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The Business of Equality: The Impact of Female Managers on Firm Performance in Guinea Bissau

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Abstract

This study investigates the impact of female managers on firm performance in Guinea-Bissau using data from 401 formal businesses. We find that female-managed firms are more likely to secure loans compared to male-managed firms. We find no effect of female-managed firms on firm profits. We also find that female-managed firms have lower productivity compared to their male-managed counterparts. The findings suggest that whilst firms that have female managers benefit from a higher likelihood of obtaining a loan, additional efforts are needed to support female entrepreneurs in effectively utilising their resources to achieve better firm outcomes.

Key words: Guinea-Bissau, Africa, female managers, female entrepreneurship, gender, firm performance, profit, productivity, loan, formal enterprises, management

The data for this study was sourced from a UNDP enterprise survey on Guinea-Bissau (2021) and this thesis is part of an individual work project conducted in collaboration with BELAB.

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Introduction

There is a paradox surrounding female entrepreneurship in developing nations. In Sub-Saharan Africa, women are prominent entrepreneurs, with the region having the highest rate of female entrepreneurial activity globally. Approximately 26% of women are involved in entrepreneurship, meaning that more than a quarter of businesses in the region are either started or managed by women (Kelley et al. 2017). Female entrepreneurship in the region drives job creation, reduces poverty, empowers women by enhancing self-confidence, and utilises women's knowledge of natural resources and cultural traditions to support and grow industries (Moreno-Gavara and Jiménez-Zarco 2019; Nukpezah and Blankson 2017; Otoo et al. 2012; Scott et al. 2012). Despite their contributions, gender-specific constraints in entrepreneurship such as legal discrimination, social norms, and gaps in education and skills, place women at a disadvantage and make it challenging to fully evaluate the effectiveness of female entrepreneurs compared to their male counterparts (Campos and Gassier 2017). Nonetheless, it is crucial to shift the perspective on female entrepreneurs, recognising them not only for their contributions to inclusive prosperity, but also as pivotal drivers of sustainable economic growth in developing countries (Adom 2015; The Gender Innovation Lab 2020; Thomas 2024). Investigating the "female effect" on business performance is vital to understanding the impact of female entrepreneurship on economic development in Sub-Saharan Africa.

Review of relevant literature

Despite women's active participation in trade in Guinea-Bissau, with a labour force participation rate of 48.9%, women face clear disadvantages in the workforce. Women are less educated and are often concentrated in low productivity work, such as agriculture, with limited opportunities to transition into higher productivity jobs in the formal market due to a lack of professional skills (World Bank, n.d.). As a result, many women are self-employed micro-

entrepreneurs or wage workers in informal businesses (Embaló 2021). Despite these challenges, Guinea-Bissau's culture does have some harmonious cooperation between men and women. Male "djilas" (itinerant traders from Eastern ethnic groups) and female "bideiras" (traders from coastal groups) often collaborate in small-scale trade, with the men focused on cross-border trade and women being responsible for vegetable, rice, and fish marketing for businesses (Lourenço-Lindell 2002). Lundy, Fernandes, and Lartley (2016) note that women are highly respected by men in regions such as the Bissagos Islands. However, women remain disadvantaged in terms of entrepreneurship empowerment. For example, there are no government policies promoting female entrepreneurship in Guinea-Bissau. Furthermore, the Civil Code (Article 1686) requires married women to obtain their husband's permission to start a business, further disadvantaging women's freedom in entrepreneurship (World Bank 2024).

Four theories are relevant to this topic. The liberal feminist theory highlights that differences in performance between men and women stem from unequal access to resources (i.e. education). The social feminist theory suggests that gendered socialisation leads to different business approaches (for example, if women are more risk-averse they may choose to focus on lower risk or return strategies, affecting their business approach) (Eagly and Wood 2012; Fischer, Reuber, and Dyke 1993; Lemma, Gwatidzo, and Mlilo 2022). The contingency theory states that the business environment explains the difference in business outcomes (i.e. female entrepreneurs have more informal competition compared to male entrepreneurs) (Moniz 2010; Okumu, Nathan, and Bbaale 2024). The social role theory suggests that women are mainly concerned with the welfare of others and have natural nurturing traits, which in this context may contribute to a better business environment, potentially leading to financial success (Carranza, Dhakal, and Love 2018; Nyeadi, Kamasa, and Kpinpuo 2021).

Previous research on the relationship between female managers and firm performance presents inconsistent findings. Many studies point to a significant gender performance gap, with female-

managed firms often underperforming compared to male-managed firms (Boohene 2009; Lemma, Gwatidzo, and Mlilo 2022; Okumu, Nathan, and Bbaale 2024; Tandrayen-Ragoobur & and Kasseeah 2017). However, findings also reveal nuances. For example, Okumu, Nathan, and Bbaale (2024) found that female-managed firms perform worse than male-managed firms, but only amongst small and medium-sized firms. On the other hand, studies have also reported better financial performance from female entrepreneurs, but it is important to note that some of these studies were conducted in South Africa where there are policies that actively support female entrepreneurship, which is not the case for other African countries (Kengne 2016; Nyeadi, Kamasa, and Kpinpuo 2021; Williams and Kedir 2017). Furthermore, a study found that female-owned firms have better annual sales growth, whereas another study found that female-owned firms have lower revenue (Baliamoune-Lutz and Lutz 2017; Williams and Kedir 2017). Mixed results within studies are also observed. For example, research found that if a female is the manager of a male-owned firm, the total factor productivity is greater, but if a female owns the firm, the productivity is lower. Also, another paper concluded that the effect of a female manager on firm productivity differs by sector and location (Ackah et al. 2023; Makochekanwa and Nchake 2019; Martínez-Zarzoso 2023). As highlighted by researchers, the inconclusive results may be due to the use of inappropriate econometric techniques (Nyeadi, Kamasa, and Kpinpuo 2021). However, another key reason for these inconsistencies could lie in the methodological differences, particularly the use of diverse and inconsistent financial performance metrics, such as raw annual sales, sales growth, turnover, labour productivity, and performance indices, as used by the researchers in the previously mentioned papers. This variability complicates comparisons and raises the question of which metric most effectively captures female entrepreneur's performance, particularly in these contexts where women face systemic disadvantages.

Literature on granting bank loans to female entrepreneurs presents positive findings. For example, a study found that female farmers secure loans more successfully than male farmers, and research also highlights that female-owned businesses are not more likely to face rejection when applying for loans (Aterido, Beck, and Iacovone 2013; Sarwosri, Römer, and Musshoff 2016). Formal education and employment in certain sectors, such as the textile industry, have also been shown to alleviate difficulties in accessing loans (Teixeira and Sharifu 2017). However, there is paucity in literature on the financial outcomes of loans based on the manager's gender. On a more negative note, Akologo et al. (2023) found that firms with female top managers who obtained loans experienced 75% lower labour productivity.

Recent data on loans in Guinea-Bissau shows that due to weak export performance in the cashew sector, the percentage of loans not being repaid on time increased from 4.3% in 2022 to 9.5% in 2023 (International Monetary Fund African Department 2024). Despite this, investments by organisations continue to support female entrepreneurship through the provision of loans. The African Development Group is currently running two projects in Guinea-Bissau: one focuses on youth and women's entrepreneurship whilst the other aims to empower youth and women in the cashew, fruit, and vegetable sectors by offering business training and loans to female entrepreneurs (African Development Bank Group 2023; African Development Fund 2021). Regarding the cashew women entrepreneurship project, significant progress has been made in training women and generating employment opportunities for them through the project. However, one of the key indicators, the increase in annual income per woman after receiving training and loans, has yet to reach half of its target. As of 2024, the actual increase in income per woman is 175,000 CFAF (West African CFA franc), compared to their target of 430,000 CFAF which is expected to be met by 2026 (MapAfrica, n.d.).

The inconsistencies in research regarding the link between firm performance and female entrepreneurship highlight the need for further and thorough analysis of this topic. Furthermore, additional research is needed to investigate whether female managers have an advantage in securing bank loans. We contribute to the literature on female entrepreneurship by filling a research gap on this topic in Guinea-Bissau, which, to our knowledge, has not been studied in the country to date. Additionally, many studies on this subject do not include micro-level firms, whereas our sample includes such firms, allowing their incorporation into the analysis. Moreover, we focus on a firm performance measure, productivity, that has not been used as much in previous literature regarding female entrepreneurship in Sub-Saharan Africa (Ackah et al. 2023).

Empirical framework

The sample and data source

The data used in this study was obtained from a UNDP enterprise survey conducted in Guinea-Bissau in 2020 (Pereira and Schäber 2021). 401 formal companies of different sizes and in various locations across the country were randomly sampled from a recent database of registered firms. Of the 401 firms, 97 are female-managed and 304 are male-managed. The surveys were conducted using a questionnaire that covered a broad range of topics including firm characteristics, management composition, financial metrics, access to finance, microfinance, and legal challenges faced by firms. Financial firm performance values were collected for 2019 and 2020. However, due to a high number of missing values for 2020, this study uses only 2019 data. Other variables such as firm age and owner age have been adjusted to reflect their values as of 2019. Not all firms answered every question, either because it was not applicable, the respondent didn't know the answer, or they chose not to answer. For our OLS and PSM analyses, we have data from 65 firms for the loan outcome, 325 firms for the

profit outcome, and 333 firms for the productivity outcome (see Appendix A, Table A1 for the breakdown of other variables).

Table A2 (see Appendix A) provides detailed information regarding each variable and its form. A key point to highlight is that the managerial level and specific responsibilities of the female manager within the firm are not known. We define a female-managed firm as one where a female manager is present. Another important point to mention is the classification of firm size, which was developed by the authors of the UNDP report. Firm size is based on both revenue and the number of employees. Firms are classified by their 2019 revenue relative to Guinea-Bissau's per capita Gross National Income (GNIpc PPP): micro (<10x GNIpc), small (10-100x), medium (100-1,000x), and large (>1,000x). Firms with more employees than typical for their revenue were reclassified accordingly (see Appendix A, Table A3). Financial variables, such as profit, costs, and revenue, were converted into CFAF millions (West African CFA franc) for the UNDP report. For this study, these variables were re-converted into their original CFAF units and transformed into logarithms to normalise their distribution. Additionally, +1 was applied to the log values to handle zero profit values, ensuring all values are positive and suitable for analysis. It is also important to note that the demographic variables (age, education, ethnicity) refer mainly to firm owners, as data on female managers for these variables was not specifically collected for this survey. Of the 401 firms surveyed, 330 responses came from the owner whilst 71 had the manager respond. Since the majority of respondents were both owner and manager, this study refers to these demographics as owner characteristics. Nevertheless, managers, who were not owners, that were respondents of the survey were likely in senior management roles, as they provided answers to questions about the firm's financial metrics and other key aspects.

Econometric procedures

The analysis will employ two statistical techniques. First, the ordinary least squares (OLS) model will be used to test the three outcome variables, controlling for various factors. Recognising the limitations of OLS, such as assumption violations that may lead to biased estimates, propensity score matching (PSM) will then be conducted (Ernst and Albers 2017). PSM, a causal inference methodology, controls for endogeneity issues and mitigates sample selection bias (Abadie and Cattaneo 2018; Titus 2006). A counterfactual group of firms will be created that are identical in all respects except the manager's gender. Female-managed firms (treated observations) will be matched with male-managed firms (control observations) based on their propensity scores, using the same control variables that were employed in the OLS models. The resulting matched sample will consist of firms with similar characteristics, and the OLS model will be re-estimated for the matched sample. This approach has been employed in similar studies by Lemma, Gwatidzo, and Mlilo (2022) and Martínez-Zarzoso (2023).

Model specifications

Our first model examines whether a firm received a loan during the period from 2017 to 2019. The researchers of the UNDP report found that firms with female managers were significantly more likely to obtain loans (Pereira and Schäber 2021). Whilst the UNDP study controlled for other factors when performing their regression, we aim to back up this finding by using the control variables chosen for this study to determine if the significance still holds. Based on this finding, we hypothesise a positive relationship.

Therefore, our model that links the gender of the manager to the likelihood of obtaining a loan and our first hypothesis is (Equation 1):

$$Loan_i = \beta_0 + \beta_1 Female\ Manager_i + \beta_2 X_i + \varepsilon_i$$

$$H_1 : \beta_1 > 0 \text{ (Firms with female managers are more likely to receive a loan)}$$

where $Loan_i$ represents a dummy variable indicating whether the firm ($_i$) received a loan in 2017–2019, set to 1 if a loan was received and 0 if not; $Female\ Manager_i$ denotes a dummy that is set to 1 if the firm ($_i$) contains at least one female manager, and 0 if not; X_i represents a vector of control variables; and ε_i is the error term.

Our second and third models examine firm performance, using profit and productivity as proxies. Contrary to other studies on firms in African countries that often use revenue or sales-based proxies to measure financial performance, such as annual sales growth or sales per worker, we chose profit as one of our measures (Nyeadi, Kamasa, and Kpinpuo 2021; Okumu, Nathan, and Bbaale 2024). This is because a firm's ability to generate strong profits is a key indicator of both the business' and the entrepreneur's success (Hussain and Li 2022; Makhbul and Hasun 2010; Siepel and Dejardin 2020).

We chose productivity as our other measure of firm performance. Productivity refers to the ratio of monthly revenue to monthly costs in 2019 (revenue/costs), indicating the amount of revenue generated by a firm per unit of cost. We selected this measure as it is an important indicator to measure a firm's operational efficiency, showing how well resources are utilised to generate value (Ackah et al. 2023; Siepel and Dejardin 2020; Walden et al. 2015).

In line with the liberal feminist theory, social feminist theory, and contingency theory, we hypothesise that firms with female managers have less profits and lower productivity compared to male-managed firms (Fischer, Reuber, and Dyke 1993; Moniz 2010). Therefore, our two firm performance models and second and third hypotheses are (Equation 2) and (Equation 3):

$$lnProfit_i = \beta_0 + \beta_1 Female\ Manager_i + \beta_2 X_i + \varepsilon_i$$

$$H_2 : \beta_1 < 0 \text{ (Firms with female managers have lower profits)}$$

$$Productivity_i = \beta_0 + \beta_1 Female\ Manager_i + \beta_2 X_i + \varepsilon_i$$

$$H_3 : \beta_1 < 0 \text{ (Firms with female managers have lower productivity)}$$

where $lnProfit_i$ represents the logarithm of monthly profits of the firm ($_i$) in 2019; $Productivity_i$ is defined as the ratio of monthly revenue to monthly costs for the firm ($_i$) in 2019; $Female\ Manager_i$ denotes a dummy that is set to 1 if the firm ($_i$) contains at least one female manager, and 0 if not; X_i represents a vector of control variables; and ε_i is the error term.

It is argued that the majority of existing research on female entrepreneurship and firm performance fails to adequately account for crucial demographic and other control variables, which are essential for ensuring the robustness of findings (Klapper and Parker 2010; Robb and Watson 2012). We have made efforts to address this issue by controlling for key determinants of firm performance, such as firm size. In developing nations, firm size is generally thought to be positively associated with performance, as smaller firms face for example, credit constraints (Hsieh and Olken 2014). The UNDP report supports this notion, showing that in 2019, large firms had an average monthly revenue of 238 CFAF million, whilst small firms had only 4 CFAF million (Pereira and Schäber 2021). However, this relationship is debated as larger firms in these contexts often face significant fixed costs or constraints not encountered by smaller firms (Hsieh and Olken 2014; Mazhinduka 2015). The UNDP lends support to this notion too, noting that within the sample, large firms contribute more to aggregate costs (and taxes) than to revenues, suggesting that their contribution to aggregate profits is relatively lower compared to smaller firms (Pereira and Schäber 2021). Despite these nuances, a relationship between firm size and performance remains evident. Firm size is a categorical variable divided into micro, small, medium, and large enterprises.

Sector is used as a control variable to account for the sector-specific factors that can influence firm performance (Masakure, Cranfield, and Henson 2008). It is a categorial variable divided into three sectors: the primary sector (firms that have their main activity in the extraction and production of raw materials i.e. agriculture, fishing, forestry), secondary sector (firms that are primarily engaged in the transformation, processing and manufacturing of raw materials i.e.

food processing, construction), and tertiary sector (firms that have their main activity in providing services i.e. retail, import/exporting products, transport, hospitality).

Region is included as a control variable since firm performance varies between urban and rural areas. Urban centres, such as Bissau in this study (the capital city), generally provide more favourable business environments due to better infrastructure and resources compared to rural regions (Masakure, Cranfield, and Henson 2008). It is important to note that rural regions in Guinea-Bissau, in particular, face challenges for businesses such as poor road quality, limited electricity (mostly confined to the capital), and inadequate network and internet coverage. It is worth noting that these issues affect not only rural areas but do affect the capital as well (Pereira and Schäber 2021). The variable is categorical, covering eight regions of Guinea-Bissau: Bafata, Biombo, Bissau, Cacheu, Gabu, Oio, Quinara, and Tombali, representing firms across the north, south, east, and west of the country.

Firm age is included as a control variable because it is positively correlated with financial performance. Older firms tend to have more experience, stronger customer recognition, and more market knowledge compared to younger firms (Doucouré & Diagne 2020; Kipesha 2013). This is a continuous variable representing the age of the firm in years as of 2019.

A cashew dummy variable is included as a control because the cashew industry plays a significant role in the economy of Guinea-Bissau, and firms involved in this industry face unique market conditions, opportunities, as well as challenges compared to firms not involved in the cashew industry (Carvalho and Mendes, 2015). This variable is coded as 1 if the firm is involved in the cashew industry (i.e. growing, selling, or exporting cashews), and 0 if the firm is not involved in the cashew industry.

Entrepreneurial characteristics are important to consider, but our dataset poses a challenge as it primarily contains data on the owner's characteristics, not of the actual female managers. Furthermore, some owners also serve as managers, whilst some respondents of the survey were

only managers. This overlap makes it difficult to separate owner characteristics from those of the manager.

Despite this, we included the ethnicity of the owner (in some cases, the manager, labelled as the owner for consistency) as a control variable. Research shows that firms with foreign ownership tend to outperform domestic firms due to larger shareholding, higher commitment, and longer-term involvement (Bolarinwa et al. 2024; Douma et al. 2006; Gurbuz and Aybars 2010). However, some argue that these firms may struggle with integration and, as a result, underperform (Carney et al. 2018). Additionally, the ethnicity of Guinea-Bissau's population may influence consumer decisions, as cultural backgrounds may affect whether customers choose to purchase from or engage with certain firms. In fact, foreign managers in Guinea-Bissau tend to work in more homogeneous management teams, often lacking local colleagues (Pereira and Schäber 2021). This is a categorical variable representing eight different ethnicities of firm owners: Fula, Mandinga, Manjaco, Mancanha, Papel, Balanta, others, and mixed.

We also included the age of the owner as a control, represented as a continuous variable for the owner's (or manager's) age in years as of 2019. Some studies have found a positive relationship between owner age and firm performance, suggesting that older owners tend to achieve better outcomes (Okunbo and Oghuvwu 2019). However, other research has either found a non-significant relationship or a potentially negative one between age and business performance (Kaunda 2012; Osunsan et al. 2015).

We carefully selected our control variables, particularly those related to the entrepreneurs' characteristics. Human capital factors such as the education level of the owner (or manager) have not been included in our analysis. Whilst a study showed that higher education levels in managers improved labour productivity, we opted not to include this as a control variable (Osikei, Ndanshau, and Kirama 2023). Previous studies on this topic have controlled for managerial experience, a variable we lacked but would have valued incorporating (Lemma,

Gwatidzo, and Mlilo 2022; Williams and Kedir 2017). In our dataset, the education variable refers to the owner (or manager's) level of schooling, but it does not capture managerial training or indeed specify whether degrees were business-related. Consequently, the education variable does not necessarily equate to business expertise or practical management experience, making it less suitable as a control in this context. Additionally, controls like loans and investments were excluded due to their confounding nature, and variables related to innovation and technology could not be isolated to 2019, as the COVID-19 pandemic in 2020 may have influenced firms to adopt more technology or innovation, coupled with missing data.

Results

Descriptive analysis

Female-managed firms represent 24% of the overall sample, with the majority operating within the tertiary sector. 7.2% of firms are managed only by women, indicating that the majority of firms with women as managers are co-managed by men. Market share is calculated as the 2019 revenue from each sector (primary, secondary, tertiary) for female-managed and male-managed firms, divided by their respective total revenues in 2019 (measured in CFAF millions). Female-managed firms contribute 89% of their total revenue to the tertiary sector (Appendix B, Figure B1), highlighting their strong focus in service-orientated industries. A scatter plot reveals that significant outliers in tertiary sector revenues belong to male-managed firms, suggesting that the high market share of female-managed firms is not skewed by extreme values (see Appendix B, Figure B2). Female managers work primarily in retail (27.8%) followed by hospitality (10.3%) (see Appendix B, Figure B3). On the other hand, female owners are also concentrated in retail (27.6%), but with agriculture (13.8%) as the second most common industry (see Appendix B, Figure B4). The concentration of female-managed firms in services reflects the "female ghetto" (or "pink ghetto") concept, which suggests that women in entrepreneurship are

often confined to low-value service sectors such as retail (Alam 2021; Kalleberg & Leicht 1991; Tandrayen-Ragoobur & Kasseeah 2017). Whilst this term to describe positions and career paths for women does not necessarily hold in more developed countries, our findings support its relevance in this context (Allen et al. 2019).

Table 1 presents a breakdown of various variables for female-managed and male-managed firms in the sample. For female-managed firms: 50.5% are small businesses, 77.3% are located in the capital Bissau, 29.9% are owned by women, are on average 7 years old, 79 out of the 97 firms employ female workers, and most owners have an undergraduate degree.

Table 1 Comparison of sample composition between female-managed and male-managed firms

Variable	Female-managed firms		Male-managed firms	
	Total (number)	Percentage (%)	Total (number)	Percentage (%)
Total	**97**		**304**	
Firm size				
Micro	30	30.9	79	26.0
Small	49	50.5	151	49.7
Medium	15	15.5	61	20.1
Large	3	3.1	13	4.3
Cashew industry	15	15.5	48	15.8
Non-cashew industry	82	84.5	256	84.2
In Bissau	75	77.3	236	77.6
Outside Bissau	22	22.7	68	22.4
Female ownership	29	29.9		
Firms with female employees	79	81.4	194	63.8
Firm age (*mean*)	6.9		7.3	
Owner age (*mean*)	40.6		43.5	
Owner education				
No schooling	2	2.1	1	0.3
Primary (3^{rd} – 8^{th} grade)	4	4.2	21	7.0
Secondary (9^{th} – 12^{th} grade)	15	15.6	57	18.9
Specialised professional training	21	21.9	64	21.2
Undergraduate degree	34	35.4	98	32.5
Master's degree	20	20.8	49	16.2
Fula	18	19.4	51	17.8
Balanta	13	14.0	23	8.0

Percentage (%) represents the proportion of each variable within the sample of female-managed firms and the sample of male-managed firms, not the overall dataset. The continuous variables age of firms and age of owners are presented as means. Age of firms refers to the firms' age in 2019. Percentage and mean values have been rounded to one decimal place

Although Guinea-Bissau's economy relies heavily on the cashew industry, with agriculture accounting for over 45% of GDP and employing 80% of the workforce, only 15 female-managed firms in the sample are involved in the cashew industry, and 8.2% operate in agriculture (Haile et al. 2020). This lack of female representation in this area aligns with a study showing that 96% of cashew producers in the country are male (Sierra-Baquero et al. 2024). In fact, a lot of the workforce is engaged in informal trades and distribution services, with the services sector accounting for nearly 40% of GDP. This aligns with our findings regarding the high concentration of female-managed firms in the tertiary sector (Haile et al. 2020). Nevertheless, it is important to reiterate that our study only analyses formal firms. In Guinea-Bissau, 92.2% of non-agricultural workers are employed informally, with 96.4% of informal workers in the non-agricultural sector being women (African Development Bank Group 2022). Out of the 65 firms that received a loan during 2017-2019, 24 of the firms contained a female manager (see Appendix A, Table A1). The majority of the firms in the sample that received a loan were small-sized (29), and were in the tertiary sector (49).

Table 2 presents a comparison of the mean financial measures between female-managed and male-managed firms. The means for revenue, profit, productivity, costs, and costs excluding taxes are all higher for male-managed firms. Female-managed firms, on average, appear to pay slightly more in taxes. However, none of these findings are statistically significant, looking at the t-test results in the last column. Therefore, these preliminary findings should not be given much weight, as they are based on univariate analyses that do not control for other variables.

Table 2 Descriptive statistics: summary of means of different financial measures and *t* tests results of mean differences between female-managed and male-managed firms

Variable	Whole Sample	Female-managed firms	Male-managed firms	*t* test
Revenue	14.87	14.78	14.90	0.38
Profit	13.89	13.77	13.93	0.61
Costs	14.41	14.19	14.48	1.07
Costs without taxes	14.31	14.17	14.36	0.65
Taxes	7.29	7.65	7.17	-0.71
Productivity	2.26	1.95	2.36	1.22

***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively

Ordinary least squares (OLS) regression results

Table 3 OLS regression results: loan and female manager

Variable	Received loan
Female manager	0.110**
	(0.048)
Small size	0.002
	(0.044)
Medium size	0.020
	(0.058)
Large size	0.336**
	(0.134)
Secondary sector	-0.027
	(0.075)
Tertiary sector	-0.004
	(0.070)
Location of firm	
Biombo	-0.033
	(0.107)
Bissau	0.018
	(0.092)
Cacheu	0.070
	(0.130)
Gabu	-0.056
	(0.138)
Oio	-0.039
	(0.195)
Quinara	0.235
	(0.232)
Tombali	-0.154
	(0.109)
Owner ethnicity	
Mandinga	-0.094
	(0.082)
Manjaco	-0.077
	(0.071)
Mancanha	-0.179***
	(0.062)
Papel	0.007
	(0.080)
Balanta	0.007
	(0.088)
Other	-0.081
	(0.061)
Mixed	-0.034
	(0.077)
Owner age	-0.002
	(0.002)

Table 3 presents the results of the OLS regression examining the relationship between loan receipt and the gender of the manager, including female manager as the key variable, alongside control variables.

The positive and statistically significant coefficient for the female manager variable (0.110) at the 5% level suggests that firms with female-managers are significantly more likely to secure loans compared to male-managed firms.

Moreover, larger firms are significantly more likely to receive loans compared to micro firms (the reference category). Firms owned by the Mancanha ethnic group are significantly less likely to receive loans compared to the Fula ethnic group (the reference category), with a statistically significant negative coefficient of -0.179 at the 1% level. However, the low R-squared value means that the independent variables included in the model explain only 9.7% of the variation in whether a firm receives a loan. Nonetheless, the F-statistic (3.22) is statistically significant at the 1% level, indicating the model's overall relevance.

Table 4 presents the OLS regression results for our two models measuring financial performance: profits and productivity. These findings indicate no significant relationship between female managers and firm profits.

Firm age	0.005
	(0.003)
Cashew industry	0.017
	(0.056)
Constant	0.223*
	(0.133)
Observations	377
R-squared	0.097
F-statistic	3.22***

Robust standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively. Reference categories are *Micro* for firm size, *Primary* for sector, *Bafata* for region, and *Fula* for ethnicity. Coefficient and standard error values are rounded to three decimal places

However, the productivity results show that the female manager variable has a statistically significant negative effect at the 10% level. This means that having a female manager is associated with a decrease in productivity by 0.591 units of revenue per cost, indicating that female-managed firms have lower productivity.

Table 4 OLS regression results: profits and productivity and female manager

Variable	Profits	Productivity (revenue/costs)
Female manager	0.052	-0.591*
	(0.169)	(0.300)
Small size	2.018***	0.070
	(0.257)	(0.308)
Medium size	3.975***	0.374
	(0.297)	(0.579)
Large size	4.654***	-0.657*
	(0.562)	(0.377)
Secondary sector	-0.157	-0.253
	(0.344)	(0.284)
Tertiary sector	0.107	0.441
	(0.235)	(0.341)
Location of firm		
Biombo	0.272	-0.659
	(0.449)	(0.622)
Bissau	0.120	-0.237
	(0.413)	(0.548)
Cacheu	0.684	-0.415
	(0.540)	(0.614)
Gabu	0.065	-0.801
	(0.677)	(0.618)
Oio	-0.222	-0.767
	(0.657)	(0.581)
Quinara	0.582	-0.246
	(0.628)	(0.881)
Tombali	0.427	2.772***
	(0.674)	(0.808)
Owner ethnicity		
Mandinga	-0.018	0.647
	(0.352)	(0.734)

Manjaco	-0.229	0.155
	(0.385)	(0.321)
Mancanha	0.063	0.015
	(0.287)	(0.280)
Papel	-0.147	-0.089
	(0.247)	(0.295)
Balanta	0.107	0.451
	(0.227)	(0.432)
Other	-0.036	0.373
	(0.305)	(0.445)
Mixed	0.241	1.285
	(0.233)	(0.902)
Owner age	0.007	0.015
	(0.008)	(0.011)
Firm age	0.003	-0.007
	(0.00932)	(0.015)
Cashew industry	-0.524	-0.337
	(0.324)	(0.277)
Constant	11.30***	1.456*
	(0.631)	(0.824)
Observations	306	315
R-squared	0.488	0.0619
F-statistic		

Robust standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively. Reference categories are *Micro* for firm size, *Primary* for sector, *Bafata* for region, and *Fula* for ethnicity. Coefficient and standard error values are rounded to three decimal places

Large firms show a significant negative effect on productivity compared to micro firms (the reference category), suggesting that although larger firms have significantly higher profits, their productivity is in fact lower. This finding may be due to the large amount of taxes and costs these firms pay compared to other sized firms (Pereira and Schäber 2021). The Tombali region has a significantly positive effect on productivity, suggesting firms there are more productive compared to the Bafata region (the reference category). Furthermore, the R-squared for the profits model shows that 48.8% of the variation in profits is explained by the independent variables in the model. However, for the productivity model the R-squared is much lower, suggesting that only 6.19% of the variation in productivity is explained by the variables included in the model. This demonstrates that the productivity model is less well-explained by the chosen variables compared to the profits model.

Propensity score matching (PSM) results

Covariate balance check

Before examining the results of PSM, we begin by evaluating and measuring the success of the matching process. This was done by testing the similarity of covariates both before and after matching. We performed the pstest for our three models. As an example of this process, Table 5 shows the covariate balance check for the loan model (see Appendix C, Tables C1 and C2 for the balance checks for the profit and productivity models).

The results suggest that before matching, most covariates of the control and treatment groups were already relatively similar. Examining the unmatched rows, p-values for all but two covariates are above 0.05: the Mixed covariate has a p-value of 0.003, and Owner age is borderline at 0.051. In order for there to be a good match, t-tests should not be statistically significant, meaning that p-values must be greater than 0.05. After matching, the covariates previously with p-values below 0.05 now show p-values above 0.05, as seen in the matched rows for the Mixed and Owner age covariates. The differences in means between the treatment and control groups for nearly all variables have decreased, which aligns with expectations of the matching method. Moreover, after matching, only six covariates have a percent bias exceeding 5% (the bias should ideally be less than 5% for good matching). Therefore, we conclude that the matching process successfully achieved balance between the observable covariates and a good match has been made. This provides confidence in re-running the OLS regression on the matched sample.

The balance checks for the profits and productivity matching process reveal that only one variable Mixed had a statistically significant p-value before matching which, as anticipated, became insignificant after matching. However, after the profits matching occurred, eight

covariates still show a percent bias greater than 5%, whilst nine covariates show this >5% bias in the productivity balance check (see Appendix C, Tables C1 and C2).

Table 5 Covariate balance check before and after propensity score matching for loan

Variable	Matched versus unmatched	Treated (Female-managed firms)	Control (Male-managed firms)	Percent bias	Percent bias reduction	*t* stat	*p* value
Small size	Unmatched	0.50538	0.49291	2.5		0.21	0.835
	Matched	0.50538	0.39785	21.4	-762.4	1.47	0.142
Medium size	Unmatched	0.16129	0.20567	-11.4		-0.94	0.350
	Matched	0.16129	0.15054	2.8	75.8	0.20	0.841
Large size	Unmatched	0.03226	0.03901	-3.6		-0.30	0.767
	Matched	0.03226	0.03226	0.0	100.0	0.00	1.000
Secondary sector	Unmatched	0.17204	0.21631	-11.2		-0.92	0.361
	Matched	0.17204	0.12903	10.9	2.8	0.82	0.415
Tertiary sector	Unmatched	0.72043	0.70213	4.0		0.34	0.738
	Matched	0.72043	0.72043	0.0	100.0	-0.00	1.000
Biombo	Unmatched	0.11828	0.10993	2.6		0.22	0.825
	Matched	0.11828	0.12903	-3.4	-28.8	-0.22	0.825
Bissau	Unmatched	0.74194	0.75532	-3.1		-0.26	0.796
	Matched	0.74194	0.67742	14.8	-382.1	0.97	0.335
Cacheu	Unmatched	0.02151	0.06028	-19.6		-1.48	0.140
	Matched	0.02151	0.05376	-16.3	16.8	-1.15	0.250
Gabu	Unmatched	0.03226	0.01418	12.0		1.12	0.265
	Matched	0.03226	0.02151	7.1	40.5	0.45	0.652
Oio	Unmatched	0.01075	0.01773	-5.9		-0.46	0.643
	Matched	0.01075	0.01075	0.0	100.0	-0.00	1.000
Quinara	Unmatched	0.01075	0.01418	-3.1		-0.25	0.803
	Matched	0.01075	0	9.7	-213.3	1.00	0.319
Tombali	Unmatched	0	0				
	Matched	0	0				
Mandiga	Unmatched	0.05376	0.07801	-9.8		-0.78	0.434
	Matched	0.05376	0.06452	-4.3	55.7	-0.31	0.757
Manjaco	Unmatched	0.07527	0.13121	-18.4		-1.45	0.147
	Matched	0.07527	0.08602	-3.5	80.8	-0.27	0.789
Mancanha	Unmatched	0.09677	0.07092	9.3		0.81	0.420
	Matched	0.09677	0.09677	0.0	100.0	-0.00	1.000
Papel	Unmatched	0.07527	0.12766	-17.4		-1.37	0.170
	Matched	0.07527	0.06452	3.6	79.5	0.29	0.775
Balanta	Unmatched	0.13978	0.07801	19.8		1.78	0.076
	Matched	0.13978	0.15054	-3.5	82.6	-0.21	0.836
Other	Unmatched	0.13978	0.22695	-22.6		-1.81	0.071
	Matched	0.13978	0.15054	-2.8	87.7	-0.21	0.836
Mixed	Unmatched	0.22581	0.10638	32.4		2.94	0.003
	Matched	0.22581	0.2043	5.8	82.0	0.36	0.723
Owner age	Unmatched	40.806	43.628	-22.2		-1.96	0.051
	Matched	40.806	42.376	-12.4	44.4	-0.85	0.394
Firm age	Unmatched	6.9247	7.2872	-4.8		-0.38	0.706
	Matched	6.9247	8.0323	-14.8	-205.5	-0.90	0.371
Cashew industry	Unmatched	0.16129	0.16312	-0.5		-0.04	0.967
	Matched	0.16129	0.2043	-11.6	-2250.0	-0.76	0.451

Visual comparisons in the balance graphs further highlight these differences. Figure C1 (loan balance check) shows most matched covariates have a percent bias clustered on and around zero on the x-axis. In contrast, Figures C2 (profit) and C3 (productivity) reveal that whilst some covariates after matching have a percent bias at zero, the points are more dispersed across the graph and are less clustered at 0 in comparison to the loan balance check. This is supported by a higher frequency of matched covariates with a >5% bias seen in the balance check tables for profit and productivity compared to the loan balance check (see Appendix C for these graphs). These results suggest that the loan balance check achieved slightly better covariate balance compared to profits and productivity. Nevertheless, whilst some imbalance remains, the overall matching process for each of our three outcome variables can still be considered successful.

Re-estimating the matched sample

Table 6 presents the coefficients of our key independent variable, female manager, for the three models. It compares the results from the unmatched sample (the values found previously through the OLS regression) with those from the matched sample (after re-running the regression on the matched data).

Although there is a small decrease in the coefficient for female manager after matching in the loan model, the significance still holds at the 5% level after matching. This suggests that female-managed firms are still more likely to receive loans compared to male-managed firms, even after applying the matching procedure.

For profits, the coefficient for female manager remains positive but still not statistically significant after matching, indicating that there is no significant relationship between having a female-managed firm and profits.

In the productivity model, the coefficient for female manager changes from -0.591 (significant at the 10% level in the unmatched sample) to -0.686 (significant at the 5% level in the matched

sample). This suggests that after matching, the negative relationship between having a female-managed firm and productivity becomes stronger and more statistically significant, strengthening our confidence in this finding.

Table 6 Comparison of OLS regression results of female manager between the previously unmatched sample and the matched sample

	Loan		Profits		Productivity	
Variable	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
Female manager	0.110**	0.103**	0.052	0.062	-0.591*	-0.686**
	(0.048)	(0.048)	(0.169)	(0.172)	(0.300)	(0.285)

Robust standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% levels, respectively. Coefficient and standard error values are rounded to three decimal places

Linking these results to our three hypotheses, the results for loans show that even after controlling for various factors and applying PSM, there is a positive and statistically significant relationship between female-managed firms and receiving a loan. This reinforces the original finding by the UNDP and supports our alternate hypothesis (H_1), indicating that female-managed firms are more likely to secure loans.

The results for profits remain insignificant, meaning that we fail to reject the null hypothesis and there is no evidence to support the alternate hypothesis (H_2) that female-managed firms have lower profits.

After matching, the relationship becomes stronger and statistically significant at the 5% level, with a negative coefficient. This supports the alternate hypothesis (H_3), indicating that female-managed firms have lower productivity.

Discussion

Based on the negative productivity coefficient, our findings align with existing research on the gender performance gap, suggesting that female-managed firms underperform relative to male-managed firms. It is important to note however, that this does not necessarily imply that having a female manager leads to negative financial performance for a firm. The study presents both positive and negative findings for female entrepreneurs, leaving ample room for further exploration.

Whilst there is no significant effect on profits, we observe that female-managed firms are less efficient, indicating challenges in converting investments (costs) into returns (revenue). Notably, female-managed firms are more likely to secure loans.

Although we did not specifically analyse the outcomes of female-managed firms that received loans due to the small number of firms in the overall study that received loans, we can still construct a narrative based on our findings. In the broader context of the study's findings, whilst female-managed firms have been able to obtain more loans, presenting the potential for firm growth, this increased access to credit does not appear to translate into higher productivity. This could suggest that whilst women have the opportunity to improve their firms, for whatever reason, this opportunity is not translating into tangible outcomes. This aligns with the social feminist theory, which suggests that women may, for example be more risk-averse, leading to a different approach to business that contributes to the productivity gap. Additionally, according to contingency theory, the business environment may influence these differing approaches. Is competition with other entrepreneurs, for example, preventing female-managed firms from thriving despite better financial access? Alternatively, are there systemic barriers (as suggested by liberal theory), such as being less taken seriously by traders, or the challenge of balancing business with caregiving responsibilities, contributing to the low productivity? Identifying the underlying causes of these disparities is essential for closing the gap, making it extremely

relevant to study these factors than to focus solely on numerical measures of financial performance.

On a positive and encouraging note, the male owners interviewed for the survey view women as better managers than men (Pereira and Schäber 2021). This could imply that men are recognising the benefits of the "female effect," even though their potential in this study's case has yet to be realised. Whilst one might argue that female entrepreneurs should be empowered to run their own firms, research suggests that mixed-gender firms may be more effective in mitigating gender discrimination in the business world for women (Kengne 2016). Overall, men must play a crucial role in advancing female entrepreneurship.

This study has relevant policy implications. For policies in this field to be successful, they must be tailored to the specific needs of businesses in Guinea-Bissau whilst also adapting to the regional challenges of the country. The UNDP report highlights that businesses are seeking workers with IT, quantitative, and financial skills (Pereira and Schäber 2021). Therefore, policies should focus on training female entrepreneurs in these areas, alongside general business skills, whilst also providing them with access to loans. Moreover, training programmes should be mobile and not limited to Bissau, given the poor road infrastructure and limited network access in rural areas. Such policies should be accompanied by monitoring and evaluation to determine if women are effectively applying these skills and translating them into better firm outcomes. This will help women entrepreneurs gain a competitive edge over their male counterparts, allowing them to effectively thrive in the business landscape. It is important to note that policies to do with women's entrepreneurship are currently lacking in Guinea-Bissau, but they should be implemented with the aim of both empowering women and driving economic development.

Future research should explore the specific gender-related constraints, behavioural choices and business-related skills of female entrepreneurs in developing countries. Qualitative methods

would be particularly useful in identifying the underlying reasons for performance differences between male- and female-managed firm. Future studies should also examine the outcomes of firms after a loan is granted to a firm that has a female entrepreneur. Moreover, researchers on this topic should consider using a more standardised, yet also nuanced measure of firm performance for female entrepreneurs, particularly one that accounts for gender-specific constraints.

Conclusion

The purpose of this study was to examine the impact of female managers on firm performance. Results show that female-managed firms are more likely to secure loans compared to male-managed firms. However, there is no significant relationship between female management and firm profits. Furthermore, female-managed firms exhibit lower productivity compared to their male-managed counterparts.

This study has several limitations. One of them is the small sample size. Additionally, data on the specific characteristics and human capital factors of female managers were unavailable, which would have provided insightful results. The analysis is only based on data from one year, whereas panel data would have offered insights into whether the observed effects were consistent over time. Finally, the results were only from one country. A comparative study with a similar country setting would help assess the broader applicability of these findings.

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Appendix

Appendix A

Table A1

Table A1 Number of observations for main variables

Variable	Whole Sample	Female-managed firms	Male-managed firms
Firm size	401	97	304
Sector	401	97	304
Region	401	97	304
Owner ethnicity	379	93	286
Owner age	393	94	299
Firm age	396	97	299
Cashew industry	63	15	48
Received loan	65	24	41
Financial measures			
Profit	325	78	247
Productivity	333	82	251
Revenue	347	84	263
Costs	339	84	255
Costs without taxes	317	80	237
Taxes	351	88	263

Table A2

Table A2 Description of variables

Variable	Description
Female manager	Dummy variable set to 1 if firm contains female manager(s) and 0 if no female manager(s) are present *Note:* the managerial level and specific duties of the female manager within the firm are unknown. A continuous version of this variable is also shown, indicating the number of female managers in these firms
Female owner	Dummy variable set to 1 if firm is owned by a woman and 0 if firm is owned by a man
Female employees	Dummy variable set to 1 if firm contains female employee(s) and 0 if no female employee(s) are present *Note:* a continuous version of this variable, indicating the number of female employees in the firm, exists but is not included in this study
Sector	Categorical variable consisting of three sectors: primary, secondary, and tertiary. Primary sector refers to firms that have their main activity in the extraction and production of raw materials i.e. agriculture, fishing, forestry. Secondary sector includes firms that are primarily engaged in the transformation, processing and manufacturing of raw materials i.e. food processing, construction. Tertiary sector contains firms that have their main activity in providing services i.e. retail, import/exporting products, transport, hospitality *Note*: firms are classified based on their primary business activity as reported in the survey, as some firms in the sample operate in multiple industries. In the OLS regressions, the primary sector is used as the baseline reference sector to see the effect of being in the secondary or tertiary sector compared to the primary sector
Firm size	Categorical variable representing four firm sizes: micro, small, medium, and large. Firm size was calculated in the UNDP report using a unique classification due to the absence of an official firm size classification in Guinea-Bissau (Pereira and Schäber

Table A2 (continued)	2021). The variable has been calculated using the monthly revenue and the number of paid workers
Region	Categorical variable representing eight regions in Guinea-Bissau where the firm is located: Bafata, Biombo, Bissau (the capital city), Cacheu, Gabu, Oio, Quinara, and Tombali. The sample includes firms from regions across the north, south, east, and west of the country, providing broad geographic coverage Note: the study does not include firms from the Bissagos Islands in Guinea-Bissau
Owner education	Categorical variable representing the education levels of firm owners. This paper categorises the owners into six education levels: no schooling, primary (3rd–8th grade), secondary (9th–12th grade), specialised professional training, undergraduate degree, and master's degree Note: the survey does not provide information regarding the education levels of female managers
Owner ethnicity	Categorical variable representing eight different ethnicities of firm owners: Fula, Mandinga, Manjaco, Mancanha, Papel, Balanta, others, and mixed *Note:* "others" and "mixed" ethnicities are unspecified in the dataset, and are therefore unknown. There is no information from the survey regarding the ethnicities of female managers
Owner age	Continuous variable stating the age of owners in years as of 2019 *Note:* there is no information from the survey regarding age of female managers
Firm age	Continuous variable indicating the number of years the firm has been in operation as of 2019
Cashew industry	Dummy variable set to 1 if the firm is involved in the cashew industry (e.g., growing, selling, or exporting cashews) and 0 if not *Note:* This variable indicates any involvement in the cashew industry, not necessarily as the firm's primary activity. For example, a female-managed firm primarily in the beauty industry that also sells cashews as a side business is coded as 1
Received loan	Dummy variable set to 1 if firm received a loan between 2017 and 2019, and 0 if not. *Note:* this variable refers to firms that successfully obtained a loan, not those that applied but were unsuccessful
Financial measures of performance	
Profit	Continuous variable representing monthly profits of firms in 2019 *Note:* this variable had been cleaned and converted into units of CFAF millions for the UNDP report. For this study, the variable has been re-converted back into its original CFAF units and transformed into a logarithm to normalise distribution. Additionally, +1 has been applied to the log values to handle zero profit values, ensuring all values are positive and suitable for the analysis
Productivity	Continuous variable representing the ratio of monthly revenue to monthly costs in 2019 (revenue/costs). This ratio indicates the amount of revenue generated by a firm per unit of cost *Note:* this variable was originally created by the authors of the UNDP report
Revenue	Continuous variable representing monthly revenue of firms in 2019 *Note:* it is also referred to as sales in the UNDP report. In the original survey, it was specified as the total sales of products and services of the firm. This variable has also been transformed into a log version, as detailed with previous variables
Costs	Continuous variable of monthly costs of firms (also referred to as expenses in the survey) in 2019. *Note:* it is also referred to as expenses in the UNDP report. In the original survey, it was specified as the total expenses of the firm including taxes, licenses, rents, salaries and all purchases. This variable has been transformed into a log version, as detailed with previous variables
Costs without taxes	Continuous variable representing the monthly costs (or expenses) of firms in 2019, excluding tax payments. *Note:* this variable has been log-transformed, as described for other variables. It was created to account for the fact that nearly 80% of total taxes in the sample were paid by large firms (Pereira and Schäber 2021). The purpose of this variable is to observe the raw value of costs, without the impact of taxes
Taxes	Continuous variable representing the monthly tax payments of firms in 2019 *Note:* this variable has been log-transformed, as described for other variables

Table A3

Table A3 Firm size classification

Table 18: Threshold for the classification of micro, small, medium and large enterprises

Thresholds	Factor x GNIpc	Annual revenue (XOF)	Monthly revenue (XOF)	Rounded Revenue Threshold	Worker's threshold
Medium firms	1,000	1,212,071,314	101,005,943	100,000,000	<100
Small firms	100[71]	121,207,131	10,100,594	10,000,000	<50
Micro firms	10	12,120,713	1,010,059	1,000,000	<10

Note: the samples use the World Bank data for Guinea-Bissau PPP GNIpc in 2019,[72] at 2,069USD, and the average exchange rate between the two currencies in this same year, at 585.83 XOF per USD.

Source: Pereira and Schäber (2021)

Appendix B

Figure B1

Figure B1 Market share by economic sector and manager gender

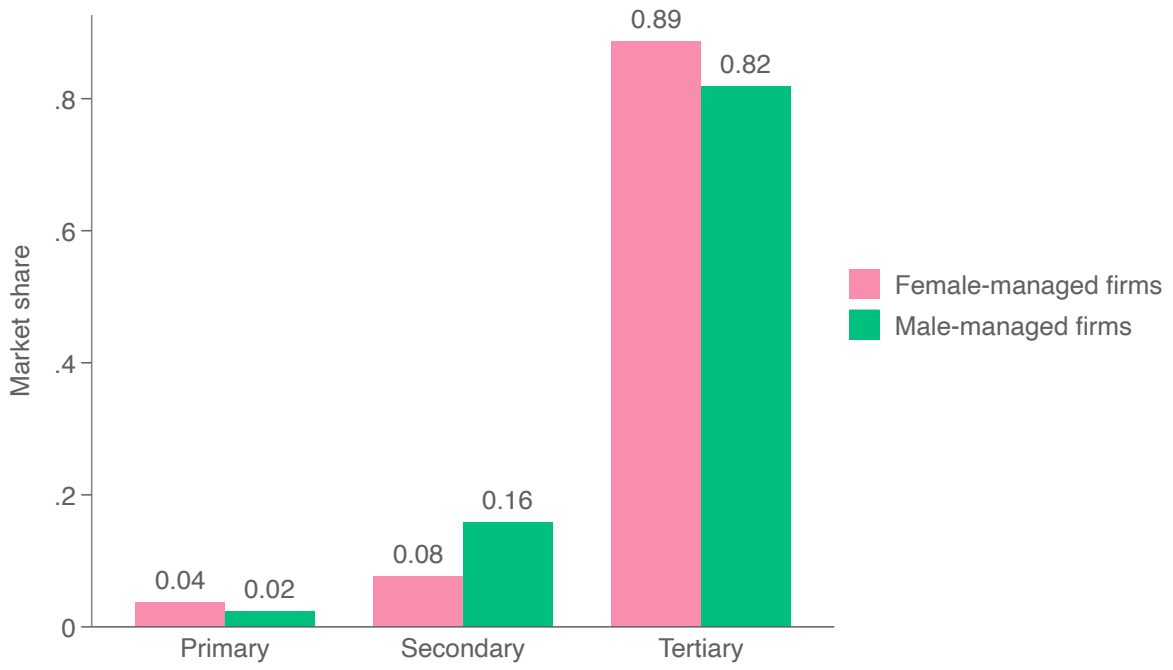


Figure B2

Figure B2 Monthly sales (2019) in CFAF million for female-managed and male-managed firms by sector

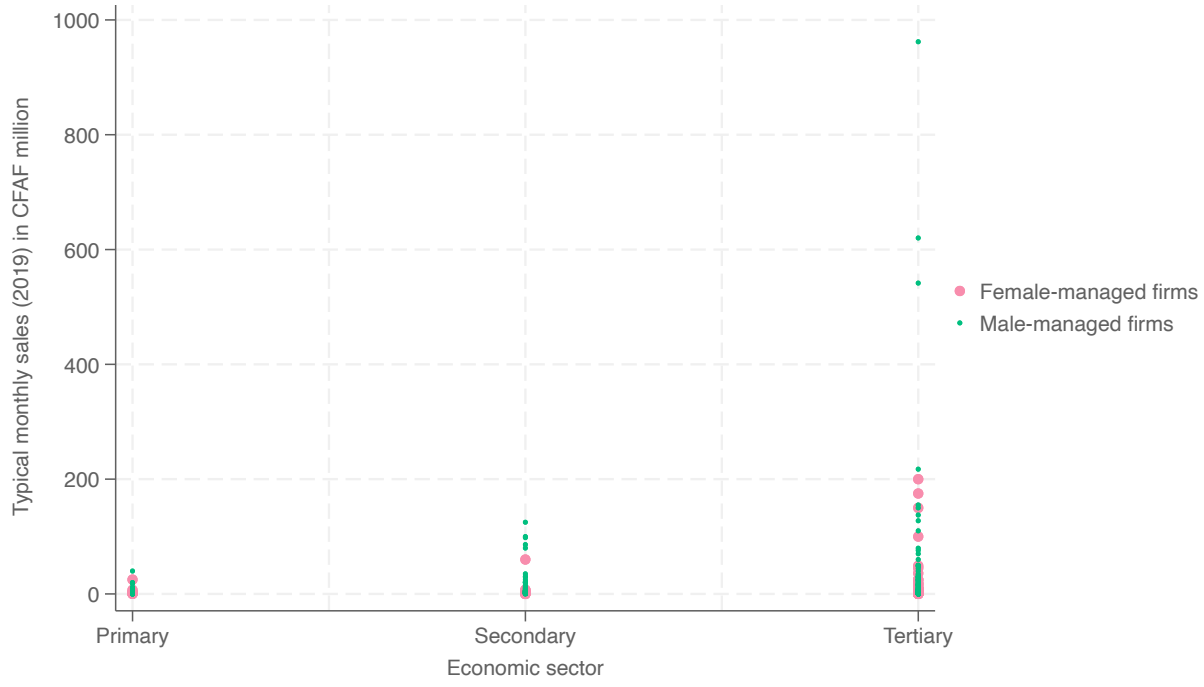


Figure B3

Figure B3 Industries of female-managed firms

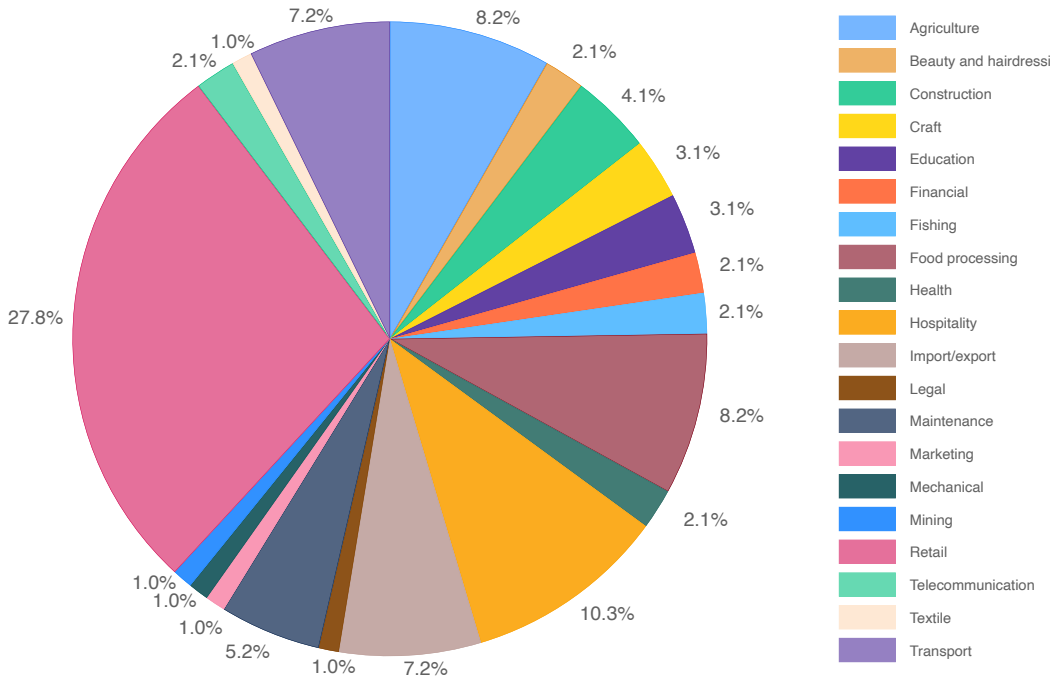
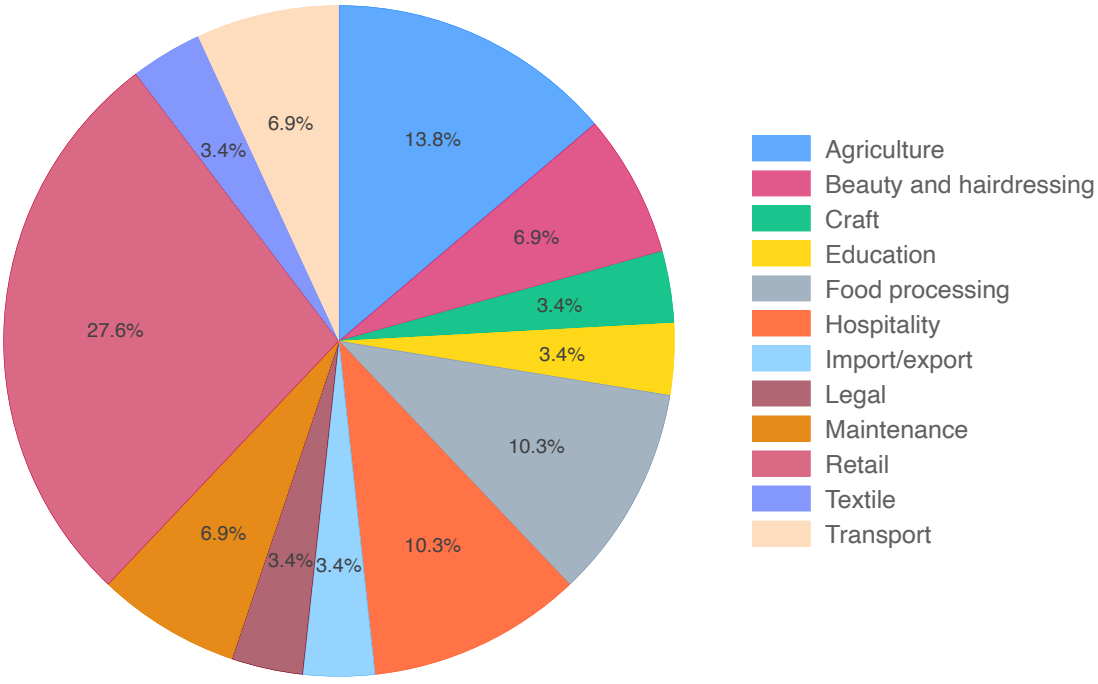


Figure B4

Figure B4 Industries of female-owned firms



Appendix C

Table C1

Table C1 Covariate balance check before and after propensity score matching for profits

Variable	Matched versus unmatched	Treated (Female-managed firms)	Control (Male-managed firms)	Percent bias	Percent bias reduction	*t* stat	*p* value
Small size	Unmatched	0.54667	0.52609	4.1		0.31	0.757
	Matched	0.54667	0.54667	0.0	100.0	-0.00	1.000
Medium size	Unmatched	0.18667	0.23478	-11.8		-0.87	0.386
	Matched	0.18667	0.10667	19.6	-66.3	1.38	0.168
Large size	Unmatched	0.02667	0.04348	-9.1		-0.65	0.517
	Matched	0.02667	0.06667	-21.7	-137.9	-1.16	0.248
Secondary sector	Unmatched	0.16	0.19565	-9.3		-0.69	0.493
	Matched	0.16	0.26667	-27.8	-199.2	-1.60	0.112
Tertiary sector	Unmatched	0.72	0.71304	1.5		0.12	0.908
	Matched	0.72	0.65333	14.7	-858.3	0.88	0.382
Biombo	Unmatched	0.10667	0.11739	-3.4		-0.25	0.801
	Matched	0.10667	0.13333	-8.4	-148.6	-0.50	0.618
Bissau	Unmatched	0.76	0.73043	6.8		0.50	0.615
	Matched	0.76	0.70667	12.2	-80.4	0.73	0.464
Cacheu	Unmatched	0.01333	0.06087	-25.3		-1.66	0.099
	Matched	0.01333	0.02667	-7.1	72.0	-0.58	0.563
Gabu	Unmatched	0.02667	0.01739	6.3		0.50	0.617
	Matched	0.02667	0.05333	-18.1	-187.5	-0.83	0.408
Oio	Unmatched	0.01333	0.02174	-6.4		-0.45	0.650
	Matched	0.01333	0	10.1	-58.6	1.00	0.319
Quinara	Unmatched	0.01333	0.01739	-3.3		-0.24	0.811
	Matched	0.01333	0.01333	0.0	100.0	-0.00	1.000
Tombali	Unmatched	0	0				
	Matched	0	0				
Mandiga	Unmatched	0.05333	0.07826	-10.0		-0.72	0.470
	Matched	0.05333	0.01333	16.1	-60.5	1.36	0.175
Manjaco	Unmatched	0.08	0.13913	-18.9		-1.35	0.179
	Matched	0.08	0.02667	17.1	9.8	1.45	0.148
Mancanha	Unmatched	0.08	0.07391	2.3		0.17	0.863
	Matched	0.08	0.02667	19.9	-776.2	1.45	0.148
Papel	Unmatched	0.08	0.12174	-13.8		-1.00	0.320
	Matched	0.08	0.06667	4.4	68.1	0.31	0.756
Balanta	Unmatched	0.14667	0.08696	18.6		1.49	0.138
	Matched	0.14667	0.14667	0.0	100.0	0.00	1.000
Other	Unmatched	0.14667	0.21304	-17.3		-1.25	0.210
	Matched	0.14667	0.22667	-20.8	-20.5	-1.26	0.211
Mixed	Unmatched	0.22667	0.1087	31.8		2.59	0.010
	Matched	0.22667	0.21333	3.6	88.7	0.20	0.845
Owner age	Unmatched	42.68	43.652	-9.0		-0.66	0.509
	Matched	42.68	43.307	-5.8	35.5	-0.30	0.764
Firm age	Unmatched	7.2267	7.4957	-3.8		-0.27	0.785
	Matched	7.2267	9	-25.0	-559.3	-1.29	0.200
Cashew industry	Unmatched	0.14667	0.18696	-10.8		-0.79	0.429
	Matched	0.14667	0.06667	21.4	-98.6	1.59	0.114

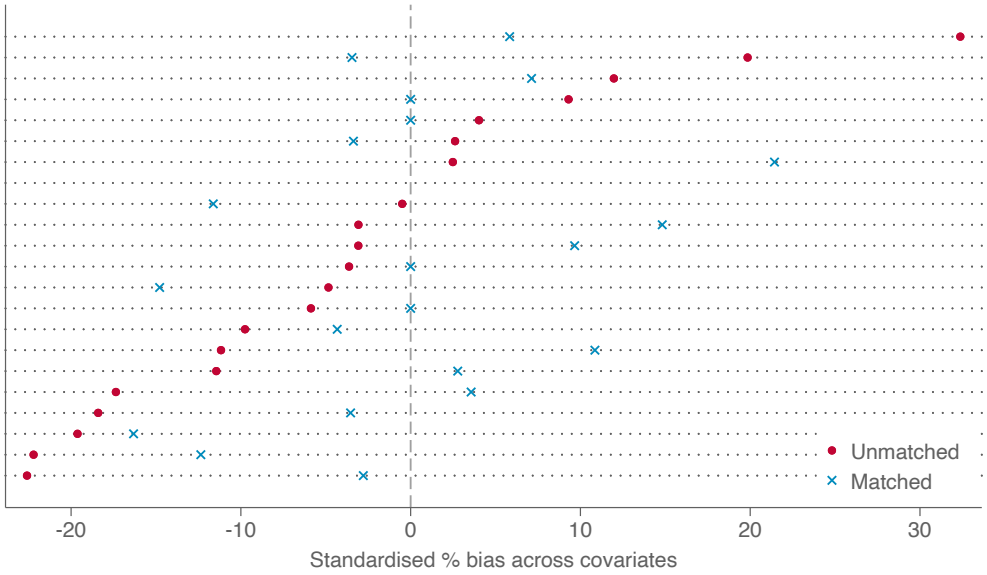
Table C2

Table C2 Covariate balance check before and after propensity score matching for productivity

Variable	Matched versus unmatched	Treated (Female-managed firms)	Control (Male-managed firms)	Percent bias	Percent bias reduction	*t* stat	*p* value
Small size	Unmatched	0.5443	0.52766	3.3		0.26	0.798
	Matched	0.5443	0.49367	10.1	-204.2	0.63	0.527
Medium size	Unmatched	0.17722	0.22979	-13.0		-0.98	0.328
	Matched	0.17722	0.1519	6.3	51.8	0.43	0.670
Large size	Unmatched	0.02532	0.04255	-9.5		-0.69	0.491
	Matched	0.02532	0.02532	0.0	100.0	0.00	1.000
Secondary sector	Unmatched	0.16456	0.20426	-10.2		-0.77	0.442
	Matched	0.16456	0.21519	-13.0	-27.5	-0.81	0.420
Tertiary sector	Unmatched	0.72152	0.70638	3.3		0.26	0.798
	Matched	0.72152	0.68354	8.4	-150.9	0.52	0.604
Biombo	Unmatched	0.10127	0.11489	-4.4		-0.33	0.740
	Matched	0.10127	0.07595	8.1	-85.8	0.56	0.578
Bissau	Unmatched	0.75949	0.73617	5.4		0.41	0.683
	Matched	0.75949	0.75949	0.0	100.0	0.00	1.000
Cacheu	Unmatched	0.02532	0.05957	-17.0		-1.20	0.232
	Matched	0.02532	0.05063	-12.6	26.1	-0.83	0.408
Gabu	Unmatched	0.02532	0.01702	5.7		0.46	0.643
	Matched	0.02532	0.05063	-17.5	-205.2	-0.83	0.408
Oio	Unmatched	0.01266	0.02128	-6.7		-0.48	0.630
	Matched	0.01266	0	9.8	-46.9	1.00	0.319
Quinara	Unmatched	0.01266	0.01702	-3.6		-0.27	0.790
	Matched	0.01266	0	10.4	-190.1	1.00	0.319
Tombali	Unmatched	0	0				
	Matched	0	0				
Mandiga	Unmatched	0.06329	0.0766	-5.2		-0.39	0.696
	Matched	0.06329	0.06329	0.0	100.0	0.00	1.000
Manjaco	Unmatched	0.08861	0.13191	-13.8		-1.02	0.309
	Matched	0.08861	0.10127	-4.0	70.8	-0.27	0.788
Mancanha	Unmatched	0.07595	0.07234	1.4		0.11	0.916
	Matched	0.07595	0.10127	-9.6	-601.5	-0.56	0.578
Papel	Unmatched	0.07595	0.1234	-15.8		-1.16	0.248
	Matched	0.07595	0.03797	12.7	20.0	1.03	0.306
Balanta	Unmatched	0.13924	0.08936	15.7		1.27	0.206
	Matched	0.13924	0.12658	4.0	74.6	0.23	0.816
Other	Unmatched	0.13924	0.21702	-20.4		-1.50	0.134
	Matched	0.13924	0.13924	0.0	100.0	0.00	1.000
Mixed	Unmatched	0.24051	0.10638	35.8		3.00	0.003
	Matched	0.24051	0.18987	13.5	62.2	0.77	0.442
Owner age	Unmatched	42.861	43.557	-6.3		-0.48	0.632
	Matched	42.861	41.215	14.8	-136.2	0.90	0.367
Firm age	Unmatched	7.2911	7.4255	-1.9		-0.14	0.889
	Matched	7.2911	8	-10.0	-427.5	-0.59	0.554
Cashew industry	Unmatched	0.13924	0.17872	-10.8		-0.81	0.419
	Matched	0.13924	0.1519	-3.5	67.9	-0.22	0.823

Figure C1

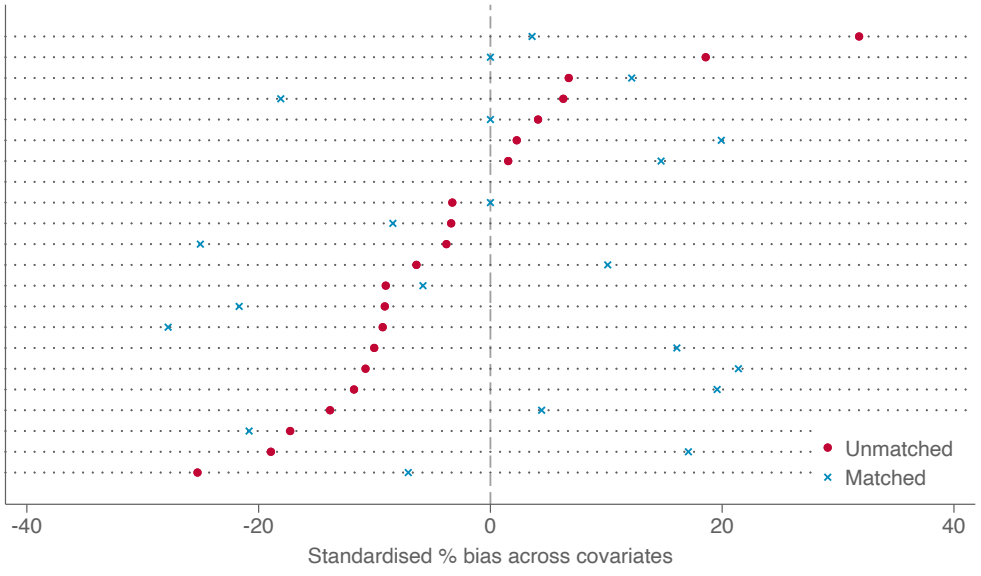
Figure C1 Pstest graph of samples (treated and control), both matched and unmatched for loan



Note: The y-axis represents the covariates of the various control variables as shown in the covariate balance check. Each horizontal dotted line corresponds to a covariate, showing its percent bias before matching (red circle) and after matching (blue crosse). The x-axis represents the standardised percent bias

Figure C2

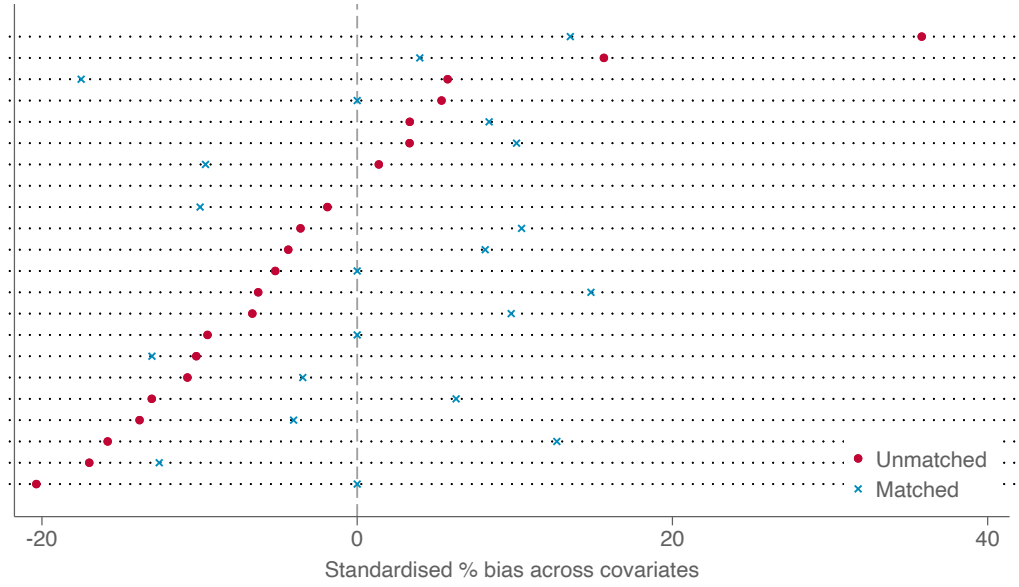
Figure C2 Pstest graph of samples (treated and control), both matched and unmatched for profits



Note: The y-axis represents the covariates of the various control variables as shown in the covariate balance check. Each horizontal dotted line corresponds to a covariate, showing its percent bias before matching (red circle) and after matching (blue crosse). The x-axis represents the standardised percent bias

Figure C3

Figure C3 Pstest graph of samples (treated and control), both matched and unmatched for productivity



Note: The y-axis represents the covariates of the various control variables as shown in the covariate balance check. Each horizontal dotted line corresponds to a covariate, showing its percent bias before matching (red circle) and after matching (blue crosse). The x-axis represents the standardised percent bias