this paper assumes that both types of employees are endowed with an ability q , which is normally distributed with mean μ and variance σ^2 . The ability observed by the manager ($s = q + \varepsilon$) has a random component ε (which measures the quality of the information) with mean 0 and variance $\sigma_{\varepsilon g}^2$ where g is the employee's gender ($g = \{m, f\}$). The employees are assigned to tasks that are either simple (e) or complex (c); an assignment error implies a larger cost in the case of complex work. Firms maximize their output subject to the salaries they pay. In the context outlined above, this paper makes no distinction in the gender of the manager. In particular, it is assumed that, in equilibrium, each worker is paid for his or her marginal productivity and this depends on his or her expected ability, given the signal received from them, $E(q|s)$:

$$E(q|s) = (1 - \alpha_g)\mu + \alpha_g s, \quad (1)$$

where the weights are given by their relative variances, $\alpha_g = \frac{\sigma^2}{(\sigma_{\varepsilon g}^2 + \sigma^2)}$. When the signal comes close to the truth ($\sigma_{\varepsilon g}^2 = 0$), only the signal matters; when it does not provide relevant information ($\sigma_{\varepsilon g}^2 \rightarrow \infty$), only the mean of the ability of the population is observed.

According to Phelps (1972), a person's ability can have a general source of variability, as well as more specific sources of variability that depend upon on social factors, such as gender or race. Phelps (1972) associates the groups that tend to suffer discrimination with the largest variability, which reduces the relevance of the signal he proposes for identifying the ability expected from employees. The individual that receives the signal, while lacking complete information, will fill in this information gap based on their previous experiences with or prejudices towards the people being evaluated. In this way, it is to be expected that women will show higher variance in their ability signal and therefore, it will be riskier for those who hire them to assign them to more complex jobs. Similarly, Flabbi *et al.* (2014) differentiate the bosses' gender, G , which is equal to F or M depending on whether the owner is female or male. It is assumed that the individual has greater ability for assessing the productivity of an employee of the same sex.¹ It is possible to derive that the variance of a female worker's ability signal is lower when it is assessed by a female boss ($\sigma_{\varepsilon fF}^2$) than when it is assessed by a male boss ($\sigma_{\varepsilon fM}^2$). This may result in a decrease of statistical discrimination faced by female workers, allowing for greater compatibility between the productivity of women and the requirements of the jobs for which they apply, and may result in a direct and positive effect on the performance of the company.

1 According to the authors, this assumption is derived from the belief that the communication styles of each gender are different and the interaction between men and women, when conducted separately, brings about a better understanding of people's capacities and attitudes, and also helps facilitate conflict resolution.

Based on the work by Phelps (1972) and Flabbi *et al.* (2014), this paper explores the relationship between the owner of a firm and the CEO, by taking into explicit account their corresponding genders, as opposed to the more frequently studied relationship between the gender of the CEO and the employees of a firm. Following the above studies, the research presented here assumes that the owner has better abilities for evaluating the productivity of a CEO of the same sex, given that the former extracts information from a more precise distribution. This means that the variance of the signal of a woman's ability is lower when assessed by a female owner ($\sigma_{\varepsilon_{fF}}^2 < \sigma_{\varepsilon_{FM}}^2$); symmetrically, the variance for the case of a male decreases when it is perceived by another man ($\sigma_{\varepsilon_{mF}}^2 > \sigma_{\varepsilon_{mM}}^2$). As mentioned above, the signal of a woman's ability has a higher average variance, *i.e.* ($\sigma_{\varepsilon_f}^2 > \sigma_{\varepsilon_m}^2$), if the gender of the individual that perceives it is not considered. Instead, if all the firms had male owners, the difference between variances would be greater, given that they would better perceive the signal of a male candidate and his dispersion would decrease even further. On the other hand, if female ownership is assumed, the disparity between variances would decrease, as the variance of the signal of a woman's ability would be smaller, given that another woman perceives it. This would lead to a reversal or reduction of statistical discrimination against women, which could have a direct effect on the performance and productivity of the firm, as a female owner would choose the best and most productive candidate, regardless of gender, to manage the firm. Additionally, once a CEO assumes their position, and given that a female owner has better skills to communicate and perceive signals, she could also strengthen the female CEO's ability to run the firm. Accordingly, a firm's performance can be expected to improve when the owner and CEO are both women, in contrast to when the owner is a man.

With the previous literature review in mind, this paper tests the impact of CEO and firm owner gender on firm performance. It hypothesizes that a company will have better performance when both its owner and CEO are women, compared to when the CEO is a woman but the owner is a man, due to the ability of the female owner to better perceive the management skills of the female CEO.

3. Data and Variables

The data come from the World Bank Enterprise Survey (WBES), which gathers economic information from a representative sample of companies, from many countries around the world, where owners or general managers are asked about the characteristics of their firm and its performance. Respondent companies are selected through random sampling stratified by size, sector, and location, based on a national registry of firms to generate representative samples across the economy.² The surveys used in this study were conducted between 2009 and 2014. The database contains information on 75,980

2 The mode of data collection is face-to-face interviews. The survey sample frame is derived from the universe of eligible firms obtained from the country's statistics office, either from a government master list, business associations, or marketing databases. In a few cases, the sample is created via block enumeration (World Bank, 2014).

manufacturing and service companies in 127 countries. I use a pool data of a cross-section of firms between these years.³

The two variables that measure the performance of the company, the growth rates of sales and productivity, are based in the WBES standardized indicator that make them comparable at a global level⁴ (World Bank, 2014). The formula that is used is as follows and corresponds to an annualized rate, with limits that vary between -66% and 66% ⁵:

$$\left[\left(\frac{Sales_t - Sales_{t-3}}{\left(\frac{Sales_t + Sales_{t-3}}{2} \right)} \right) \times \frac{1}{3} \right] \times 100 \quad (2)$$

The most important behavioural aspects of the firms in the sample are as follows (see Table 1). A typical company has operated for 18 years. On average, 89% of the companies are domestically-owned while 8% are foreign-owned. The firms have a workforce of around 129 full-time employees, of which 32 are women. More women are found in production areas than in administrative or management fields. The data also report that in 31% of the firms, at least one of the owners is a woman, while only 14% have a female general manager. In terms of performance, sales growth is 3.12% yearly on average, while growth in sales *per* employee stands at 0.42% *per* year. Several statistically significant findings should be mentioned about the correlation between variables of interest.⁶ For example, there is a positive relationship between the company's size and the CEO's years of experience (11%). It is also possible to verify that larger firms tend not to hire female CEOs (-8%). Companies that dedicate a larger proportion of their production to direct exports seem to hire a greater share of women within their total workforce (13%), particularly in production areas (22%). A larger number of female workers is associated with better company performance (3%), larger size (18%), and fewer years in business (-7%). Finally, there is a positive correlation between the measurements of performance and the presence of women in executive management (5%).

3 We worked with the latest information available on each company for the years mentioned, given that it was not possible to work with a panel of firms.

4 This is an indicator of normalized growth proposed by Davis & Haltiwanger (1992) that allows the inclusion of new firms which tend to have a value for $t-3$ equal to 0, and contributes to reducing the large rates that could be associated with small firms, which begin with very small values for sales.

5 It is worth noting that this formula reveals that only firms having positive sales for more than 3 years could enter in the estimation sample.

6 The correlation matrix between these variables is available upon request.

Table 1 | Variable Description

Variable	Description of the variable	Mean
Industry	Industrial sectors, built with the ISIC code. From 1 to 20 according to the industrial sector	
Firm size	0 Micro (≤ 5 employees) 1 Small (> 5 and ≤ 20 employees) 2 Medium (>20 and ≤ 100 employees) 3 Large (>100 employees)	
Years operating in the market	Year of database recollection minus year in which the company began operations	18.23
Years of informal activity	Year in which the company began operations minus year in which it was formally registered	0.72
Private property	Percentage of the company that belongs to persons, companies, or national private organizations	89.35
Foreign property	Percentage of the company that belongs to persons, companies, or private foreign organizations	7.68
Public property	Percentage of the company that belongs to Government/State	0.66
Owned by others	Percentage of the company that belongs to others	2.32
Part of a large firm	The company is part of a larger firm 1 Yes 0 No	0.1780
Has a credit line	The company has a line of credit or a loan from a financial institution 1 Yes 0 No	0.3454
Sales growth	Percentage annual growth in total sales over the past 3 years	3.12
Growth of labor productivity	Percentage annual growth in total sales per employee over the last 3 years	0.42
Female owner	Some of the owners of the company are women 1 Yes 0 No	0.3051
Female CEO	The company's general manager is a woman 1 Yes 0 No	0.1395
Experience of the CEO	Years of experience the general manager of the company has in the sector	17
Value of capital replacement	Cost of replacing all machinery and all land and buildings. Log value in millions of USD	3.30
Security services	The establishment paid for security services three years ago 1 Yes 0 No	0.6268
Permanent employee	Total number of permanent and full time employees at the end of last fiscal year.	128.54
Total number of women	Total number of female employees in the labour force at the end of last fiscal year.	31.77
Female employees in productive areas	Total number of women in productive areas at the end of the last fiscal year	31.61

Source: Prepared by author based on WBES.

4. Empirical procedure

From an empirical perspective, the variable for the performance of the firm should be an outcome variable from the production function that is a performance indicator and not a traditional measure of output quantities. Following Dobbs and Koller (2005) and Santos and Brito (2012), there are different ways to measure this outcome variable. Typical measures are 1) financial indicators, in the form of firm profitability or value contribution to the economy; 2) indicators related to the capacity of a firm to grow and generate value, such as sales productivity, operating efficiency, unit costs, and indicators associated with market performance; and 3) performance in the capital markets, such as forecasts related to share prices.⁷ Likewise, there is no empirical consensus regarding the factors that explain the performance of a firm due to the heterogeneity of firms across the world (Cooper *et al.*, 1994). Nevertheless, it is possible to make some generalizations and propose four groups of determinants (Hansen and Wernerfelt, 1989):

- a) The industry's characteristics (growth rate, level of concentration, and capital intensity).
- b) Position of the firm *vis-à-vis* its competitors, generally measured through each company's market share, experience, and level of formalization.
- c) The quantity and quality of the company's financial, human, and physical resources.
- d) Other less tangible factors, such as the organizational structure and climate of the firm.

The empirical specification for the firm's performance was chosen using the following linearized Cobb-Douglas production function,⁸ including some of the factors discussed above as regressors and taking into account the relationship between the gender of the general manager and the owner.⁹

$$\ln Y_i = \ln \alpha + \beta \ln K_i + \pi \ln LD_i + \gamma \ln LP_i + (\delta + \phi GM_i + \theta DM_i \times GM_i) \ln LG_i + \omega \ln C_i + \varepsilon_i \quad (3)$$

7 In this case, the study uses short-term indicators linked to the second option, the firm's capacity to grow.

8 The study follows Fernandez-Baca (2011), who argues that the grade 1 homogenous production functions have specific characteristics that allow us to adequately model a company's productive processes (the average and marginal productivities of factors, and their marginal rates of substitution, depend on the proportion in which they are combined). Other researchers who have discussed the subject of firms' performance, such as Bardasi, Sabarwal, & Terrell (2011), also use this type of production function because of its versatility. Finally, even if the Constant Elasticity of Substitution (CES) production function is a general version with similar properties to the Cobb-Douglas formula, its estimation process is more complex, since it is not easily linearized.

9 For simplicity, it can be assumed that the function proposed has constant returns to scale. Other assumptions behind this production function may not be aligned with a firm's performance model such as the proposed one. Among them is the fact that elasticities associated with production factors remain unchanged over time or that the differences in the quality of factors, like the labour force, cannot be captured. However, as mentioned before, for the purposes of this paper it is used as a basic approach of the process for the firm's behaviour and its results, as other authors have proposed. Finally, it can be stated that the functional form used to specify the model will not be key for demonstrating the proposed hypothesis.

where Y_i is the performance of firm i ; K_i is its capital stock; L_i is its availability of human resources, differentiated between the owners (LD_i), those who hold management positions (LG_i) and those who are employees (LP_i); C_i represents other factors that can affect the firm's performance (including geographical and sectoral fixed effects); and ε_i is a random component. The management productivity factor is distinguished by the gender of the general manager (GM_i) and that of the owner (DM_i). As such, GM_i and DM_i are dummies that take the value of 1 when the individual is a woman.

Based on the specification described in Equation 3, I select an empirical specification according to the data available, which are estimated with OLS in a cross-section structure, including all regions and industrial sectors:

$$Y_i = \alpha + \phi GM_i + \pi DM_i + \theta(GM_i \times DM_i) + \omega X_i + \tau Loc_i + \vartheta Sec_i + \varepsilon_i \quad (4)$$

where Y_i is the dependent variable for each of the two different measurements of firms' performance: annual growth in sales and annual growth in labour productivity. GM_i is a dummy that takes the value of 1 when the manager is a woman. DM_i is a dummy that takes the value of 1 when one of the owners of the company is a woman.

Following the model, the marginal impact on sales or productivity growth rate, Y_i , for having a female CEO, instead of being male, if the owner is male, would be ϕ . If, on the other hand, the owner were also women, that marginal impact would be $\phi + \theta$. Following the proposed hypothesis, the sign of the parameter of the multiplicative variable (θ) is expected to be positive, meaning that regardless of the connection between the presence of a female CEO and the firm's performance, the presence of a female owner will improve the result obtained. Control variables are also included in X_i , like capital stock (K_i), human resources (L_i), and other controls (considered in C_i in Equation 3). Finally, the study includes fixed effects for the firms' geographic location (Loc_i) and industrial sector (Sec_i). In all regressions we allow for clustering at the industry level to account for robust estimators.

It is important to consider the possibility that the explanatory variables of interest (*i.e.* the presence of a woman at a higher managerial level within a firm) may not have the exogeneity condition necessary to ensure a consistent estimation of the parameters. Possible sources of endogeneity would be the bidirectional relation with the dependent variable, which could eventually introduce a bias in either direction (Smith *et al.*, 2006). In this regard, it is likely that the least productive companies may be tempted to hire more women to reduce costs (negative bias). It is also possible that firms that have attained favourable outcomes will decide to take more risks and appoint women to higher positions within the firm (positive bias). Another issue at play are possible unobservable elements, such as cases when the firm decided to adopt a non-conservative business approach involving higher risks.

Due to the lack of relevant and exogenous instruments, from the three gender variables included in the analysis (GM_i , DM_i and $GM_i \times DM_i$), only GM_i was instrumentalized. This was considered fundamental to correct for the endogeneity created by the fact that the manager is a woman, given that this outcome is the result of the firm's decision. Moreover, it is the firm that decides who to hire as general manager, and the gender of the candidate is part of the selection process. Additionally, it is to be expected that the performance of a female

owner will have a significant impact on the CEO's performance.¹⁰ I use two instruments: the UN Gender Development Index (GDI, 2016), following Navarro and Gallo (2014), and the average fertility rate of the country in which the firm is located (see Cruces and Galiani (2007), Ponczek and Souza (2012) and Angrist and Evans (1998)). GDI measures the gaps between men and women in each country on the three basic dimensions contemplated by the Human Development Index (HDI): life expectancy, education, and standard of living (gross income). We expect to find that in those countries where the human development of both sexes is more homogenous, and where opportunities for both genders are very similar, women can compete with men under more equal conditions to obtain higher positions within firms. Otherwise, using the average fertility rate I attempt to capture its possible influence on the participation of women in the labour market, especially for more educated women in positions of authority (Angrist & Evans, 1998). The proposed instrumentalization procedure considers country instruments to characterize the behaviour of the enterprises in the country. In line with Fisman and Svensson (2007), the probability of hiring women as managers depends on constitutive aspects of the firm, which are associated, in this case, with the gender equity level (GDI) and the level of fertility in the country where the firm operates. These two variables are not correlated with unobservables that may affect a firm's growth, given that this depends on the aggregate characteristics of the country and should have no direct influence on the firm's performance. However, it can be expected that in countries with a specific degree of gender equity or level of fertility, there is a greater predisposition to have CEO of any gender, and not only a male CEO. As such, it is possible to instrumentalize the probability that the manager would be a woman by using both instruments, given that they comply with the two conditions for a good instrument, *i.e.* relevance and exogeneity.¹¹

5. Results

The results of the first estimation stage (the CF), using the GDI and Fertility as instruments are presented in Table 2 (Column 1). These variables explain the presence of a woman as company CEO, with a significance level of 1% and 10%, respectively.¹²

10 It is important to take into account that the DM_i variable can be subject to a host of possible endogeneity problems since, in large firms, there is a high number of owners, meaning there is an increased chance that there are more female owners. Therefore, it is important to take into account the distortions that can be generated if the DM_i variable is not instrumentalized. If we consider that the women who have the necessary skills to carry out these positions are those who become owners of a company, we can expect that they can also obtain better results for the firm. This would make it more difficult to isolate the final effect of their presence on the company, if this effect is solely associated with the fact that they are women: this could be overestimated due to the fact that we are observing a sub-group of women who actually become owners.

11 The instrumentalization procedure is carried out by using the Control Function (CF) methodology proposed by Wooldridge (2015) and considers the cases where the main equation is linear (OLS), while the first stage of estimation is non-linear (Probit). The fixed effects of the geographic location and industrial sector of the company, as well as cluster at the industry level, are also considered in this first stage.

12 According to Wooldridge (2002), this is sufficient proof of the relevance of the proposed instrument.

Table 2 also shows the results for the two proposed measurements of performance, the OLS estimations (Column 2 and 4), and the CF procedure (Column 3 and 5). The fact that the coefficient of the variable from the first stage (generalized errors) is statistically significant (at 1%) in Columns 3 and 5 implies that the endogeneity problem is appropriately captured.

When analysing the effect of the variables of interest on the firm's performance, in the case of sales growth (Column 3), the study supports the hypothesis that when the owner is women, the business performance of a female CEO improves: if the owner were male, having a woman CEO (instead of a man) would produce a decrease in the company's performance of 15 percentage points (parameter φ); this decrease would be 3 percentage points lower if the owner were a woman (because the parameter θ would be added to the parameter φ). The fact that both are women improves annual sales growth by 3 percentage points (with a significance of 1%) respect to the situation in which the owner is a man and the CEO is a woman. The analyses also suggest that a female CEO performs worse for a given firm than her male CEO counterparts; when the owner is female the situation improves, yet fails to reverse the observed negative effect on the firm's performance. The results are very similar in the case of the second measurement of performance (Column 5), where the combination of a female CEO and female owner, suggests an improvement in the firm's performance of 2 percentage points (at a 5% level of statistical significance) compared to when the owner is a man.

Additional findings of interest become evident when focusing on the CF results (see Column 3 and 5 in Table 2). In the case of sales growth, there is a positive relationship between the firm's performance and variables such as being part of a large firm, the company's capital stock, and the CEO's years of experience. It is also evident that the firm's growth rate declines the more years that it operates, but stabilizes after 77 years.¹³ The fact that a firm has a credit line and hires security services contribute with additional growth around 1.5 percentage points, at a 1% level of significance. Regarding the firm's productivity, the results are very similar, but also highlight the participation of foreign capital in the firm, which, when increased, improves the firm's performance. Lastly, it is important to note that the proportion of women working at the firm is a highly significant explanatory variable (between 1% and 5% confidence level) and has a positive sign in both performance measurements, which indicates that a firm's performance increases are commensurate with a higher percentage of female employees. Therefore, a one-percentage point increase in this share increases sales growth by 0.04 percentage points and the firm's productivity growth by 0.06 percentage points.

13 Where the slope of the squared explanatory variable "years' operating in the market" becomes 0.

Table 2 | Sales Growth Model & Labour Productivity Growth Model

Variables	Female CEO	Sales Growth		Labour Productivity Growth	
	Probit (1)	OLS (2)	CF (3)	OLS (4)	CF (5)
<i>Female CEO</i>	– –	–1.333** (0.615)	–14.978*** (2.732)	–0.894 (0.544)	–11.159*** (2.625)
<i>Female Owner</i>	1.225*** (0.051)	2.582*** (0.428)	5.074*** (0.770)	2.351*** (0.326)	4.223*** (0.654)
<i>Female owner*Female CEO</i>	– –	–0.683 (0.805)	3.016*** (0.660)	–0.667 (0.557)	2.125** (0.763)
<i>Firm size</i>	–0.134*** (0.016)	1.084*** (0.172)	0.769*** (0.194)	–0.163 (0.161)	–0.401** (0.154)
<i>Years’ operating in the market</i>	0.004*** (0.001)	–0.182*** (0.035)	–0.176*** (0.034)	–0.039* (0.019)	–0.035* (0.018)
<i>(Years’ operating in the market)²</i>	–0.000*** (0.000)	0.001*** (0.000)	0.0012*** (0.000)	0.001** (0.000)	0.001** (0.000)
<i>Years’ operating informally</i>	–0.000 (0.002)	0.019 (0.023)	0.017 (0.022)	–0.017 (0.024)	–0.018 (0.023)
<i>Foreign property</i>	–0.000 (0.000)	0.009 (0.006)	0.009 (0.006)	0.023*** (0.006)	0.023*** (0.006)
<i>Part of a large firm</i>	0.093*** (0.030)	0.759*** (0.226)	0.918*** (0.232)	0.399* (0.204)	0.519** (0.214)
<i>Has a credit line</i>	–0.024 (0.016)	1.569*** (0.291)	1.484*** (0.284)	0.715*** (0.174)	0.651*** (0.168)
<i>Experience of the CEO</i>	–0.015*** (0.001)	0.056*** (0.009)	0.029*** (0.009)	0.095*** (0.011)	0.075*** (0.012)
<i>Value of capital replacement</i>	0.008** (0.003)	0.093 (0.056)	0.106* (0.057)	0.020 (0.067)	0.030 (0.067)
<i>Security services</i>	–0.127*** (0.022)	1.607*** (0.250)	1.362*** (0.261)	1.550*** (0.229)	1.367*** (0.248)
<i>Proportion of women in the company</i>	0.012*** (0.001)	0.014 (0.013)	0.042** (0.017)	0.036*** (0.011)	0.057*** (0.014)
<i>GDI</i>	0.479* (0.266)	– –	– –	– –	– –
<i>Fertility</i>	0.124*** (0.007)	– –	– –	– –	– –
<i>Generalized error</i>	– –	– –	6.321*** (1.320)	– –	4.751*** (1.244)
Constant	–2.631*** (0.271)	–4.428*** (0.910)	–3.407*** (0.797)	–8.635*** (0.626)	–7.869*** (0.548)
Observations	53,035	38,935	38,935	38,244	38,244
Goodness of fit (R2)	–	0.052	0.053	0.052	0.053
Pseudo R2	0.257	–	–	–	–

Note: Robust errors in parenthesis *** p < 0.01, ** p < 0.05, * p < 0.1

Source: Author.

6. Main Findings

This study supports the hypothesis that when the owner is female, the business skills of the female CEO are strengthened, improving the firm's performance compared to when the owner is male. It also confirms that on average a female CEO performs worse than her male counterparts, and that when the owner is female, the situation improves, but cannot reverse the negative effect on a firm's performance. This paper also concludes that a higher proportion of female workers increases a firm's performance, regardless of the function the female employees carry out at the firm.

CF results confirm that the marginal effect of variables of interest (GM_i , DM_i and its interaction term) increase in absolute terms *versus* OLS estimation (for both measurement of a firm's performance). Signs remain unchanged, confirming the complementary effect of the presence of female owner and female CEO on the performance of the firm.

The differences in results with and without instrumentalization are due to the fact that this procedure reduces the (positive) bias caused by the endogeneity of the explanatory variable of interest (*e.g.* a female CEO). It is likely that women who assume management positions will be the most qualified among the pool of capable applicants. Accordingly, observed female CEOs are ostensibly those that have successfully managed their firms. For this reason, their performance would be overestimated if the endogenous explanatory variable of interest is not instrumentalized. This also allows the model with instrumentalization to show the effect of the presence of the female owner on the performance of the female CEO, since it partly compensates for the lower performance that the company shows when the CEO is a woman and not a man.

Nevertheless, the negative result attributable to a female CEO, obtained after instrumentalizing, may be due in part to the inability to control the specific characteristics of those who hold the positions in question, as well as their education or specific experience in similar positions. This generates a bias against women who, on average, perform at a lower level than men in these fields. This has nothing to do with their gender condition, but instead reflects the fact that they must compete for higher positions within firms with human capital that is less qualified than that of their male peers. The marginal effect of female owners on female CEO performance, compared to that of a male owner (parameter θ), may have a similar problem due to the factors mentioned above (lower education and business experience). Nevertheless, if this were the case, the estimated θ would be expected to have a downward bias, as it is impossible to control the equation for the aforementioned characteristics that, according to international evidence, should be assumed to be less favourable than for their male counterparts.

7. Conclusions

This research has sought to establish whether a firm reaps benefits from having women in top management positions, particularly when the owner of a firm and CEO are both women. Recent literature posits that this may be true, as female workers may help mutually strengthen their business skills, which can result in improved firm performance.

To accomplish this, the research presented here drew upon the 2009–2014 World Bank Enterprise Survey, which covers 75,980 manufacturing and service companies, and applied an OLS approach on the pool data of a cross-section of firms between these years. In order to account for endogeneity of the explanatory variables for gender, the CF approach was applied by using the UN GDI and the average fertility rate at the country level as instruments, as these variables comply with the exclusion restrictions.

The results support the hypothesis that a female owner strengthens the business skills of a female CEO, improving the firm's performance compared to when the owner is a man. This shows that a female owner has greater capacity to perceive and strengthen the skills of the women who manage the firm. It was also verified that, on average, female CEOs perform at a lower level than their male counterparts, and that the presence of a female owner improves the situation, but is not capable of reversing the negative results of the firm's performance.

In this sense, it is necessary to make efforts to ensure that equal opportunities are provided for recruiting personnel of both genders to fill positions at different levels within a firm. This would leverage the productivity and commitment of the female workforce to achieve objectives and improve a firm's performance. However, to ensure that equal opportunities exist, both women and men must start on equal ground when competing for a position; thus, it is imperative to close the remaining gender gaps in the labour market.

In the near future, researchers should consider creating a panel structure from the WBES, that although may be difficult to carry out at the company level, could be used in reference to industrial sectors. In this regard, it would allow the testing of differential patterns in the relationship between the gender of those who run a firm and its performance, according to the sector in which the firm operates. Similarly, an analysis by geographic region could be carried out to analyse the strength of the relationship in connection with specific cultural characteristics. However, this differentiation might involve some representativeness problems, since not all countries have conducted surveys on the same number of companies. Finally, alternative instruments for gender variables of interest, whether included in the database or not, could also be tested to establish a more precise marginal contribution of the explanatory variables.

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