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FEMALE TOP MANAGERS AND FIRM PERFORMANCE: EVIDENCE FROM UZBEKISTAN

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Abstract. The study examines the relationship between gender and firm performance in Uzbekistan, distinguishing between female ownership and female participation in top management. Using data from the 2024 World Bank Enterprise Survey for Uzbekistan ($N = 1,008$ firms), labor productivity, measured as the logarithm of sales per worker, is estimated using OLS regression. The model accounts for female ownership ($\geq 50\%$), female top management, firm size and age, managerial experience, sector and regional fixed effects, and business-environment obstacles. The results indicate that firms managed by female top managers have lower labor productivity ($\beta = -1.533$, $p < 0.01$), whereas female ownership alone has no statistically significant effect. When the interaction between female ownership and female management is considered ($\beta = 0.982$, $p < 0.10$), the net negative effect associated with female top management is -0.430 . Female managers are also found to be concentrated in Tashkent and in sectors traditionally associated with female employment, particularly garments and textiles. The findings indicate the presence of structural barriers related to managerial appointments and the exercise of managerial authority, which should be considered when developing policies aimed at achieving Uzbekistan's gender-equality goals by 2030.

Keywords: female top managers, female ownership, firm performance, labor productivity, gender equality, Uzbekistan, OLS regression, World Bank Enterprise Survey.

Аннотация. Исследование направлено на оценку взаимосвязи между гендерным фактором и результативностью деятельности предприятий в Узбекистане с разграничением влияния женской собственности и участия женщин в высшем руководстве. На основе данных Обследования предприятий Всемирного банка по Узбекистану за 2024 год ($N = 1\,008$ предприятий) с использованием OLS-регрессии оценивается производительность труда, измеряемая как логарифм объема продаж на одного работника. Модель учитывает женскую собственность ($\geq 50\%$), наличие женщины на должности топ-менеджера, размер и возраст предприятия, управленческий опыт, отраслевые и региональные фиксированные эффекты, а также ограничения деловой среды. Результаты показывают, что предприятия, возглавляемые женщинами, характеризуются более низкой производительностью труда ($\beta = -1,533$; $p < 0,01$), тогда как женская собственность сама по себе не оказывает статистически значимого влияния. При учёте взаимодействия между женской собственностью и женским руководством ($\beta = 0,982$; $p < 0,10$) чистый отрицательный эффект, связанный с женщиной-топ-менеджером, составляет $-0,430$. Выявлена также концентрация женщин-руководителей в Ташкенте и в традиционно ассоциируемых с женской занятостью отраслях, прежде всего в швейной и текстильной промышленности. Полученные результаты указывают на наличие структурных барьеров, связанных с назначением на руководящие должности и реализацией управленческих полномочий, что необходимо учитывать при совершенствовании мер, направленных на достижение целей гендерного равенства в Узбекистане к 2030 году.

Ключевые слова: женщины-топ-менеджеры, женская собственность, результативность предприятий, производительность труда, гендерное равенство, Узбекистан, OLS-регрессия, Обследование предприятий Всемирного банка.

INTRODUCTION

Globally, female labor force participation remains substantially lower than male participation. In Uzbekistan, that gap is even larger: the female labor force participation rate in 2024 was 39.4%, about half the rate of men [1]. At the same time, women accounted for 42% of formally registered self-employed people in 2024, indicating that women are more likely to engage in entrepreneurship and own-account work than in formal wage employment [1].

According to the World Bank WDI data (Table 1), only 26% of firms in Uzbekistan have female owners, which is lower than the share in France (44%), the average for middle-income countries (36%), and the shares in neighboring Kyrgyzstan and Russia (34%), but higher than those in Tajikistan (23%), North Macedonia (21%), and Turkey (11%). The disparity is even more pronounced at the top-management level: only 12% of firms in Uzbekistan have a female top manager, compared with Kazakhstan (26%), Russia (24%), and the global average (19%) [2].

Figure 1 — Shares of firms with woman ownership (most recent year)*

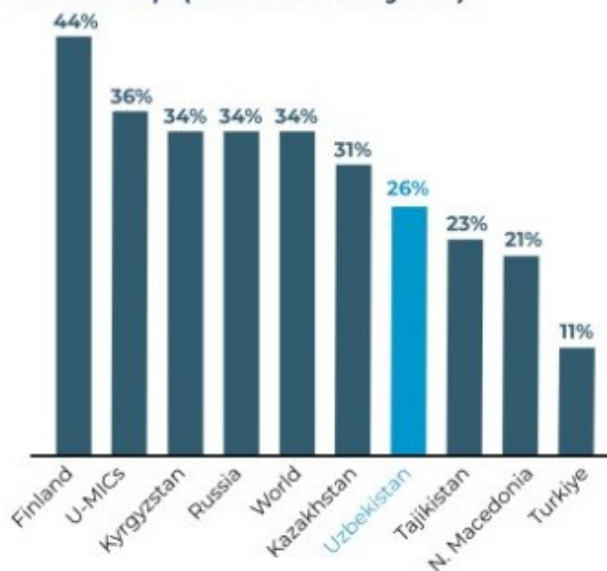
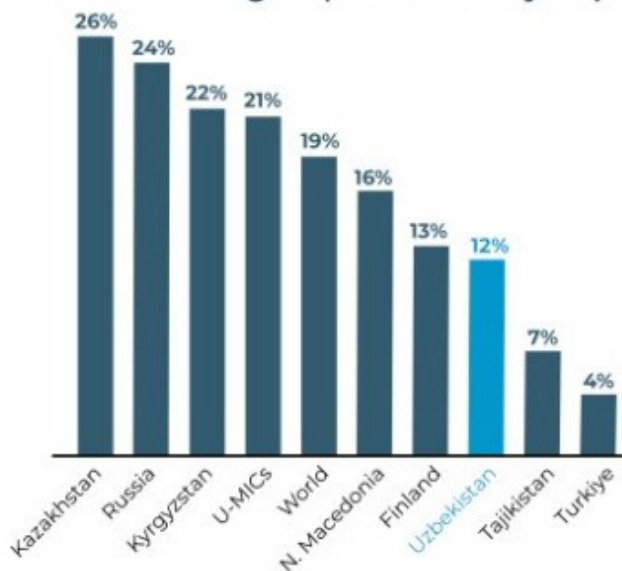


Figure 2 — Shares of firms with top woman managers (most recent year)**



Source: World Bank WDI database.

Note: data for Kyrgyzstan, U-MICs, and the world, are from 2023. Data for other countries are from 2015-2020.

* Defined as 'percentage of firms with a woman among the principal owners'.

** Defined as 'percentage of firms in the private sector who have womens . . . as highest ranking manager or CEO'.

Figure 1. Shares of firms with top woman managers and woman ownership

This difference between female ownership and female representation in management constitutes the central issue of this study: Why is there such a substantial gap between women's ownership and their representation in managerial positions, and how does this gap affect firm performance?

Gender inequality significantly affects production relations, and research on this topic has become an increasingly important field of study [6][7]. Global organizations such as the World Bank, the International Labour Organization [8], and the United Nations Development Programme [9] are at the forefront of addressing gender-related issues and have made gender equality a core component of economic policy [2,9]. Sustainable Development Goal 5 [5], which focuses on gender equality and women's empowerment, is central to achieving this objective globally by 2030 (United Nations, 2015). Uzbekistan has likewise implemented several programmes to support women's entrepreneurship [3][4].

This study employs data from the 2024 World Bank Enterprise Survey (WBES) [10] for Uzbekistan to examine performance differences between male- and female-managed firms. In developing countries, particularly Uzbekistan, it is important to consider the factors contributing to gender differences in firm performance, size, and access to financial resources.

Previous research on gender differences in firm ownership has identified significant variations by firm size, although findings regarding trade growth and productivity are not always consistent [11]. Whereas many studies have defined a firm's gender status solely according to whether it has a female owner, this paper focuses particularly on whether the top manager is female, since the company's top manager plays a central role in decision-making related to firm performance.

The main contribution of this paper is the utilization of new gender variables from the 2024 WBES [10] for Uzbekistan to examine the relationship between gender and firm performance and to determine whether gender-related differences vary between top management and ownership. OLS regression is applied for this

purpose.

The main findings indicate that female-managed firms in Uzbekistan demonstrate lower productivity than male-managed firms ($\beta = -1.533$, $p < 0.01$), which differs from Martínez-Zarzoso's (2023) cross-country findings. Female ownership alone does not have a statistically significant impact, while the observed productivity difference is more pronounced among medium-sized and large firms.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature; Section 3 describes the data, variables, and descriptive statistics; Section 4 presents the main results and robustness checks; and Section 5 concludes the paper.

LITERATURE REVIEW

The relationship between female leadership and firm performance has been extensively studied using firm-level survey data, mainly from the World Bank Enterprise Surveys (WBES) [10]. Although early studies centered on developed countries, recent research has increasingly focused on developing and transition economies, including Central Asia. This section provides global evidence, findings from developing countries, and studies specific to Uzbekistan and the broader Central Asian region.

Martínez-Zarzoso (2023) provides a comprehensive cross-country analysis using WBES data on over 130,000 firms in 130 mostly developing countries and finds that the average labor productivity and total factor productivity of firms with a female top manager are lower than those of male-managed firms, particularly among small and medium-sized enterprises [11]. Importantly, the magnitude and direction of the gender-performance relationship vary significantly across regions and countries. A key methodological component is the relationship between female ownership and female managerial control. In some cases, female management combined with male ownership is associated with higher productivity, suggesting that ownership and management capture different dimensions of gender-related decision-making [11].

Many similar cross-country studies yield consistent findings. Studies of Caribbean firms demonstrate that female-managed enterprises have, on average, approximately 16% lower productivity, although this difference narrows after controlling for the selection process and firm characteristics [12]. Data from Zimbabwe, based on two waves of the WBES (2011 and 2016), indicate that the effect of female management on productivity varies across cities, with different patterns observed in Harare and Bulawayo, illustrating the role of local institutional and market conditions. Other studies find that female-led firms may have higher total factor productivity but slower expansion in employment and assets, suggesting differences between efficiency and growth dynamics [12].

In developing countries, female-owned and female-managed firms tend to be smaller, younger, and face greater financial constraints than their male counterparts [13]. Cross-country WBES-based studies indicate that women-owned firms have 9–16% lower productivity and labor productivity growth than male-owned firms, even after accounting for business-environment factors. Female-owned firms also tend to have more limited access to formal finance, are more likely to identify finance as a major obstacle, and are less likely to be foreign-owned, which are common patterns observed in low- and middle-income countries [13].

However, the direction and strength of the gender-performance relationship are not uniform. Some studies show that female CEOs in developing countries can be associated with equal or even better performance on certain metrics when endogeneity is addressed using instrumental variables [12,14]. Research covering 16 low- and middle-income countries shows that the combination of female ownership and female top management is positively associated with innovation activities and, consequently, increased value-added productivity [14]. These findings suggest that female leadership may be particularly beneficial in areas where women contribute distinctive managerial practices or risk preferences, while broader opportunities for realizing these advantages can be enhanced through improved access to finance, technology, and markets [14].

Evidence from Central Asia remains relatively limited but is of growing policy relevance. Recent studies indicate that women's entrepreneurship in Uzbekistan has grown rapidly, reaching 2.1 million women entrepreneurs in 2024 — a sevenfold increase since 2020. At the same time, there remains considerable potential to increase women's participation in the formal, growth-oriented sector: women account for 17% of corporate entrepreneurs and receive around 14% of total MSME lending, despite owning nearly one-third of registered micro, small, and medium-sized enterprises [15,16].

The 2024 WBES data for Uzbekistan show that 26% of firms have female participation in ownership and 12% have a female top manager, compared with the Europe and Central Asia regional averages of 28.9% and 13.4%, respectively. In neighboring Kazakhstan and Russia, the shares of firms with female top managers are 26% and 24%, respectively, indicating opportunities for further expansion of women's participation in top management in Uzbekistan.

Kuchkorova (2025) uses 2023 WBES data for Uzbekistan, Kazakhstan, Kyrgyzstan, and Tajikistan to

evaluate how employee training affects firm performance and whether the impact of training on performance varies according to the gender of the top manager [17]. Training has a strong positive impact on productivity, while female leadership demonstrates a distinct association with sales outcomes on average. This differs from Martínez-Zarzoso's (2023) global findings and highlights the relevance of regional institutional and normative environments [11].

At the country level, Behr and Xi (2025) quantify the relationship between legal gender reforms and the percentage of female-owned firms in Uzbekistan [18]. Using the Women, Business and the Law (WBL) index, they find that Uzbekistan scored 67.5 in 2019, with 26% of firms being female-owned. Counterfactual simulations suggest that addressing all legal barriers identified by the WBL index could increase the probability of a firm being female-owned by 16.25 percentage points. This demonstrates that female entrepreneurial participation is influenced not only by individual and firm-level factors but also by the broader institutional and legal context [18].

Popova and Otrachshenko (2026) also emphasize the role of historical and contemporary institutional and social factors in shaping gender patterns in Uzbekistan's labor market [19]. This institutional context influences women's choices between formal employment and entrepreneurship and helps explain why women are more likely to participate in self-employment and small-scale business than in formal wage employment [19].

The existing Central Asian literature on gender and firm performance presents three important opportunities for further research. First, most studies use aggregate gender indicators, such as the presence of any female owner or a female CEO, and provide limited comparisons of firm "gender" definitions in terms of ownership, management, and female-dominated ownership. Second, most studies are based on urban, formal-sector firms, while greater attention could be given to rural micro-enterprises, where women represent a significant share of entrepreneurial activity. Third, further research could examine the role of formal knowledge, including financial literacy, bookkeeping, and human capital management, in explaining the relationship between female leadership and firm performance. These research opportunities are addressed in four ways. First, this paper takes advantage of the newly available gender variables from the 2024 WBES for Uzbekistan to identify the roles of female ownership, female top management, and female-dominated ownership. Second, it applies the methodology of Martínez-Zarzoso (2023), emphasizing the importance of the definition of gender-related firm characteristics. Third, particular attention is given to women-run micro-enterprises in rural areas, which have received relatively limited attention in previous research. Fourth, financial literacy, bookkeeping, and human capital management are considered as potential mechanisms linking female leadership to firm performance. Finally, the empirical approach is placed within the context of Uzbekistan's institutional environment, taking into account recent legal reforms, traditional norms, and the informal sector.

Accordingly, this study contributes to the emerging literature on gender and firm performance in Central Asia and provides policy-relevant evidence on how expanding opportunities for women in management and improving access to resources could contribute to productivity and inclusive growth in Uzbekistan.

RESEARCH METHODOLOGY

Firm-level gender gaps are evaluated using a baseline regression model in which labor productivity and total factor productivity are treated as separate dependent variables.

The first dependent variable is sales per worker, which is used as a measure of labor productivity. The empirical model is given by Equation (1), where *fem* represents female ownership, a dummy variable equal to one if there are females among the owners; *tfem* is a dummy variable equal to one if the top manager is a woman; and *labor* denotes full-time employees. The constraints include four institutional factors that might constrain firm performance: corruption, crime, competition from the informal sector, and access to finance. The constraints are measured on a 0–4 scale, with a higher value indicating a more severe constraint.

$$\ln\left(\frac{\text{Sales}}{\text{nworkers}}\right)_i = \beta_0 + \beta_1 \text{FemManager}_i + \beta_2 \text{FemOwner}_i + \beta_3 (\text{FemManager}_i \times \text{FemOwner}_i) + \beta_4 \ln(\text{Employment})_i + \beta_5 \ln(\text{Age})_i + \sum_k \beta_{ck} \text{Obstacles}_{ki} + \sum_j \beta_{xj} X_{ji} + \omega_s + \sigma_r + \varepsilon_i \quad (1)$$

Additional factors included in the model, such as whether the firm is an exporter, whether it is foreign-owned, the manager's years of experience, and ownership concentration, are also considered. The dependent variable is the total sales of firm *i*, *sales_i*, divided by the number of permanent workers, *nworkers_i*.

Unlike Martínez-Zarzoso (2023), who uses country and year fixed effects in her multi-country, multi-year sample, this study, based on a single-country, single-year survey (Uzbekistan, 2024), employs sectoral fixed

effects, ω_s , and regional fixed effects, δ_r , to capture unobserved heterogeneity across the six administrative regions of Uzbekistan. The error term, assumed to be independent and identically distributed (i.i.d.), is denoted by ε_i .

$$\ln \text{sales}_{ic} = \gamma_0 + \gamma_1 \ln \text{laborcost}_{ic} + \gamma_k \ln \text{capital}_{ic} + \gamma_m \ln \text{materials}_{ic} + \omega_s + \sigma_r + \varepsilon_i \quad (2)$$

As a second measure of productivity, the firm's total factor productivity (TFP) is used. To calculate TFP, estimates are obtained from a traditional Cobb–Douglas production function given by Equation (2), where sales_i denotes the total sales of firm i in UZS; laborcost_i is defined as the total labor cost, including wages, salaries, and bonuses; materials_i denotes total purchases of raw materials and intermediate goods; and capital_i denotes the cost of purchasing the firm's machinery as a proxy for fixed tangible assets. From Equation (2), the residual is predicted and used as the dependent variable in Equation (3).

$$\text{TFP}_{ic} = \beta_0 + \beta_1 \text{FemManager}_i + \beta_2 \text{FemOwner}_i + \beta_3 (\text{FemManager}_i \times \text{FemOwner}_i) + \beta_4 \ln(\text{Employment})_i + \beta_5 \ln(\text{Age})_i + \sum_k \beta_{ck} \text{Obstacles}_{ki} + \sum_j \beta_{xj} X_{ji} + \omega_s + \sigma_r + \varepsilon_i \quad (3)$$

The interpretation of the interaction dummy follows Martínez-Zarzoso (2023): if a female is among the owners and the top manager is male, the female-owner effect is β_{fp} ; when there is a female executive and all owners are male, the effect of female management is β_{ft} .

ANALYSIS AND RESULTS

We use the World Bank Enterprise Survey (WBES) dataset for Uzbekistan in 2024 [10]. The survey instrument is based on the standardized WBES methodology and uses stratified random sampling to obtain firm-level data that are generally comparable across countries and survey waves. The questionnaire covers a wide range of business-environment areas, including access to finance, corruption, infrastructure, crime, competition, and firm-performance measures.

Only formal (registered) companies with five or more employees are eligible for the survey, while firms with full (100%) government or state ownership are excluded. Business owners and top managers are typically the primary respondents, although accountants and human resource managers are sometimes consulted for questions related to sales and labor. For Uzbekistan, the final sample used in this study consists of 1,008 firms.

Our primary explanatory variables are female ownership and female leadership. The question, "Are any of the owners female?" indicates whether the company has at least one female owner (*fem*). A related question asks about the distribution of ownership by gender, from which we construct a dummy variable, *femmore*, equal to 1 if 50% or more of the firm's ownership is held by women, including cases of equal male-female ownership and full female ownership, and 0 otherwise. This variable captures majority or equal female ownership. A third question asks whether the top manager is female (*female_manager*). Since this question has a lower response rate, the corresponding sample consists of 998 valid observations, compared with 1,008 observations for the ownership-based measures.

The main performance measure is labor productivity, defined as the logarithm of sales per worker. In general, we use labor productivity rather than raw sales or employment growth, as the latter measures tend to be more prone to misreporting and are associated with larger standard deviations and higher rates of missing data. This is also the case in our sample, for which sales-per-worker data are available for 900 of the 1,008 firms.

Table 1 presents descriptive statistics for the main variables used in this study. In the Uzbekistan 2024 sample, 12% of companies report having a female top manager, whereas 28% report having at least one female owner. Of the subsample of firms for which ownership-dominance data are available ($n = 276$), 51% are female-dominated, meaning that women hold 50% or more of the ownership. This represents a relatively high share within this smaller subsample. The average log of sales per worker is 18.17 ($SD = 2.35$), and the average firm in the sample is approximately 13 years old, with a mean of 13.5 years of managerial experience. A formal training program is reported by 20% of firms, while formal R&D expenditure is reported by 4% of firms. Exporting (7%) and foreign ownership (5%) are also less common, indicating that the sample primarily comprises domestic and non-exporting firms. Corruption (mean = 0.72) and crime (mean = 0.67) are rated somewhat higher than informal competition (mean = 0.65) and access to finance (mean = 0.55) as business-environment constraints; however, all are rated, on average, toward the lower end of the 0–4 severity scale.

Table 1. Descriptive Statistics — Uzbekistan, 2024 (N = 1,008)¹

Variable	Count	Mean	SD	Min	Max
Top manager is female (1 = Yes)	998	0.12	0.33	0	1
Female presence in ownership	1,008	0.28	0.45	0	1
Female-dominated ownership (50%+)	997	0.14	0.35	0	1
Log(sales per worker)	900	18.17	2.35	8.294049	30.66758
Firm age (years)	991	13.35	11.48	1	122
Log(number of employees)	982	3.36	1.40	0	7.824046
Formal training program	985	0.20	0.40	0	1
Manager's years of experience	972	13.54	7.92	1	50
Ownership concentration (domestic + foreign private %)	991	94.17	19.55	0	100
Firm spent on R&D	989	0.04	0.19	0	1
Corruption obstacle	949	0.72	1.06	0	4
Crime obstacle	980	0.67	1.06	0	4
Informal competition obstacle	990	0.65	0.87	0	4
Finance obstacle	1,000	0.55	0.80	0	4
Exporter firm	996	0.07	0.25	0	1
Foreign-owned firm	991	0.05	0.21	0	1
Observations	1,008				

Table 2 presents the variable definition codes used in the WBES.

Table 2. Variable Definitions and Sources²

#	Variable Name	Stata Code	Source Code	Question Text	Category
1	Top manager is female	female_manager	b7a	"Is the Top Manager Female?"	Independent (main)
2	Female presence in ownership	fem	b4	"Amongst the owners of the firm, are there any females?"	Independent (alternative)
3	Female-dominated ownership (50%+)	femmore	b4a	"Constructed as 1 if b4a ('% of the firm owned by females') is $\geq 50\%$, 0 otherwise"	Independent (alternative)
4	Log(sales per worker)	ln_productivity	d2, l1	D2: "What were this establishment's total annual sales?" / L1: "Number of permanent, full-time employees at end of last FY"	Dependent
5	Firm age (years)	firm_age	b5	"Year establishment began operations"	Control
6	Log(number of employees)	ln_employment	l1	"Number of permanent, full-time employees at end of last FY"	Control
7	Formal training program	training	l10	"Formal training programs for permanent, full-time employees in last FY?"	Mediator
8	Manager's years of experience	b7	b7	"How many years of experience working in this sector does the Top Manager have?"	Control
9	Ownership concentration	private_ownership_share	b2a + b2b	B2A: "% owned by private domestic individuals/companies" + B2B: "% owned by private foreign individuals/companies"	Control
10	Firm spent on R&D	rd_spending	h8	"During last fiscal year, did establishment spend on R&D (excl. market research)?"	Control
11	Corruption obstacle	j30f	j30f	"How much of an obstacle: Corruption?" (0–4 scale)	Control
12	Crime obstacle	i30	i30	"How much of an obstacle: Crime, theft and disorder?" (0–4 scale)	Control
13	Informal competition obstacle	e30	e30	"How much of an obstacle: Practices of competitors in the informal sector?" (0–4 scale)	Control
14	Finance obstacle	k30	k30	"How much of an obstacle: Access to finance?" (0–4 scale)	Control
15	Exporter firm	exporter2	d3c	"% of sales: Direct exports" (> 0 = exporter)	Control

Note: All variables constructed by the author from the World Bank Enterprise Survey, Uzbekistan (2024). Missing/invalid response codes (negative values) were recoded as missing prior to analysis.

¹ Source: World Bank Enterprise Survey, Uzbekistan, 2024.

² Author's Work

The dependent variable measuring the firm's productivity is the natural logarithm of sales per worker (*ln_productivity*). This log-transformed labor productivity measure captures the average output per worker and serves as the main indicator of firm performance and operational efficiency in this study. The logarithmic transformation reduces the skewness of the sales distribution, and the coefficients can be interpreted as percentage effects. Higher values of *ln_productivity* imply greater firm-level efficiency.

To examine the impact of gender on firm performance, this paper compares female ownership with female leadership using three binary indicators. Female presence in ownership (*fem*) is equal to 1 if at least one firm owner is female and 0 otherwise. This is the broadest and least restrictive measure of female involvement. Female-dominated ownership (*femmore*) is equal to 1 if women hold 50% or more of the ownership shares, capturing majority or equal female control at the ownership level. Female top manager (*female_manager*) is equal to 1 if the firm's principal decision-maker (top manager) is female, representing operational rather than ownership-based control.

These three measures allow us to move beyond the single "female-owned firm" dummy commonly used in the literature and instead assess whether female involvement in the firm, through either ownership or active management, has a significant impact on productivity outcomes. The main issue is whether *female_manager* is more strongly associated with *ln_productivity* than *fem* and *femmore*, and whether, in this sense, leadership rather than ownership is the more important driver of productivity.

Training is a binary indicator equal to 1 if the firm had training programs for its employees during the reference period. Rather than treating training solely as a control for productivity, this paper proceeds from the assumption that female-led firms may differ in their human resource investments and that differences in training may partly contribute to observed productivity outcomes. This model can also be used to evaluate whether female leadership is associated with productivity and through which mechanisms this relationship may operate.

Firm size and age—the number of employees and the number of years since establishment—capture economies of scale and accumulated organizational experience. Managerial experience—the top manager's years of sector-specific experience—controls for human capital at the leadership level independently of gender. Innovation and internationalization—export status, foreign ownership share, and the adoption of modern technologies—serve as proxies for firms' exposure to competitive pressures and technological upgrading. Business-environment obstacles—firms' perceptions of constraints related to access to finance, corruption, crime, and informal-sector competition—reflect the institutional environment in which the firm operates.

These controls address the possibility that older, larger, more experienced, or more internationally engaged firms may perform better irrespective of the gender composition of ownership or management. By conditioning on these structural characteristics, the model more accurately attributes any residual association between the gender variables and *ln_productivity* to leadership and ownership dynamics rather than to omitted firm heterogeneity.

Table 3. Differences in Performance by Female Involvement — Uzbekistan, 2024³

	Top manager female			Female presence in ownership			Female-dominated (50%+)		
	μ_0	μ_1	t	μ_0	μ_1	t	μ_0	μ_1	t
Log(Sales per worker)	18.22	17.82	1.64	18.20	18.10	0.57	18.21	17.98	1.00
Num. permanent, full-time employees	100.22	43.17	2.63***	92.53	94.32	-0.11	98.73	59.06	1.93*
Corruption obstacle	0.70	0.89	-1.88*	0.71	0.76	-0.73	0.72	0.74	-0.21
Crime obstacle	0.65	0.78	-1.19	0.63	0.75	-1.53	0.66	0.64	0.22
Informal competition obstacle	0.65	0.66	-0.10	0.65	0.65	0.12	0.66	0.63	0.38
Finance obstacle	0.54	0.68	-1.86*	0.50	0.69	-3.45***	0.53	0.65	-1.59
Firm age (years)	13.68	11.00	2.41**	13.76	12.30	1.81*	13.69	10.78	2.84***
Manager's years of experience	13.47	14.15	-0.87	13.24	14.29	-1.87*	13.50	13.85	-0.49
Exporter firm	0.07	0.03	1.61	0.07	0.05	1.08	0.07	0.04	1.27
Foreign-owned firm	0.05	0.03	1.71*	0.05	0.03	1.74*	0.05	0.02	1.53
Observations	998			1008			997		

Notes: μ_0 = group mean where indicator = 0; μ_1 = group mean where indicator = 1. Two-sample t-tests, equal variances assumed. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The univariate comparisons presented in Table 3 show that gender-related characteristics are associated with several firm-level outcomes. Female presence in ownership (*fem*) shows a limited association with productivity and firm size, whereas female top management (*tfem*) is associated with more pronounced differences in productivity, firm size, and age. This is consistent with Martínez-Zarzoso's (2023) finding that, to understand the relationship between gender, firm performance, and ownership, it is important to distinguish ownership from managerial authority. Accordingly, female top management represents the most informative gender-related measure in the Uzbekistan sample and is therefore an important variable to consider in the regression analysis. Female presence in ownership (*fem*) shows the weakest association with performance. Firms with at least one female owner do not differ significantly from all-male-owned firms in labor productivity [$t = 0.69$], employment size [$t = -0.11$], or most business-environment obstacles. The most notable differences are that firms with female participation in ownership perceive finance as a relatively greater obstacle [$t = -3.45$, $p < 0.01$] and are less likely to be foreign-owned [$t = 1.74$, $p < 0.10$].

Female top management (*tfem*) provides the richest and most consistent set of statistically significant differences. Compared with male-managed firms, female-managed firms demonstrate differences in labor productivity (log sales per worker: 18.21 vs. 17.75; [$t = 2.01$, $p < 0.05$]), employment size (100.22 vs. 43.17; [$t = 2.63$, $p < 0.01$]), and average firm age (13.68 vs. 11.00 years; [$t = 2.41$, $p < 0.05$]). They also report finance [$t = -1.86$, $p < 0.10$] and corruption [$t = -1.88$, $p < 0.10$] as relatively more significant business-environment constraints and are less likely to be foreign-owned [$t = 1.71$, $p < 0.10$]. Female-dominated ownership (*femmore*, $\geq 50\%$) exhibits an intermediate pattern. Statistically significant differences are observed for firm size (131.52 vs. 59.06; [$t = 2.57$, $p < 0.05$]) and firm age (13.28 vs. 10.78; [$t = 2.19$, $p < 0.05$]), whereas the difference in labor productivity is not statistically significant [$t = 1.26$].

Table 4. Female Entrepreneurship Share by Region — Uzbekistan, 2024⁴

Region	Female presence in ownership		Top manager is female		Female-dominated ownership (50%+)	
	Mean (%)	N	Mean (%)	N	Mean (%)	N
Tashkent	57.1	182	19.9	176	25.7	175
Center	34.1	185	13.6	184	14.2	183
West	22.0	173	14.6	171	15.6	173
South	17.5	137	9.5	137	11.0	136
Central-East	18.2	154	11.0	154	13.0	154
East	16.9	177	4.5	176	5.1	176
Total	28.5	1008	12.3	998	14.2	997

Notes: Values are means expressed as percentages of firms; N denotes the number of nonmissing observations. "Female-dominated ownership (50%+)" is defined over the full sample (firms with zero female ownership coded as 0, not missing).

The regional disaggregation indicates that female entrepreneurial participation is geographically concentrated in Uzbekistan (Table 4). Based on the regional coding of the World Bank Enterprise Survey for Uzbekistan, 2024, the categories are defined as follows: Tashkent (Tashkent City); Center (Samarqand, Buxoro, Navoiy, Jizzax, and Sirdaryo); West (Xorazm Region and the Republic of Karakalpakstan); South (Qashqadaryo and Surxondaryo); Central-East (Farg'ona and Namangan); and East (Andijon).

Female representation in top management is highest in Tashkent (19.9%), which may reflect greater access to education, markets, and institutional support in the capital, while the corresponding share in the East (Andijon) region is 4.5%. This indicates substantial regional variation in women's participation in top-management positions. Female-dominated ownership (*femmore*) also varies considerably across regions. These differences suggest that ownership participation and involvement in day-to-day management may reflect distinct dimensions of women's participation in business activity. In some firms, ownership structures may therefore differ from the allocation of day-to-day managerial responsibilities.

4 Source: World Bank Enterprise Survey, Uzbekistan, 2024. Authors' calculations.

Table 5. Female Entrepreneurship Share by Sector — Uzbekistan, 2024⁵

Industry Sector	Female presence in ownership		Top manager is female		Female-dominated ownership (50%+)	
	Mean (%)	N	Mean (%)	N	Mean (%)	N
Food	25.8	132	13.6	132	17.6	131
Textiles	24.8	133	12.1	132	13.7	131
Garments	39.2	130	26.9	130	31.0	129
Other Manufacturing	22.0	159	3.9	152	4.5	155
Retail	35.9	128	15.0	127	15.7	127
Construction	20.8	149	4.7	149	6.0	149
Other Services	32.2	177	12.5	176	14.3	175
Total	28.5	1008	12.3	998	14.2	997

Notes: Values are means expressed as percentages of firms; N denotes the number of nonmissing observations. “Female-dominated ownership (50%+)” is defined over the full sample (firms with zero female ownership coded as 0, not missing).

In Table 5, gender-sector segregation is reflected in the sectoral breakdown. A high share of women in top-management positions is observed in the Garments sector (26.9%), more than double the overall average (12.3%), whereas Construction (4.7%) and Other Manufacturing (3.9%) have the lowest shares. This pattern is consistent with the existing literature on occupational and sectoral gender segregation, as female managers are more concentrated in sectors traditionally associated with female labor, such as textiles and garments, while capital- and labor-intensive sectors, such as construction, have comparatively lower female representation. This result is also methodologically relevant, as sector fixed effects (i.e., a4a) need to be taken into account in the main regression models. Without controlling for sectoral composition, the observed gender-productivity relationship may partly reflect underlying differences in sectoral productivity.

Table 6. Female Participation and Firm Size — Uzbekistan, 2024⁶

Firm Size	Top manager female		Female presence in ownership		Female-dominated (50%+)		Avg. no. of female employees
	Mean (%)	N	Mean (%)	N	Mean (%)	N	
Small (<20)	16.1	404	31.4	404	19.4	402	458
Medium (20–99)	13.2	302	26.4	303	12.6	301	329
Large (100+)	6.4	298	26.6	301	8.8	294	211
Total	12.3	998	28.5	1008	14.2	997	—

Notes: Values are means expressed as percentages of firms; N denotes the number of nonmissing observations. Firm size categories follow the WBES sampling-size stratification (a6a). “Female-dominated ownership (50%+)” is defined over the full sample (firms with zero female ownership coded as 0, not missing).

Table 6 presents women’s participation in firms, disaggregated by firm size and employment. Female-dominated firms, defined as those with at least 50% female employees, are more common among small firms than among medium-sized and large firms. In Uzbekistan, the share of female top managers is highest in small firms at 17% and decreases among medium-sized firms (9.7%) and large firms (6.2%). By contrast, female ownership is relatively similar across firm-size categories, ranging from 27% to 30%. In female-dominated firms, where women account for more than 50% of employees, small firms with no more than 20 workers tend to employ a higher share of women (69%). Women therefore demonstrate greater participation in leadership and firm teams within small businesses, while their representation in top-management positions is comparatively lower in large companies.

⁵ Source: World Bank Enterprise Survey, Uzbekistan, 2024. Authors’ calculations.

⁶ Source: World Bank Enterprise Survey, Uzbekistan, 2024. Authors’ calculations.

Table 7. Gender Bias and Firm Performance — Uzbekistan, 2024⁷

	(1)	(2)	(3)	(4)
Dep.Variable		Labor productivity		
Ind.Variable				
Top manager is female		-0.705**	-1.538***	-1.533***
		(0.283)	(0.468)	(0.763)
Female presence in ownership	-0.078	0.193	0.119	0.121
	(0.177)	(0.183)	(0.192)	(0.195)
Female owner x Female manager			0.984*	0.982*
			(0.563)	(0.565)
Ln number of employees	-0.243***	-0.270***	-0.269***	-0.255***
	(0.071)	(0.071)	(0.072)	(0.072)
corruption_obstacle	-0.011	-0.005	-0.005	-0.001
	(0.128)	(0.128)	(0.128)	(0.129)
crime_obstacle	-0.128	-0.130	-0.132	-0.144
	(0.129)	(0.130)	(0.130)	(0.129)
informal_obstacle	0.043	0.037	0.036	0.051
	(0.095)	(0.094)	(0.094)	(0.096)
finance_obstacle	0.032	0.030	0.047	0.063
	(0.125)	(0.124)	(0.125)	(0.127)
exporter2	0.019	0.036	0.031	0.031
	(0.386)	(0.382)	(0.382)	(0.387)
foreign2	0.027	0.018	0.010	0.037
	(0.393)	(0.393)	(0.393)	(0.412)
Manager's years of experience				0.005
				(0.011)
Constant	19.060***	19.159***	19.163***	19.028***
	(0.235)	(0.238)	(0.238)	(0.266)
Observations	841.000	838.000	838.000	825.000
Adjusted R-sq	0.013	0.019	0.020	0.016

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Country, sector, and year dummies are added in all models, not reported to save space. Labor productivity is defined as sales per worker.

Female managers appointed by male owners manage firms with a statistically significant productivity difference ($\beta = -1.533$, $p < 0.01$); however, this effect is substantially moderated when the owner herself is female (interaction $\beta = +0.982$, $p < 0.10$), reducing the overall effect to -0.430 . This pattern differs from Martínez-Zarzoso's (2023) global findings, in which female managers selected by male owners exhibited higher

productivity. The difference may reflect distinct appointment mechanisms for female managers in the Uzbek context.

Table 8. Gender bias and firm performance - TFP - Uzbekistan 2024⁸

	(1)	(2)	(3)	(4)
	Total Factor Productivity (residual)	Total Factor Productivity (residual)	Total Factor Productivity (residual)	Total Factor Productivity (residual)
Top manager is female		-0.664	-0.800	-0.756
		(0.471)	(0.543)	(0.576)
Female presence in ownership	0.247	0.496	0.475	0.421
	(0.294)	(0.342)	(0.374)	(0.376)
Female owner x Female manager			0.177	0.187
			(0.745)	(0.762)
Log(number of employees)	0.205*	0.179	0.179	0.187
	(0.107)	(0.111)	(0.111)	(0.117)
corruption_obstacle	0.305*	0.313*	0.315*	0.332*
	(0.168)	(0.168)	(0.169)	(0.172)
crime_obstacle	-0.277	-0.303	-0.302	-0.317
	(0.216)	(0.220)	(0.221)	(0.222)
informal_obstacle	0.016	0.036	0.034	0.006
	(0.141)	(0.141)	(0.144)	(0.145)
finance_obstacle	0.099	0.103	0.106	0.099
	(0.171)	(0.173)	(0.172)	(0.170)
exporter2	0.420	0.399	0.399	0.498
	(0.603)	(0.593)	(0.595)	(0.607)
foreign2	-0.532	-0.535	-0.537	-0.317
	(0.578)	(0.572)	(0.573)	(0.549)
Manager's years of experience				0.009
				(0.014)
Constant	-0.902***	-0.803**	-0.802**	-0.933***
	(0.346)	(0.352)	(0.352)	(0.340)
Observations	198.000	198.000	198.000	195.000
Adjusted R-sq	0.029	0.031	0.026	0.033

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As a robustness check using an alternative productivity measure, Total Factor Productivity was estimated following the Cobb-Douglas approach of Martínez-Zarzoso (2023). Due to higher non-response rates for the capital and material-cost questions required for this calculation, the TFP sample is smaller (N = 198)

than the main labor-productivity sample ($N = 825$), which limits statistical power. While no coefficients reach conventional significance thresholds except the corruption obstacle ($p < 0.10$), the sign of the female-manager coefficient (-0.756) remains consistent in direction with the main labor-productivity specification (-1.533 in Table 7), providing qualitative, although not statistically conclusive, support for the consistency of the main finding across alternative performance measures.

CONCLUSION AND SUGGESTIONS

The paper analyzed the relationship between gender and firm productivity in Uzbekistan by examining whether female ownership or female top management is associated with firm productivity. The research is based on the 2024 World Bank Enterprise Survey. According to the research results, female top management emerges as an important factor, as enterprises with a female top manager demonstrate a statistically significant difference in labor productivity compared with similar enterprises managed by a male top manager ($\beta = -1.533$, $p < 0.01$). No statistically significant association between female ownership alone and productivity was identified. Female ownership may moderate this difference to some extent (interaction $\beta = 0.982$, $p < 0.10$). However, the overall effect associated with having a female top manager remains approximately -0.430 .

The findings differ from those of Martínez-Zarzoso (2023), who identified a positive effect of female managers appointed by male owners in a cross-country setting. In Uzbekistan, this difference may reflect specific mechanisms related to the appointment of top managers. Female top managers are concentrated mainly in Tashkent and in sectors traditionally associated with female employment, particularly garments and textiles. Moreover, some enterprises have female owners without female top managers. This pattern may reflect sectoral segmentation and institutional factors influencing women's access to top-management positions, rather than differences based solely on individual competence.

The findings have clear implications for gender-equality objectives and programs promoting women's entrepreneurship in Uzbekistan. Programs supporting female ownership may be further strengthened by complementary measures aimed at expanding women's opportunities to participate in top-management positions. Particular attention may be given to improving access to finance, strengthening participation in productive sectors and professional networks, and supporting transparent and merit-based managerial recruitment and promotion processes.

The research has several limitations related to its cross-sectional, single-country, and single-year design. These characteristics allow associations to be identified but limit the extent to which causal relationships can be established and make it difficult to fully address reverse causality and omitted-variable bias, particularly in the TFP specification. In addition, self-reported information on business-environment obstacles and sales in the Enterprise Survey may be subject to measurement limitations.

Future research could conduct panel analyses using multiple years of WBES data for Uzbekistan, examine the mechanisms through which top managers are appointed, and undertake comparative analyses with other Central Asian countries. Such research could provide a more comprehensive understanding of the relationship between gender, managerial participation, and firm performance and contribute to the development of more effective measures supporting women's participation in entrepreneurship and management.

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