RESEARCH ARTICLE

'In the company of cheerful ladies': whether female entrepreneurs are more productive?

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Abstract After over two decades, the debate on the female underperformance hypothesis remains not concluded. This study sheds some new light on the hypothesis by (i) showing that surrounding institutional forces play an important role in determining how female businesses perform and (ii) arguing that to understand gender differences (or lack of those) in performance, we need to look at productivity alongside profitability, revenues, and growth. Specifically, we posit that, in certain developing countries, female entrepreneurs devise specific strategies to cope with challenging institutional contexts. In such contexts, female entrepreneurs have less opportunity to realize economic rents compared to males, but they respond to these constraints by becoming more efficient in resource use through relying on female employment. Investigating a large set of longitudinal data from Vietnam, we find that female businesses are more productive than male businesses, and that this effect is stronger when female owner-managers employ more female employees, or even female employees only. However, we also find that these positive effects are weakened with increased corruption. This provides important implications for female entrepreneurs and policymakers in developing countries.

Plain English Summary For developed economies, there is an ongoing debate on how female-run firms perform relative to those run by males. However, less is known about these differences in developing economies, where the institutional environment is less stable. Moreover, the answer may depend on the measure of performance. This study aims to shed light to this question by examining a large number of SMEs in Vietnam over a period of 12 years. Interestingly, we found that female entrepreneurs devise specific strategies to cope with challenging institutional contexts. Specifically, they respond to institutional constraints by becoming more efficient in resource use through relying on female employment. Thus, the principal implication of this study is that policymakers should, on the one hand, encourage more women to participate in the workplace, while on the other hand, urge emerging market firms, especially female-run firms, to take on more female employees, not only for the sake of gender equality but also to benefit their organizational productivity.

The title of the article is borrowed from the novel by Alexander McCall Smith in the "No.1 Ladies' Detective Agency" series.

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1 Introduction

Female entrepreneurship has gained increasing attention in the last few years.[1] Unlike the first wave of research that emerged two decades ago, which focused mostly on testing female entrepreneurs' underperformance hypothesis (Du Rietz & Henrekson, 2000; Orser et al., 2010; Watson, 2002), now scholars follow two strands of research: (i) on the impacts of institutional environments on female businesses (Gimenez-Jimenez et al., 2020; Hechavarría & Brieger, 2020; Santos & Neumeyer, 2021) and (ii) on the employment gender composition strategies in female-run firms (Bednar et al., 2021; Manello et al., 2020; Périlleux & Szafarz, 2021). Even though expanding our understanding of female entrepreneurship significantly, the two strands of literature alone do not resolve the long-lasting debate about female underperformance. Interestingly, we realize that by merging the two strands of literature to examine how women (entrepreneurs and employees) work together to overcome institutional obstacles in a weak institutional environment, we can shed some new light onto the female underperformance debate.

Research on the female underperformance hypothesis is challenging because of the influence of institutional contexts that is not only complex but also evolving (Estrin & Mickiewicz, 2011). This is the reason why some findings support the female underperformance hypothesis (Kiefer et al., 2020; Lee & Marvel, 2014; Orser et al., 2010), while some others do not (Biga-Diambeidou et al., 2021; Johnson et al., 2018; Kalnins & Williams, 2014). Both formal institutions and informal social norms in a particular country imply specific constraints/enablers on women's entrepreneurial activities (Ashraf et al., 2019; Uzuegbunam & Uzuegbunam, 2018). We therefore propose that carefully addressing the impacts of institutional forces

is the element that helps us move one step toward understanding female business performance.

We argue furthermore that to assess performance, we need more precision because performance is a multidimensional concept. In the past, studies used either output or input measures, 'without relating those outputs to the amount invested/inputs' (Robb & Watson, 2012: 545). In contrast, we propose to focus on the efficient use of inputs to produce output, as measured by productivity. The productivity of female entrepreneurship has been initially examined in Watson (2002) and Bardasi et al. (2011). However, these important studies have not yet been able to successfully establish a theoretical mechanism that links the institutional-context-specific entrepreneurial process to both firm-level productivity and financial performance.

We fill these gaps by raising two research questions: (i) how is the productivity performance of female businesses relative to males affected by the presence of institutional voids, defined as the inefficiency or underdevelopment of institutions that fail to facilitate smooth market-based transactions (Stephan et al., 2015); and (ii) can female entrepreneurs strategically utilize their employment gender composition (prioritizing female employment) to improve their productivity performance under such conditions?

To answer these questions, we utilize a large and representative dataset of more than 700,000 observations of Vietnamese private firms (predominantly young, small and very small businesses) across 12 years (2006–2017). We combine this individual dataset with regional data on institutional quality. We find some evidence showing that by sticking together, female entrepreneurs and female employees can successfully transform a situation of 'constrained performance' (Marlow & McAdam, 2013) into one of 'overperformance' in terms of superior productivity. Our aim is to develop an argument for why female-run firms, and in particular those with female employees, will be superior in terms of productivity but not profitability.

This study makes three contributions to the entrepreneurship literature. First, it is one of the first studies to argue that adopting the productivity perspective is important for a systematic investigation of gender differentials in performance. Second, it proposes a framework for investigating the effects of female entrepreneurship and female employment on firm

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[1] For example, Small Business Economics published 12 papers examining female entrepreneurship in the 2020–2021 period.

productivity with an appreciation of the surrounding institutional forces. Third, our study extends the theory that builds on the notion of diversity (Dai et al., 2019) and makes a novel suggestion of employment strategies that can be adopted by female entrepreneurs to boost productivity. Overall, this extends previous work in the female entrepreneurship field and has implications for both entrepreneurs and policymakers.

The paper follows with the literature and hypothesis development section, in which we will describe the institutional context of Vietnam and explain why we expect the female-run firms, which employ female employees, might achieve better productivity. Then, Sect. 3 describes the data we use, and the methods employed to test the proposed hypotheses. Section 4 presents the empirical findings and a set of robustness tests. Section 5 discusses the findings in relation to the extant literature. Finally, Sect. 6 concludes the paper.

2 Literature and hypothesis

2.1 Institutional voids in Vietnam and gender

Vietnam is a developing country characterized by institutional voids, both formal and informal. Formal ones relate especially to weak rule of law. More specifically, Ashraf et al. (2019) document that in countries where the rule of law is weaker, women are placed in a disadvantageous position against men. Next, informal voids (i.e., concerning values, norms and customs) relate, as in much of South East Asia, to high power distance, which in turn is associated with traditional social hierarchies and gender-based discrimination (Hofstede et al., 2010). Last but not least, Webb et al. (2020) argue that institutional voids exert a non-trivial impact on productivity of entrepreneurial firms.

The impact on women of a weak rule of law works through several related mechanisms. First, weaknesses in the adjudication system imply that law is not universally implemented, creating space for different sorts of biases to influence the execution and implementation of the laws, including traditional gender biases. When facing such an environment, women may choose to be more careful in investing in business since they may face a higher risk of expropriation compared to men. Second, a

weak rule of law implies weaker protection from violence, and gender-based violence in particular. As argued by Ashraf et al. (2019). 'when rule of law is absent, the threat of violence looms over even seemingly innocuous market transactions' (Ibid.: 30). Importantly, this also relates to domestic violence, which can cause disruption to women-operated businesses. The effect can be tangible. For example, Raghavendra et al. (2017) estimate that for Vietnam, the direct and indirect effects of violence against women, when aggregated, result in almost 1% GDP loss. The underlying reason for these phenomena is a universal pattern observed across all human societies, which is that men exhibit a greater propensity for violence (Wilson & Herrnstein, 1998). Institutional voids in the rule of law provide space for such violence to continue.

We also noticed that a weak rule of law creates space for social biases to operate. More generally, we argue that institutional voids (Webb et al., 2020) imply deficiencies in impartiality and universality of formal rules, and therefore leave space for stronger influence of informal institutions and culture. Specifically, social organizations and norms may support structures consistent with the traditional norms of hierarchy with a strong gender component. These norms of hierarchy are often summarised under the cultural dimension of power distance, that is, the social acceptance of the unequal distribution of power (Hofstede et al., 2010). In turn, high power distance also implies more power inequality in business relations, with a stronger position assigned to men (Jogulu & Wood, 2008). Likewise, Shinnar et al. (2012) document that high power distance comes with stress on patriarchy and less support for gender equality. Empirically, Hechavarría and Brieger (2020), investigating GEM and GLOBE data, show that females are less likely to engage in entrepreneurial activities when societal-level power distance cultural practices are high.

Moreover, cultural norms related to (gender-based) hierarchy deny women an equal position in the labour market compared to men. When women become economically active, new economic obligations are added to their traditional family obligations. In such an environment, women are expected to engage more strongly economically while still fulfilling family obligations that are skewed towards women. This phenomenon persists in developed market economies

(Welter, 2020), but is even stronger in the context of developing economies, including Vietnam (Nguyen, 2021).

To sum up, in line with Webb et al. (2020), (i) formal institutional voids act directly as external inhibitors of women's entrepreneurial activity[2] and (ii) open space for informal institutional voids related to power distance to play a non-trivial role in business practices. These negative effects of institutional voids may reduce female-run firms' performance in Vietnam substantially.

However, we do not see women as passive recipients of institutional influences. We will next consider how female entrepreneurs respond to this challenging institutional context, emphasizing their strategies related to gender mix of employees, and the implications for performance.

2.2 Productivity of female-run firms

In this section, we argue why we expect female-run businesses to be more productive compared to their male-run counterparts, especially under institutional voids, in the context of Vietnam. In other words, we expect that female entrepreneurs, compared to their male counterparts, to use resources, labour, capital, materials, and information to produce goods and services in a more efficient manner. Borrowing the terminology from Marlow and McAdam (2013), we argue that 'constrained performance' in female-run firms can become 'overperformance' with respect to the efficient use of resources, especially under institutional voids.

First, we draw upon the literature that examines the impacts of management styles on productivity, which extends naturally to entrepreneurs (interpreted in our study as owner-managers of businesses). The literature suggests that female managers are more likely to employ decentralized management (Rutherford, 2001) and that females pay more attention to the surrounding environment with the aim of producing harmony and forming congruent relationships with stakeholders (Aldrich et al., 1996; Lee & Marvel, 2014). Female entrepreneurs, thanks to their gender self-schema, are keen on creating a family-like

working environment (Lortie et al., 2017). Meanwhile, it has been documented that employees with a strong sense of belonging boost firm productivity by enhancing their contributions to the affiliated organizations. Barbera and Moores (2013) show that output contributions of employees in organizations facilitating family-like culture are significantly higher than those in organizations without such a culture. The reason is that this culture nurtures a quasi-kinship feeling in employees; it strengthens the informal connection between employees and their firms, leading to higher contributions and improved productivity. Manello et al. (2020) use a sample of more than 84,000 Italian firms to show that women in top positions (CEO, presidents, or members of board of directors) are more likely to participate in networks with their employees. And when they do so, firm performance increases significantly, hinting at superior returns for female networking. In contrast, male entrepreneurs are more likely to pursue autocratic management styles that focus on centralizing power, while being less tolerant of experiments and mistakes (Orser et al., 2010), irrespective that business errors can lead to the discovery of new know-how, and in turn, innovation and productivity. Furthermore, as males tend to be less risk-averse (Borghans et al., 2009), they are more likely to adopt aggressive high-growth strategies. In contrast, female-run firms are likely to adopt harmony-based and less-risky strategies (Cliff, 1998), and therefore to perform better in terms of inputs management and long-term development (e.g., survival) (Justo et al., 2015; Boden and Nucci, 2000; Kalnins & Williams, 2014). As a consequence, the average efficiency of resource use of female businesses will be higher compared to firms led by male entrepreneurs, even if male managed firms may be more represented among high growth firms.

Second, as mentioned previously, under institutional voids in the context of Vietnam, female-run businesses typically face more external difficulties, forcing female entrepreneurs to pay more attention to controlling efficiency. Gender inequality in accessing resources, resulting from the cultural traits of gender biases or from structural features, put female-run firms in a resource-constrained situation; for example, men may form old-boy social ties as a result of their privileges and opportunities for accessing wider society, and can utilize these ties in business. In contrast,

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[2] The terminology of 'inhibitors' versus 'enablers' draws upon Davidsson (2016).

female-run businesses need to actively adapt to the adverse environment (Wei & Zhang, 2011) by using their resources wisely and constantly improving their efficiency and productivity in order to compete with their male counterparts (Gupta et al., 2009; Zhao et al., 2005). The situation of 'what does not kill you makes you stronger'[3] indicates that 'constrained performance' may actually lead to the 'overperformance'.

In contrast, consistent both with more universal gender differences in risk taking (Borghans et al., 2009) and with more specific social expectations based on power distance cultural traits, men may attempt to adopt a fast expansion strategy in business, and male entrepreneurs may therefore perform better on growth. However, these businesses may underperform with respect to the efficient use of resources. Likewise, their profits may reflect rents (Driffield et al., 2013); the latter, in our context, may result from social (cultural) biases and formal institutional features that create an advantageous position of men-led businesses. In contrast, to achieve a sufficient level of profits, female entrepreneurs may need to compensate for their disadvantageous position with relatively higher productivity based on the gender-specific managerial advantages we discussed above. Therefore, we propose that.

> **Hypothesis 1**: *In Vietnam, firms run by female entrepreneurs are more productive than firms run by male entrepreneurs.*

2.3 Female entrepreneurs and female employees

We now move from the level of owner-managers to the level of employees. Here, the literature documents some effects that are opposite to those just discussed for managers and entrepreneurs. There are results on lower productivity of female as compared to male employees. Important for our argument, however, task allocation is cited as the key determinant. De Pater et al. (2010) find that task allocation decisions are not gender-blind and may result in women having fewer opportunities for challenging, productive job experiences. This is attributed to social stereotyping, whereby males are preferred for higher management and generally more productive positions. Again, this phenomenon should be more pronounced in a society with cultural traits related to high power distance, such as Vietnam.

At the same time, we expect that female entrepreneurs will exhibit less bias towards their female employees, allowing for the full potential of the human capital of the latter to be utilized. While women's decisions may also be influenced by social stereotypes with respect to their social and business roles, Dai et al. (2019) show that this, in fact, applies less to women in managerial positions. Jogulu and Wood (2008) document, for the South Asian economy of Malaysia, that there is a significant difference in male and female perceptions of women in the business context, with women's perceptions of women being significantly more positive. This implies that the productivity of female employees may be higher in businesses managed by female entrepreneurs, and this is likely to be a result of the more efficient allocation of tasks, characterized by lower gender biases. Further, female employees make easier contact with more experienced/superior women, gaining a sense of identity and overcoming the hazards of isolation and tokenism by talking to their bosses about their ideas and experiences (Durbin, 2011; Périlleux & Szafarz, 2021). On the side of female managers, the ties with their female employees help them extract support, sympathy, and loyalty (Durbin, 2011; Kwiek & Roszka, 2020).

Naturally, the gains we just discussed will be stronger in firms where female owners-managers employ more female workers, because there will be more opportunities to gain from better work allocation, overcoming gender biases. Consistent with this, a strand of literature highlights the benefits of having female managers and female employees working together. For example, Bednar et al. (2021) investigate a sample of 996 firms from the phrase II Small Business Innovation Research (SBIR) funded projects; they find that projects led by female principal investigators (PI) have a greater probability of being commercialized in female-owned firms than in male-owned firms. They rationalize this finding by citing that females tend to perform better when working under a female supervisor. Again, the more female employees, the more like these positive productivity effects will materialize. We expect this pattern will apply to the entrepreneurship context of Vietnam.

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[3] The term is borrowed from Bernile et al. (2017).

In particular, female-run firms may perform better when they employ more female employees. However, unlike previous studies, but in line with our discussion in the previous section, we posit that, in the context of Vietnam, the female-entrepreneur-female-employee effect is more significant for productivity than for financial performance, as the latter may also be affected by rents, more likely to be acquired by men. Therefore, we propose:

> **Hypothesis 2a**: *In Vietnam, firms that are led by female entrepreneurs and have a high proportion of female employees will perform better in terms of productivity.*

The next hypothesis goes further: in addition to claiming that more female employees under female owner-manager would imply more productivity, we also posit that in the Vietnamese context, firms that combine female owners-managers with female employees only will have an even stronger productivity advantage. Durbin (2011) and Périlleux and Szafarz (2021) employ the concept of homophily to explain the advantages of companies that consist of female entrepreneurs with female employees only. Homophily connotes individuals who share similar identities or who are similar in socially significant ways (Kanter, 2010). However, homophilous ties require time and effort to maintain.

It is found that women engage in both formal and informal homophilous networking to a greater extent than their male colleagues (Aldrich et al., 1996; Durbin, 2011; Kwiek & Roszka, 2020), which implies that they may derive more benefits from the homophilous environment. Périlleux and Szafarz (2021) use a sample of more than 100,000 small businesses in Belgium to show that female boards achieve better performance when they work with female CEOs and female subordinates. To explain this finding, they cite the effect of gender affinity—which suggests that same-gender superior-subordinate relationships are more effective (Gagliarducci & Paserman, 2015). What they describe is again a homogeneity effect, which appears stronger for women.

More generally, a strand of literature suggests that employees who are perceived by managers as being similar to themselves are seen as more trustworthy and capable (Bauer & Green, 1996). Unsurprisingly, gender affects the managers' perceptions of similarity

(Tsui & O'Reilly, 1989). These perceptions are particularly strong in homogenous female-manager-female-employee relationships (Durbin, 2011), helping facilitate the flow of information and knowledge generation, fostering a family-like organizational culture, and encouraging delegation and decentralization, which leads to a stronger sense of belonging among employees and faster responses to environmental changes (De Pater et al., 2010; Joshi et al., 2015). As a consequence, we expect the productivity of firms in female-only companies to be higher than the productivity of firms in the other categories. In other words, such homophily effects should be the strongest in firms that have both only female employees and female owner-managers.

It is noteworthy that, consistent with our arguments, male-only firms also enjoy the homophily effects. However, as just argued, these effects appear weaker than for female-only firms, due to the strong element of male competition. Also, as per arguments leading to Hypothesis 1, the effects of homophily in male-only firms are more likely to lead to strengthened growth rather than higher productivity, in comparison with female-only firms. Therefore, we propose:

> **Hypothesis 2b**: *In Vietnam, firms that are led by female entrepreneurs and have only female employees will perform best in terms of productivity, compared to other gender-based categories.*

2.4 Female businesses and corruption

A weak rule of law is a key aspect of institutional voids (Estrin et al., 2016) since it implies that different individuals, and different social groups will be affected by institutions in different ways (Kasper et al., 2012), including both gender effects, and regional variation. One fundamental way in which low institutional quality, associated with weak rule of law, could be experienced differently across individuals is through corruption. Corruption breaks the essential condition of the rule of law, that is, the impartiality in the exercise of government powers and the equal treatment of all (Rothstein, 2013).

We argue that in the presence of corruption, the effectiveness of the gender-uniform, female-entrepreneur-female-employee strategy discussed above may

become weaker. Specifically, female entrepreneurs together with their female employees would not be able to achieve superior productivity when corruption is severe. The reason for this is that men's and women's attitudes towards government bureaucracy diverge (Diekman & Schneider, 2010); they may play the institutional games differently. Specifically, women are less interested in political issues and less active in addressing problems through influencing the government administration, including corruption, than men (Diekman & Schneider, 2010). This is particularly the case in Southeast Asian developing economies. For example, Gerrard et al. (2003), in a study of 75 Vietnamese female entrepreneurs, show that they have intense Confucian mindsets, leading to ignoring political issues. Similarly, Wang et al. (2019), using a multiregional sample of 206 Chinese entrepreneurs, demonstrate that Chinese women entrepreneurs have more negative perceptions of the institutional environment than their male counterparts due to their limited political ties. That implies it is more difficult for them to realize any business gains through corruption.

These findings lead to an argument that under the weak rule of law and severe corruption, both female entrepreneurs and female employees are inferior to their male counterparts in terms of making use of political networks to overcome institutional voids (Darnihamedani & Terjesen, 2020). While male entrepreneurs and employees may enjoy favourable treatment thanks to their political connections or their old-boy groups, female entrepreneurs and employees typically suffer more from institutional inefficiency (Gimenez-Jimenez et al., 2020; Hanousek et al., 2019). As a result, performance of female entrepreneurs and employees is more negatively affected by dealing with government inspections by corruptive officials, and by non-transparent payments for licences/business registrations (Nguyen, 2020). As they are less effective in dealing with corruption, overcoming these obstacles distract female entrepreneurs and employees' time and financial resources to a larger extent. As a result, they may have less time to spend on directly productive activities or their attention may be skewed toward coping with corrupt officials (Nguyen, 2021). Furthermore, Efobi et al. (2021) demonstrated that in Vietnam firms paying bribes are forced to shift the cost of those onto employees, paying over a quarter lower wages, and

this effect is strongest on the highest wages. Therefore, where female businesses are affected by corruption, lower wages will result in their inability to retain or attract the best human capital, affecting productivity negatively. The efficiency effect of female superior management of the female employees is likely to be weaker, when the human capital of the female employees will be weaker. Thus, all these adversities stem from a weak rule of law inevitably reduce the benefits that female entrepreneurs could otherwise obtain from fully developing gender-affinity, gender-homophily businesses.

On the opposite, under controlled corruption, all firms are treated relatively equally. At this case, the effectiveness of female homophily becomes more distinct. Female entrepreneurs can focus on their business operations with lower time and material costs inflicted by interactions with the government, and importantly the difference with male-operated businesses also becomes weaker. Therefore, they can extract more benefits from mingling and building close relationships with their female employees (Manello et al., 2020; Powell & Eddleston, 2013) to improve efficiency and productivity. In other words, freedom from corruption provides female-owner-female-employees firms with conditions to effectively transform 'constrained performance' into 'overperformance'. Hence, we posit:

> **Hypothesis 3a**: *While firms that are led by female entrepreneurs and have a high proportion of female employees will perform better in terms of productivity, these effects will be alleviated in regions where corruption is high.*
> **Hypothesis 3b**: *While firms that are led by female entrepreneurs and have only female employees will perform best in terms of productivity, compared to other gender-based categories, these effects will be alleviated in regions where corruption is high.*

3 Data and methodology

3.1 Context

The empirical context of this study is Vietnam. The country still exhibits the gender economic pecking order, skewed against females (Coxhead et al., 2019), who are nevertheless expected to be economically

active (Nguyen, 2021). Vietnam is fairly representative of emerging markets, more specifically in Southeast Asia. Thus, the country fits well into the theoretical settings of this study.

Emerging market economies are characterized by sound macroeconomic policies combined with institutional reforms that should result in a successful development path. Southeast Asian economies are prime examples of emerging markets, combining institutional development and infrastructure building with strong elements of human development policies, especially those related to education and healthcare (Rigg, 2003). The latter two are particularly relevant for entrepreneurship as they create favourable conditions for widening labour participation by increasing labour returns (van der Sluis et al., 2005). One specific yet important sub-category of emerging market economies is the transition economies that had an institutional history of adopting the Soviet economic model of state socialism but since the late twentieth century, have implemented some market reforms. This group includes countries in Central and Eastern Europe, Russia and part of Central Asia, and Southeast Asia (China, Vietnam, and a number of neighbouring countries) (Meyer & Grosse, 2019).

With respect to two institutional aspects we highlighted in our theory, first, on control of corruption, Vietnam ranks at a low 104 position, next to neighbouring Indonesia and Thailand.[4] Second, on the cultural maps, Vietnam is located close to other East Asian societies (China, India, Indonesia, Hong Kong, Malaysia, and Singapore) with respect to its very high score on the power distance measure (Hofstede et al., 2010).

From the gender point of view, the ideological programme implemented by the Marxist regime stresses the centrality of work in human life and promotes the wide participation of women in employment (Dalton et al., 2002). With respect to gender roles, the World Value Survey documented strong support for women's participation in the labour market: 97% of Vietnamese believed that both husband and wife should contribute to family income. Yet, at the same time, 48% of Vietnamese (a plurality) believed that men have a better right to jobs when employment opportunities are scarce. Running parallel to this, family is ranked

as 'very important' by 82% of Vietnamese, with 86% believing that a woman needs to have children to fulfil her role. All these results locate Vietnam culturally close to neighbouring South East Asia (Dalton et al., 2002). Combining these traits, women are expected to enter the labour market, yet to keep their family obligations at the same time. This is a combination that makes their business activities challenging.

3.2 Data

To test the Hypotheses 1–2b, we employ the Annual Enterprise Survey dataset provided by the Vietnam General Statistics Office (GSO). The survey was first conducted in 2000, and the dataset has been updated annually. By regulation, all businesses having more than 10 employees are required to participate in the survey. For businesses with fewer than 10 employees, a sample is randomly selected to participate in the survey. The dataset provides comprehensive information about firm financial characteristics, employment, investment, and performance. The scope of the survey comprises both manufacturing and service industries and includes all types of ownership. The panel data obtained from GSO covers 18 years, from 2000 to 2017. It is by far the most comprehensive and representative dataset of the business community in Vietnam (Tran, 2019).

Our population of interest in this study is private businesses. These are predominantly micro-firms and small and medium-sized enterprises (SMEs); the mean value of employment is 30 employees, and the largest firm in the sample employs 502 employees. The number of private micro-firms and SMEs accounts for 97.7% of the total private business population in the study period.

Tran (2019) offers a discussion of the economic transition process in Vietnam and explains that the liberalization phase of reforms was only achieved from the year 2000 onwards. This is why the population of private firms is very young, and the average firm age in our sample is 6.5 years. Given that these are new firms and are predominantly run by owner-managers, who are in most cases the founders, we can consider the private sector as equivalent to the entrepreneurial sector (Nguyen & Canh, 2020). The same assumption is often made with respect to China (Du & Mickiewicz, 2016), but it is even more appropriate for Vietnam, given that full liberalization reform was

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4 https://www.transparency.org/en/cpi/2020/index/nzl#

achieved in Vietnam less than 20 years ago, whereas China's started in 1978 and was implemented over the subsequent decade).

In this study, we exclude state-owned firms because their operation may not follow market principles (Zhou, 2017). Nor do we count foreign-owned firms since they enjoy special treatment from the central government, which may affect their productivity (Nguyen & Dijk, 2012).

Furthermore, for Hypotheses 3a–b, we employ a panel dataset of Vietnam Provincial Competitiveness Index (PCI). It is a joint product of Vietnam Chamber of Commerce (VCCI) and the US Agency for International Development (USAID). This dataset measures provincial governance quality. The quality is scored from 0 to 10, the higher the score, the better the governance quality. The PCI index is calculated based on annual surveys of more than 17,000 domestic firms and 1700 foreign firms across provinces in Vietnam. From 2006, the PCI index is available for all provinces and is updated annually. The PCI is a standardized score of 10 sub-indices; each measures a particular dimension of the governance quality of local governments, including business support services, legal institutions, policy bias (toward state-owned firms), proactivity of provincial leadership, and informal charges (corruption control).[5] In this study, we pay particular attention to understanding how corruption control influences the productivity performance of female-run firms; as such, we will make use of the informal charges sub-index of the PCI data.

We combine the firm-level dataset with the provincial-level informal charges index to create a multilevel panel of 12 years: from 2006 to 2017. While the informal charges dataset is strongly balanced, the firm-level dataset is unbalanced and requires cleaning before using. Specifically, firms with no identification code or no meaningful accounting information were dropped. Moreover, the outliers are controlled for by censoring the top and bottom 1% of observations in each continuous variable. The number of observations available for analysis after cleaning the data is 787,955 firm-year. However, since the purpose of the study is to examine productivity differences between male- and female-run firms, we excluded 10,740 observations that changed ownership during the study period. This leaves us with

777,215 firm-year observations of 232,420 firms. We will conduct an investigation of the sample with changing ownership later, in the robustness check section.

To ensure consistency and comparability across regressions, we employ this sample size in all specifications. For a robustness check, we also employ the firm-level sample in the longer period 2000–2017 to test hypotheses 1–2b, in that case without institutional controls. The results obtained are consistent across these different time windows.

3.3 Variables and summary statistics

3.3.1 Variables

The key dependent variable of interest is firm productivity. For the sake of robustness, we measure productivity in two ways: by total factor productivity (TFP), our preferred choice, and by labour productivity. Total factor productivity is estimated following the Levinsohn and Petrin (2003) method, using investment values as a proxy for intermediate inputs to control for unobservable productivity shocks. Specifically, we first estimate a production function using the logarithm of revenue as the dependent variable, and the logarithm of the number of employees and the logarithm of total capital as the inputs, plus the logarithm of investment values as the proxy for intermediate inputs to control for unobservable productivity shocks. Consistent with Levinsohn and Petrin (2003), the residuals from this first supplementary estimation of the production function are interpreted as TFP. It is used as the dependent variable in the core productivity models that we report below. In turn, labour productivity is the ratio of sales revenue over the number of employees.

We acknowledge that productivity varies significantly by industry, year (due to economic trends), and region (due to environmental differences). To yield meaningful comparisons, we need to account for that heterogeneity when investigating firm productivity. Specifically, we construct the TFP gap (results in Tables 1 and 2) and labour productivity gap variables (results in Online Appendix A1), which are the productivity gap calculated as the difference between a particular company's productivity value and the mean productivity value of its specific industry in the same year and geographical location. By doing this, our dependent variable captures the

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[5] More information about the sub-indices and methodology of PCI is available at https://pcivietnam.vn/en/about/pci-metho dology.html

Table 1 Pairwise correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Labour productivity gap (1)												
TFP gap (2)	0.608											
Female owner (3)	0.038	0.035										
Female rate gap (4)	0.079	0.022	0.166									
Owner age (5)	− 0.003	0.048	− 0.062	0.005								
Firm size (6)	− 0.125	− 0.055	− 0.085	0.043	0.167							
Firm age (7)	− 0.018	0.050	− 0.049	0.012	0.375	0.320						
Wage gap (8)	− 0.050	0.073	− 0.024	0.013	0.053	0.061	0.080					
Profitability (9)	0.083	0.116	− 0.007	− 0.028	0.080	0.052	0.112	0.055				
High-school graduates (10)	− 0.028	− 0.061	− 0.008	0.022	− 0.060	− 0.019	− 0.028	− 0.005	− 0.113			
Provincial consumption power (11)	− 0.061	− 0.012	0.036	0.025	− 0.138	− 0.024	− 0.062	0.074	− 0.083	0.206		
Corruption control (12)	0.013	0.091	− 0.007	− 0.009	0.019	0.081	− 0.059	− 0.014	0.008	− 0.196	− 0.352	

All correlation coefficients are significant at 10% level

productivity position of a firm relative to its comparable peers. That is, we calculate:

$(pg)_i = p_i - \overline{p}_{.i}$, where pg relates to productivity gap (either TFP or labour), and p relates to productivity.

The key independent variables of interest are entrepreneurs' gender and employees' gender (the latter operationalized by two alternative measures that we will discuss below). An attractive feature of the Vietnamese survey is that it requires the identification of a single person who is considered the main owner. To reduce the contamination effects stemming from the fact that firms may be run by a group of entrepreneurs that comprise both males and females, we include only two types of private firms in our sample: the private enterprise (an enterprise owned by an individual who is liable for all of its operations with his/her entire property), and the limited liability company (by the Enterprise Law of Vietnam; this type of enterprise can be owned by more than one individual, but there must be the registered 'lead' individual who assumes legal accountability for the company's activities). We do

Table 2 Owner gender, employee gender, corruption control, and TFP

	(1)	(2)	(3)	(4)	(5)
Female owner	5.281**		5.487**	5.608***	5.670***
	(2.376)		(2.417)	(0.433)	(0.445)
Female employment rate gap		5.111*	6.071*	1.650**	3.286***
		(2.979)	(3.143)	(0.781)	(0.833)
Corruption control	3.660**	3.651**	3.665**	3.689***	0.120
	(1.484)	(1.511)	(1.475)	(0.226)	(0.170)
Female owner×female employment rate gap				11.702***	7.198***
				(1.401)	(1.532)
Female owner×corruption control					−0.168
					(0.324)
Corruption control×female employment rate gap					−4.539***
					(1.061)
Corruption control×female owner×female rate gap					11.586***
					(1.964)
Owner age	−0.267	−0.398	−0.323	−0.301	−0.023
	(0.638)	(0.644)	(0.667)	(0.615)	(0.614)
Firm size	2.122**	2.144**	2.130**	2.123***	2.045***
	(1.023)	(1.031)	(1.028)	(0.206)	(0.206)
Firm age	1.640	1.739	1.704	1.688***	1.792***
	(1.205)	(1.244)	(1.232)	(0.624)	(0.624)
Wage gap	0.173**	0.175**	0.175**	0.173***	0.175***
	(0.086)	(0.084)	(0.084)	(0.007)	(0.007)
Profitability	7.625	7.513	7.443	7.357***	7.120***
	(6.354)	(6.349)	(6.351)	(1.469)	(1.470)
Limited liability company	0.824	0.717	0.830	0.828	0.516
	(2.469)	(2.524)	(2.467)	(1.188)	(1.189)
Provincial high-school graduates	0.153	0.157	0.152	0.150***	0.003
	(0.175)	(0.170)	(0.168)	(0.023)	(0.023)
Provincial consumption power	−0.025	−0.024	−0.025	−0.025***	−0.042***
	(0.032)	(0.033)	(0.032)	(0.005)	(0.005)
Mean of female rate gap	7.987	12.932**	8.965	9.000***	8.700***
	(6.210)	(5.929)	(6.251)	(1.426)	(1.427)
Mean of owner age	0.517	0.644	0.573	0.551	0.272
	(0.670)	(0.676)	(0.697)	(0.615)	(0.615)
Mean of firm size	−11.017***	−11.138***	−11.051***	−11.096***	−11.155***
	(2.431)	(2.458)	(2.442)	(0.251)	(0.252)
Mean of firm age	−0.536	−0.616	−0.599	−0.582	−0.675
	(1.405)	(1.434)	(1.427)	(0.631)	(0.630)
Mean of wage gap	0.082	0.080	0.081	0.084***	0.071***
	(0.151)	(0.152)	(0.151)	(0.015)	(0.015)
Mean of profitability	115.676**	115.714**	115.861**	115.982***	119.787***
	(50.079)	(50.059)	(50.134)	(4.337)	(4.345)
Mean of high-school graduates	−0.949**	−0.984**	−0.947**	−0.944***	−0.900***
	(0.414)	(0.424)	(0.416)	(0.054)	(0.054)
Mean of consumption power	0.036	0.036	0.036	0.036***	0.050***
	(0.028)	(0.027)	(0.027)	(0.005)	(0.005)
Mean of corruption control	0.350	0.379	0.349	0.348***	0.606***
	(0.326)	(0.334)	(0.328)	(0.049)	(0.046)

Table 2 (continued)

	(1)	(2)	(3)	(4)	(5)
Observations	777,215	777,215	777,215	777,215	777,215
No. firms	232,420	232,420	232,420	232,420	232,420
R squared	0.038	0.037	0.038	0.039	0.041

The estimator is Mundlak-type model. All specifications include full sets two-digit industry dummies and year dummies. The variables firm size, payment gap, and profitability are lagged one period. Standard errors are clustered by firm, industry and province. *Significant at 10%, **significant at 5%, and ***significant at 1%

not include partnerships or shareholding companies as the effects of gender leadership in these two types of firms are not well identified. Based on this, we use female owner dummy variable to quantify entrepreneurs' gender; it takes value 0 for males and 1 for females. It will enable us to test Hypothesis 1.

In turn, employees' gender is measured by the female employment rate gap variable, where the female rate is the ratio of female employees over the total number of employees. The female rate gap variable is the gap between the female rate in a particular company and the mean female rate of its specific industry in the same year and geographical location, which is calculated following the same logic as the productivity gap discussed above. When used as a moderator, with its effect combined with that of the female owner dummy, this variable will enable us to test Hypothesis 2a.

To explore the homophily effect proposed in Hypothesis 2b, we construct gender combinations of entrepreneurs and employees. We introduce a set of mutually exclusive dummy variables that jointly cover all the data: (1) female entrepreneur/female-only employees; (2) female entrepreneur/at least one male employee; (3) male entrepreneur/at least one female employee; and (4) male entrepreneur/male-only employees. The last category will be taken as the benchmark omitted category in the models that follow. We label this vector of dummy variables gender combinations.

For local governance quality, we use corruption control. The variable corresponds to the informal charges index obtained from the PCI dataset. The index takes value from 0 to 10, the higher the value, the better the control of corruption at the provincial level (that is, less corruption). Specifically, the informal charges is a measurement of the amount of extra fees that businesses pay, the difficulty those extra fees present for their operations, the fulfilment of expected results or 'services' after paying those extra fees, and whether provincial officials use

adherence to local laws as a means of collecting rent. Some examples of items used to create the informal charges index include (i) enterprises in my line of business usually have to pay for informal charges (% agree or totally agree), (ii) percentage of firms paying over 10% of their revenue for informal charges, (iii) rent-seeking phenomenon is popular in handling administrative procedures for businesses (% strongly agree or agree), (iv) percentage of firms saying that informal charges usually or always deliver expected results. Given that the informal charges index captures the outcomes of local governance settings aiming at controlling corruption in the public service sector, it could be used as a proxy for corruption control. Prior studies of Vietnam have employed the informal charges index as a measure of local corruption control and found that provinces having a higher score attract more foreign direct investment (Nguyen & van Dijk, 2012) and their local firms perform better (Nguyen et al., 2018).

Following the extant literature, we include a set of covariates that may influence firm productivity. At the firm-level, we control for firm size, firm age, wage of employees (generating wage gap that is, similar as before, the wage difference of a company relative to the average industry wage in the same year and same location), and profitability. These variables represent firm-specific characteristics that significantly affect efficiency levels (Ding et al., 2016; De and Nagaraj, 2014). Specifically, older firms may lose their flexibility and entrepreneurial mindset, leading to reduced efficiency (K De and Nagaraj, 2014). Meanwhile, average wage (incomes of employees, e.g., salary and bonus) may, if we accept the efficiency wage argument (Ewing & Wunnava, 2004), boost firm productivity as higher incomes may motivate employees to work harder and make contributions. Also, earlier higher profits may translate into resources for better technology and working conditions, which subsequently boost productivity.

At the entrepreneur-level, alongside gender, we control for owner age. The latter plays a role in determining firm productivity because it indicates the knowledge and experience of the entrepreneur (Nguyen, 2018).

At the provincial level, we include two control variables: annual consumption value per capita, which may control for local market demand; and the proportion of high school graduates to high school students able to graduate, which controls for local human resources' quality (Otsuka, 2017). We also control for unobservable time-invariant provincial characteristics by using a set of region dummy variables; and for unobservable macroeconomic fluctuations by using a set of year dummy variables.

3.3.2 Summary statistics

The definition and summary statistics of the variables are presented in Tables 3 and 4.

In general, the summary statistics indicate that the distribution of productivity of Vietnamese private firms has a long tail on the right, implying negative mean values for the TFP gap and labour productivity gap (Kurtosis statistics are 20.91 for TFP gap, and 131.79 for labour productivity gap). In other words, there are many firms that have very low levels of productivity and only a few with very high levels of productivity. Specifically, the mean TFP gap (-12.064) indicates that, on average, a firm in our sample is 12.064 unit of TFP lower than the average of firms in the same industry, same year, and same region. Similarly, the

Table 3 Variable definition and summary statistics

Variable	Definition	Mean	SD	Min	Max
TFP gap	The total factor productivity (TFP) gap between a particular company and the mean total factor productivity value of its specific industry in the same year and same geographical location. TFP is estimated using Levinsohn and Petrin (2003) method	−12.064	79.813	−121.421	520.612
Labour productivity gap	The labour productivity gap between a particular company and the mean labour productivity value of its industry in the same year and same geographical location. Labour productivity is the ratio of sale revenues over the number of employees	−0.062	0.497	−1.086	2.935
Female owner	Takes value 0 for male entrepreneurs and value 1 for female entrepreneurs	0.237	0.425	0	1
Female (employee) rate gap	The gap of female rate between a particular company and the mean female rate of its specific industry in the same year and same geographical location. Female rate is the ratio of female employees over the total number of employees	0.004	0.170	−0.795	0.939
Owner age	Age of entrepreneurs, in years	42.977	9.920	25	69
Firm size	Natural logarithm of the number of employees (here, transformed back to the number of employees). Lagged 1 year	30	74.943	2	502
Firm age	Years since firm establishment	6.474	6.489	1	68
Wage gap	The payment gap between a particular company and the mean wage of its specific industry in the same year and same geographical location. Payment is the average income per employee, calculated by the ratio of total employment payment over the number of employees. Lagged 1 year	−0.653	22.789	−65.235	115.998
Profitability	The ratio of firm profits to total capital. Lagged 1 year	0.050	0.113	−0.637	0.417
High-school graduates	The ratio of high school graduates to total number of high school students in a province, representing the quality of local human capital	93.727	6.803	38.570	99.980
Provincial consumption power	The value of provincial consumption per capita, in billion Vietnam Dong	0.044	0.053	0.0003	0.274
Provincial corruption control	The value of the informal charge index, obtained from the PCI dataset, available from 2006	5.759	1.032	3.340	8.943

All values are deflated to 2010 prices using official GDP deflators. The observations are 777,215 firm-year (232,420 firms) from 2006 to 2017. The firm-level data are obtained from the Annual Enterprise Survey conducted by the Vietnam General Statistics Office. The province-level data are extracted from the Annual Statistic Yearbook. The corruption control index is obtained from the Provincial Competitiveness Index dataset. https://pcivietnam.vn/en

Table 4 TFP gap and labour productivity gap by combination of owner gender and employees' gender

	TFP gap	Labour productivity gap	Group 1 versus others	Group 2 versus others	Group 3 versus others
Firms with female owner and no male employees (group 1)	− 8.233				
	(96.359)				
Firms with female owner and at least one male employees (Group 2)	− 8.243		0.001		
	(91.525)		(0.785)		
Firms with male owner and at least one female employees (Group 3)	− 13.361		5.128***	5.117***	
	(75.699)		(0.642)	(0.157)	
Firms with male owner and male employees only (group 4)	− 11.573		3.339***	3.330***	− 1.787***
	(77.439)		(0.366)	(0.742)	(0.292)
Firms with female owner and no male employees (group 1)		0.246			
		(0.674)			
Firms with female owner and at least one male employees (group 2)		− 0.046	0.291***		
		(0.495)	(0.004)		
Firms with male owner and at least one female employees (group 3)		− 0.081	0.326***	.035***	
		(0.406)	(0.003)	(0.001)	
Firms with male owner and male employees only (group4)		0.087	0.158***	− 0.133***	− 0.168***
		(0.517)	(0.005)	(0.002)	(0.002)

Firms with male owner and male employees only serve as the benchmark for comparison. Standard errors are in the parentheses. *Significant at 10%, **significant at 5%, and ***significant at 1%

mean of labour productivity gap (− 0.062) indicates that on average, the employee productivity of a firm in our sample is 0.062 million VND sale revenues per employee lower than the average of firms in the same industry, same year, and same region.

In terms of owner's gender, approximately 24% of entrepreneurs are female and the overall average age is 43 years. Regarding female employee rate, at maximum, firms employ 94% more females than the average of their industry in the same year and location. Conversely, at minimum, other firms employ 80% more males than the average of their industry in the same year and location.

Interestingly, female-owned firms in our sample employ far more female employees than male-owned firms: the average ratio of the number of female employees over the total number of employees in female-owned firms is 47.6%; meanwhile, the corresponding ratio in

male-owned firms is 23.1%. These simple statistics could be an early indication supporting our hypotheses 1 and 2: female entrepreneurs choose for their businesses the employment structures that result in higher efficiency.

In Table 4, we provide the mean statistics of TFP gap and labour productivity gap variables for the four groups of firms: (1) female entrepreneur/female-only employees; (2) female entrepreneur/at least one male employee; (3) male entrepreneur/at least one female employee; and (4) male entrepreneur/male-only employees. It could be seen that the productivity of firms in group 1 (females only) is higher than all other groups of firms. These simple statistics could be an early indication supporting our Hypotheses 1 and 2: female entrepreneurs choose for their businesses the employment structures that result in higher efficiency. The pairwise correlation matrix is presented in Table 1.

3.4 Specifications and estimation

We propose the following expanded reduced-form equation as our baseline specification:

$$\text{TFP gap}_{it} \text{ or Labour productivity gap}_{it} = x_{it}\beta + z_{gt}\gamma + \bar{x}_i\zeta + \bar{z}_g\eta + j_t\delta + \mu_{it}$$

where i denotes an individual firm, g is the province, and t a year. Therefore, TFP gap_{it} or labour productivity gap_{it} are (alternatively) the relative productivity levels that firm i in year t. The matrix of firm level explanatory variables, x_{it} (with corresponding coefficients vector β) is comprised of the owner-related characteristics (female owner dummy—for Hypotheses 1–3b; and owner age) and firm-related characteristics (female employment rate gap—for Hypotheses 2a–3b; firm age; labour size; average employee wage gap; and profitability). To reduce concerns about endogeneity caused by simultaneity, we use 1-year lag values of the variables firm size, wage gap, and profitability in all specifications. Province level variables, $z_{gt}\gamma$ include control of corruption—for Hypotheses 3a–b, annual per capita consumption value per province, and the ratio of high school graduates. We will also estimate models where the interaction of the female owner and female employee rate gap is included (for Hypothesis 2a). For Hypothesis 2b, we will add a matrix of dummy variables, $j_t\delta$ that each presents a combination of entrepreneur gender and employee gender, as discussed above. We will also include the interaction terms between corruption control, female owner and either female employee rate gap (for Hypothesis 3a) or the matrix of combinations of entrepreneur gender and employee gender (for Hypothesis 3b). In addition, all the equations include all variables averaged over time, $\bar{x}_i\zeta + \bar{z}_g\eta$, and a set of time dummies, $j_t\delta$. Finally, μ_{it} is the idiosyncratic error. Following (Wooldridge, 2010), we always cluster standard errors to firm level in all specifications. Also, we take into account the multilevel structure of the data by clustering standard errors by industry sectors and provinces as well.[6] Inclusion of averages over time implies these

are the Mundlak-type models (Mundlak, 1978). For time-variant variables, the models produce coefficients that are the same as for the fixed effects panel models; however, fixed effects are replaced by averages–over

time, for all variables (Bell et al., 2019). This is relevant for our research question as we wish to evaluate the between-firms effects based on the gender characteristics of both business owners-managers and employees. For the sake of robustness check, we also replicate our findings using simpler between-effects model that do not control for time-variant effects, and additionally the random effects model that combines within- and between effects together. The results of these estimations are reported in the robustness check section.

4 Results

4.1 Main results

Before applying our proposed productivity models, we replicate a highly cited study by Bardasi et al. (2011). Using samples from Eastern Europe and Central Asia, Latin America, and Sub-Saharan Africa, they find no difference in terms of productivity between male-run and female-run firms. However, their samples are relatively small. When applying their models to our longitudinal data in the context of Vietnam, we do not find similar results. The results of the replication are presented in the Appendix, Table A.8, which shows that female-run firms in Vietnam are consistently more productive in our sample. Based on this finding, we further explore the impacts of owner gender and employee gender utilizing specifications discussed in the previous section.

The first set of regression results is presented in Table 2. The female owner coefficient in model 1 is our key test of Hypothesis 1. In model 2, we replace it with female employment rate gap, and model 3 includes both. We run these three models separately to explore if coefficients on both variables are sensitive to exclusion or inclusion of the other one. We found that not much, and more generally we verified that the variance inflation factor (VIF) scores vary between 2.018 and 3.985 for all models, suggesting there is no serious multicollinearity in our specifications.

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[6] This is excepted for the specifications of industry sectors interact with owner gender conducted in the robustness check section. There, we do not cluster standard errors to industry level because we control for both two-digit industry dummies and three sector dummies (i.e., agriculture, manufacturing, and services) in these specifications.
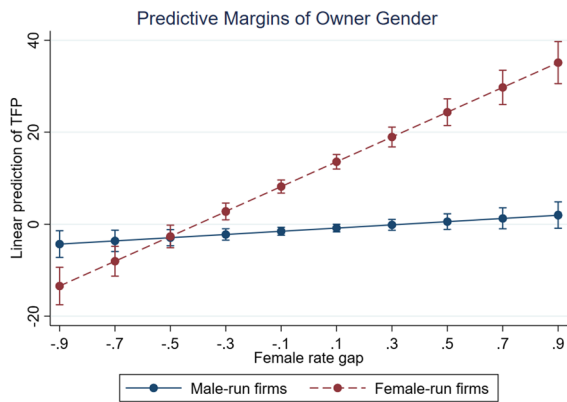
Fig. 1 Predictive margins: interaction of female entrepreneurs with female employment rate gap
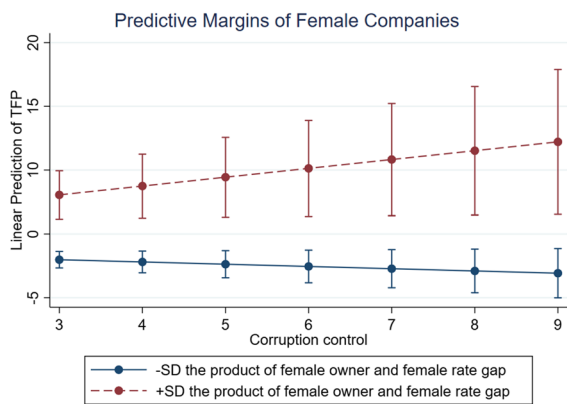

Fig. 2 Predictive margins: interaction of female entrepreneurs with female employment rate gap and provincial corruption control

In model 4, we add the interaction term between female owner and female employment rate in order to evaluate Hypothesis 2a. Model 5 adds interactions with the provincial control of corruption to test Hypothesis 3a. The coefficients associated with the female owner variable are positive and statistically significant in all specifications. This finding suggests that female-run businesses are more productive than male-run ones. As such, Hypothesis 1 is fully supported.

Next, the regression coefficients associated with the female rate gap variable are also positive and statistically significant in all models, indicating that firms employing a higher rate of female employees (compared with the industry average in the same year and same location) achieve higher levels of

productivity. While we did not hypothesize it directly, we found clear support for the positive effect of female employees.

Regarding the moderating effect, the coefficients associated with the interaction terms between the female owner and female employee rate variables are positive and statistically significant in models 4 and 5. This finding indicates that for the firms that are led by female entrepreneurs, the positive effect on productivity is enhanced when there are more female employees in the firm compared with the corresponding industry average. Thus, we found support for Hypothesis 2a. To illustrate this moderating effect in a more precise manner, we provide a graph of predictive margins in Fig. 1 drawn from model 4. The figure shows that, on average, firms that employ female employees at a rate that is higher than the average rate of their industry in the same location and same year are more productive than firms that do not do so. More interestingly, this effect of female employment becomes stronger in female-run firms.

To examine the moderating effect of corruption, we move to model 5 of Table 2. The coefficient associated with the triple interaction term corruption control × female owner × female rate gap is positive and statistically significant. This finding indicates that firms led by female entrepreneurs and employing more female employees benefit from improved corruption control more than other firms. This finding thus supports Hypothesis 3a. Figure 2 visualizes the interactive effects based on model 5 and shows that control of corruption amplifies the positive effect of female entrepreneurs with female employees, as illustrated by a steeper upper line on the graph.

We now turn to the effects of gender combinations between entrepreneurs and employees on firm productivity; we present the results in Table 5 below. The key category of interest is female entrepreneurs with female-only employees. The regression coefficient for this category contrasts with the benchmark omitted category of male entrepreneurs with male-only employees (model 1). The coefficient is positive and highly significant. Furthermore, in Table 5, below the coefficients, we also report post-estimation two-tail *t* tests for the differences in coefficients with the other two categories (mixed gender employment). The effect for the first category differs from each of the other two significantly. As expected, female entrepreneurs with female-only

Table 5 Entrepreneur-employee gender combinations, corruption control and TFP

	(1)	(2)
Female owner and no male employees (β_1)	21.809***	21.548***
	(6.898)	(0.924)
Female owner and at least one male employees (β_2)	15.421***	15.211***
	(5.351)	(0.790)
Male owner and at least one female employees (β_3)	9.460	8.252***
	(6.781)	(2.132)
Female owner and no male employees×corruption control		2.995**
		(1.257)
Female owner and at least one male employees×corruption control		1.223**
		(0.498)
Male owner and at least one female employees×corruption control		0.565
		(0.461)
Corruption control	1.258**	0.540
	(0.526)	(0.447)
Owner age	0.737	0.729
	(1.152)	(0.780)
Firm size	0.063	0.062
	(0.707)	(0.274)
Firm age	1.776	1.788**
	(1.472)	(0.787)
Wage gap	0.435***	0.435***
	(0.130)	(0.009)
Profitability	41.603***	41.613***
	(11.314)	(2.280)
Limited liability company	5.430**	5.380***
	(2.451)	(2.040)
Provincial high-school graduates	−0.334*	−0.332***
	(0.176)	(0.033)
Provincial consumption power	−0.069	−0.069***
	(0.053)	(0.006)
Mean of female rate gap	7.468	7.515***
	(8.563)	(1.731)
Mean of owner age	−0.486	−0.479
	(1.158)	(0.781)
Mean of firm size	−12.365***	−12.363***
	(3.136)	(0.343)
Mean of firm age	−0.475	−0.487
	(1.443)	(0.794)
Mean of wage gap	−0.226	−0.225***
	(0.214)	(0.020)
Mean of profitability	98.758**	98.723***
	(48.901)	(5.023)
Mean of high-school graduates	−0.637	−0.638***
	(0.384)	(0.068)
Mean of consumption power	0.084*	0.085***
	(0.047)	(0.007)
Mean of corruption control	0.545	0.545***

Table 5 (continued)

	(1)	(2)
	(0.355)	(0.053)
Observations	777,215	777,215
No. firms	232,420	232,420
R squared	0.067	0.068
t test $\beta_1=\beta_2$ p value	0.021	0.000
t test $\beta_2=\beta_3$ p value	0.261	0.001
t test $\beta_3=\beta_1$ p value	0.004	0.000

The estimator is Mundlak-type model. The benchmark is the group "male owners running male-employee-only firms". All estimations include full sets of industry dummies and year dummies. The variables firm size, payment gap, and profitability are lagged one period. Standard errors are clustered by firm, industry and province. *Significant at 10%, **significant at 5%, and ***significant at 1%

owners trump all other categories, not only the benchmark omitted one. Thus, we found strong clear for Hypothesis 2b concerning female homophily effects in employment, under institutional voids and high-power distance cultural values.

At the same time, the ranking for all four categories is also of interest. As noticed, the homogenous female-entrepreneur/female-only employment category has the best result for productivity. It is followed by the female entrepreneurs with gender-heterogeneous employment, and male entrepreneurs with gender-heterogeneous employment come in at the third place.[7] We will additionally verify if these results are robust in the next section using the diversity indices, as applied, for example, by Dai et al. (2019).

Next, to examine the moderating effect of corruption, we move to model 2 of Table 5. The coefficient associated with the interaction term female owner and no male employees×corruption control is positive and statistically significant. Also, it is greater than the coefficients associated with other interaction terms between corruption control and combinations of owner/employee gender. This finding thus supports Hypothesis 3b. Therefore, it could be concluded that the effects on productivity of female entrepreneur–female employment match are amplified in regions where control of corruption is more efficient.

In terms of the control variables, we see first that larger firms are more productive than smaller firms.

There is also evidence showing that older firms are more productive than younger ones. Next, the results indicate that wage gaps may play a role in boosting firm productivity, with wages higher than those of comparable firms being associated with higher productivity. Finally, the findings also suggest that past profitability can help improve productivity.

4.2 Robustness tests and extensions

4.2.1 An alternative approach to entrepreneur–employee gender mix: diversity

For our Hypotheses 2a and 2b, we argued that when a women entrepreneur hires female employees, and especially if there are female-only employees, it may result in a productivity premium. This was based on the social homophily phenomenon that, as we argued, applies to female entrepreneurs under institutional voids, high power distance values context. However, this departs from standard theorizing that centres on the concept of diversity (Harrison & Klein, 2007). In the environment we consider, more diversity would predominantly imply more female employees, as the average number of female employees is smaller than the number of male employees in the sample. When our research question is translated into diversity terminology, the issue becomes whether gender diversity among workers enhances the efficiency of firms run by female and male entrepreneurs correspondingly.

We implement gender diversity models, relying on two measures of diversity: Blau index and Teachman index (Blau, 1977; Solanas et al., 2012). Blau index is $B = 1 - \sum_{t=1}^{k} f_i^2$ and Teachman index is

[7] However, it is noteworthy that the difference between β_2 and β_3 is not statistically significant in model 1, Table 5.

$T = -\sum_{t=1}^{k} f_i \times lnf_i$, in which k is the number of groups, f_i is the relative frequency of ith groups, ln is the natural logarithm. We use each in turn to substitute for female employment rate gap included in the models presented in Table 4 above. The results are presented in Online Appendix A2. We interact the measure of diversity with the female owner indicator variable. Models 2 and 4 are of particular interest as they correspond to the effects in Hypothesis 2a. What we see here is that for female owners, the effect of employee diversity decreases productivity. These coefficients cannot be directly compared with our main results reported in Table 4, due to the different construction of the variables; however, the results seem consistent with Hypothesis 2a (and more indirectly, 2b). Thus, more homogeneity (less diversity) is associated with higher productivity for female entrepreneurs.

4.2.2 Sectoral effects

The literature for developed economies suggests that gender-based differences in performance may to a large extent be reduced to sectoral differences (Dean et al., 2019; Jennings & Brush, 2013; Marlow & McAdam, 2013; Zolin et al., 2013). In the context of developing economies, however, the effects of sectors remain unclear. Therefore, we explore the issue a bit further and interact the entrepreneur's gender effect with sectoral dummies (reduced from two-digit industries to three general sectors for the sake of simplicity), to see if these effects are stronger in some sectors than in others. We find that female entrepreneurship productivity premium is strongest in the manufacturing sector. This suggests it is in that sector where female entrepreneurs need and can compensate most for rents enjoyed by their male counterparts. The models we discuss here are presented in the Online Appendix A3.1.

To examine the moderating effect of corruption by sectors, we further conduct a split-sample analysis. The results presented in Online Appendix 3.2 once again show that female-led firms are more sensitive to corruption than male-led firms in manufacturing industries, while the moderating effect of corruption between genders is not statistically significant in agricultural and service industries. The results therefore highlight the disadvantages of female working in male-dominated industries (Marlow & McAdam, 2012).

4.2.3 Size effects

Arguably, the effect of the entrepreneur's gender may become weaker in large firms, as there is less of an imprint from the entrepreneur's characteristics when firms grow. Large organizations are more complex and the influence of the owner-managers becomes more indirect as a middle level of management emerges. When we add the moderating effect of firm size to the owner's gender effect, we do indeed find that the entrepreneur's gender effect on labour productivity becomes weaker for larger firms. We measure the size of firms by the number of employees, and we should therefore expect the related productivity effects of size to relate primarily to labour. And this is indeed what we find. These results are presented in the Online Appendix A4.1.

Moreover, our sample comprises both micro firms (with less than 10 employees) and SMEs (with more than 10 employees). We thus conduct an additional analysis of split samples. Online Appendix 4.2 presents the results, which show that the main findings of the direct effects remain for both groups of firms. However, when it comes to the moderating effects of corruption, the results in the group of micro-firms remain statistically significant, but the results in the group of SMEs become statistically insignificant. This finding is consistent with prior research indicating that small firms are more sensitive to corruption than larger ones (Du & Mickiewicz, 2016), especially when they are led by female and employ more female employees.

4.2.4 Ownership changes

In the main analysis, we focus on examining the differences between male-run and female-run firms. To do this, we exclude firms that changed ownership in the study period. However, it would be interesting to investigate whether our findings extend to firms that change ownership. Specifically, the research question now becomes how a firm's productivity changes when its owner changes from female to male or vice versa. To answer this question, we conduct an analysis of the full sample, including those changing ownership. We apply a fixed-effect panel estimator in order to focus on the 'within' effect of female ownership on productivity of firms. The results are reported in Online Appendix A5.1 and A5.2 and remain

consistent with our main findings. We thus conclude that the superior productivity of female owners exists both between firms and following changes over time within firms.

4.2.5 Productivity versus profitability and growth

Last but not least, it is insightful to present models with alternative conventional indicators of performance as dependent variables. In addition of productivity, we explore four alternative performance indicators: profitability, revenue size, and two measures of growth: based on total assets, and on employment.

The results are presented in the Online Appendix A6. First, for profitability, the female owner indicator coefficient is insignificant. Following the logic applied by Driffield et al. (2013), our interpretation of this result is the following. In our main set of results (Table 4), we found evidence supporting Hypothesis 1 that female entrepreneurs are more productive. This effect should feed into profitability. However, the effect is likely to be counterbalanced by specific rents that men are in a position to extract due to the cultural values supporting their privileged position on the social and economic hierarchy (power distance) and their wider social networks (e.g., resulting from military service). When these two effects (of productivity and rents) cancel each other out for the different gender of the entrepreneurs, the net outcome is an insignificant gender difference for profitability, which is what we obtain.

Second, we estimated a model with firm revenue size as the dependent variable, and then with two different measures of growth. Because the firms in our sample are young (on average, 6.5 years old), firm size also reflects growth, which accumulates with time. The entrepreneur's gender differences in firm size are again insignificant, but the gender differences in the two growth models come out as significant and they all point to higher emphasis on growth by male entrepreneurs, consistent with the literature (Cliff, 1998).

4.2.6 Alternative estimation methods

In the main section, we employ a Mundlak-type model to estimate effect of male and female ownership on productivity between firms. This technique allows us to estimate the time-invariant effect of owner gender while controlling for the within effects. We replicate the findings using the between-effects (BE) technique. The between effects model does not control for within effects. The latter results are reported in Online Appendix A7.1 and A7.2, which are consistent with those obtained from using the Mundlak technique.[8]

5 Discussion

In this study, we argue that the traditional cultural traits of power distance mean that the playing field for women is far from even. In turn, to compensate for their social disadvantages, female business owners need to be more efficient than their male counterparts when using resources; that is, they need to be more productive. In contrast, male entrepreneurs translate social advantages into rents. The net effect of these two traits is that the profitability of female and male businesses does not significantly differ.

The higher productivity of female entrepreneurs may, to some extent, result from the 'Darwinian' selection process (Wei & Zhang, 2011): given the social disadvantages faced by women, only the fittest and most efficient female businesses survive. If so, what our results indicate is not that female entrepreneurs have some inherent advantages compared to men, but rather that the threshold levels for entry and survival are higher for women, under the institutional context we consider. This would further imply a tangible opportunity cost of some female entrepreneurial talent that may be as good as that of their male counterparts but nevertheless goes to waste because some female businesses are either not initiated or drop out of the market. This echoes observation by Estrin and Mickiewicz (2011).

However, in the emerging-market economy environment, female entrepreneurs may actually possess some culture-specific productivity-related advantages compared to men and may apply strategies that compensate for their social disadvantage. For example, a female-specific management style that highlights decentralization and improves sensitivity to

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[8] We do not employ the random effect (RE) technique because the Hausman test result rejects the validity of RE.

stakeholders may result in productivity advantages. Also, in such environments, female entrepreneurs may be keen to build a familial organizational culture and social capital with their employees (Bian, 2018; Johnson et al., 2018). This culture may nurture a quasi-kinship relationship within the firm. These culturally driven, gender-specific competitive advantages that are also related to the centrality of family values may be transformed into improved productivity.

Related to this, we argue that the combined characteristics of entrepreneur's gender and employees' gender matter. Women help to reduce the effects of discrimination in the labour market, by employing other women (Tan, 2008; Welter et al., 2003), and by enabling them to realize their full potential. That leads to productivity gains. Parallel to this, the gender-specific networking characteristics allow women to exchange ideas and innovate, thereby improving organizational productivity (Dai et al., 2019). In contrast, men-only groupings are less open. Generalizing our insight and recasting it in terms of micro-sociological theory, what we proposed is consistent with the fundamental insight that prejudice towards the out-groups restricts the choices for those who are prejudiced, in our case for men (Blau, 1977). This in turn affects the productivity of their ventures.

We make the following contributions to the entrepreneurship literature. First, we add to the studies that investigate productivity performance associated with the gender of entrepreneurs, by elaborating on the context-specific employment-related strategies that female entrepreneurs may employ. Prior work has paid substantial attention to the economic performance of female-run businesses. The female underperformance hypothesis was tested and initially confirmed but later rejected for the developed economies (Du Rietz & Henrekson, 2000). Scholars have drawn on social feminist theory to argue that female entrepreneurs are more risk-averse, run smaller businesses, and do not pursue economic growth (Gupta et al., 2009; Langowitz & Minniti, 2007). Standing in contrast to this large body of literature, we argue that the policies and conditions of emerging-market economies open up entrepreneurial opportunities for women, while at the same time, the social norms associated with power distance, formal male-dominated patterns of hierarchy, institutional voids, and weak rule of law work against them. We argue that this produces the specific pattern of performance where female entrepreneurs may be more efficient in resource use, but this does not translate into profitability differential.

Second, we make a contribution by theorizing the effects of female entrepreneurship combined with female employment. We discuss how the specific features of the emerging market context may imply productivity premia for hiring female employees. Our finding that female employees may achieve higher levels of productivity in female-run businesses opens a research direction that highlights the unique advantages of women in specific institutional contexts. Here, our arguments have practical implications for strategies that female entrepreneurs might adopt to succeed in these adverse environments.

Finally, our theory leads to an even sharper prediction related to the gender composition of employment: under specific emerging markets conditions, female entrepreneurs achieve their best results when they work only with other women. Diversity terminology makes sense for studies like Dai et al. (2019) where diversity implies increased presence of women; however, once we focus on employees, female gender homogeneity emerges as a positive feature in a specific context we consider. Thus, the wider implications of our argument concern the rethinking of conceptualizations based on diversity. In light of what we have argued and found, it is too simple to say that diversity is good, and homogeneity is not (Bednar et al., 2021; Périlleux & Szafarz, 2021). The ambiguity in the language of diversity is such that we may have a situation of macro gender diversity of entrepreneurship combined with micro-organizational gender homogeneity. It is the latter we focus on, and paradoxically, in the developing economies environment, this type of micro-homogeneity may result in more macro-diversity, as it opens more space for productive female businesses.

Policymakers in developing countries should create conditions that encourage more women to participate in the workplace and especially in young businesses, with the provision of childcare being one obvious policy (van Ham & Buchel, 2006). Also, they should urge emerging market firms to take on more female employees, not only for the sake of gender equality but also to benefit their organizational productivity. In addition, our results suggest that there is scope for public policy to alleviate gender effects by controlling corruption. Thus, findings in this study

are relevant to policymakers concerned with productivity and gender equality in emerging and developing economies. We expect that the wider participation of women in entrepreneurship would bring significant economic gains, while reducing the productivity differential between female and male-owned businesses. This reduction in the average gender productivity gap will be achieved not by reducing the productivity of existing female businesses but rather by opening up space for those potential female entrepreneurs who are currently unable to use their productivity to sufficiently compensate for the economic rents realized by male entrepreneurs.

A practical implication, for female entrepreneurs who operate under institutional voids and high-power distance cultural values typical for developing economies,[9] is that one successful strategy is to employ more female staff. Our results suggest it may be a successful route to achieve efficient use of inputs, that is, to achieve higher productivity.

This study is not without limitations which should be acknowledged. First, the dataset employed in this study is country-specific. Yet, as we have discussed, Vietnam's cultural and formal institutional traits are similar to those of other emerging market economies in Southeast Asia. It is likely therefore that our results can be generalized but naturally this should be done with care. Future research may therefore re-test the validity of our findings using a multi-country dataset. Also, due to data limitations, we only examined two dimensions of productivity (TFP and labour productivity). Future studies might examine other dimensions, such as value-added (sales minus intermediate goods), mark-up, and waste management. Finally, due to data limitation, in this study, we have not been able to control for entrepreneur-level characteristics such as education and marital status, number of children, and size of household. Future studies should take into account these factors.

6 Conclusion

Female entrepreneurs do not typically pursue growth (Justo et al., 2015) in contrast to male entrepreneurs, who exhibit stronger growth orientation. However, in this study, we show that female entrepreneurs are more efficient in using resources, that is, they are more productive. Interpretation of the latter result leads to wider questions. Growth remains a highly popular measure of business performance in business and entrepreneurship literature (Nason & Wiklund, 2015). But is not the time ripe to centre our interest on the efficient use of resources instead of growth? And is there not a specific role for women entrepreneurs to change the dominant narrative?

Declarations

Competing interests   The authors declare no competing interests.

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[9] We found correlation between power distance and GDP per capita (purchasing power parity, latest figure) across countries to be -0.41; significant, below 0.001 probability threshold.

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