# State ownership, formality status and technical efficiency: evidence from Vietnamese SMEs

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**Abstract:** Small and medium-sized enterprises (SMEs) are critical in a rapidly growing economy like Vietnam, which requires significant government assistance. Our analysis begins by examining the technological efficiency of enterprises utilising data from Vietnamese SMEs from 2017 to 2018. We then examine the effects of formality status and state ownership as a proxy for

political ties on the technical efficiency of SMEs in Vietnam. We found that policies should reduce cronyism in firm-state relationships to incentivise firms to invest in improving productivity. Moreover, to boost productivity, it is critical to promote formalisation by raising the number of legally registered businesses, the level of tax registration, and the number of formal labour contracts.

**Keywords:** formality; small and medium scale firms; state ownership; technical efficiency; Vietnam.

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# 1 Introduction

Vietnam is a developing country with a majority of the domestic enterprises being small and medium scale, but its economy has been evaluated to be more competitive compared to most Southeast Asia countries (Ohno, 2009; Tran and Pham, 2021). According to the Vietnam General Statistics Office (GSO), small and medium-sized enterprises (SMEs) play a key role in socio-economic development, accounting for 45% of the country's total GDP.[1] Moreover, the Vietnamese SME sector has been growing rapidly in recent years and contributed significantly to poverty alleviation by generating vacancies for both high-skilled and low-skilled workers (World Bank, 2018).

However, several studies argued that SMEs in developing countries had faced many obstacles in globalisation, including lack of financial accessibility, inefficient government support and limited capacity (Mukherjee, 2018; Naradda Gamage et al., 2020). For instance, undersupply of credit due to asymmetric information, high default risk and lack of collateral are barriers for SMEs to improve competitiveness and expanse production or business (Niinimäki, 2018). Thus, participating in international trades (e.g., a member of AFTA, WTO, and TPP) in recent years could bring opportunities but challenges to SMEs in many developing countries by integrating into highly competitive global markets. Therefore, understanding the key drivers that promote the development of the SME sector is vital to boosting economic growth in emerging countries like Vietnam.

In the context of Vietnam, the political regime is one of the vital factors that could impact SMEs' business activities and performances. A strong relationship with the state (i.e., political connections) could contribute to firms' performances, such as developing informal lobby relationships in financial activities (Li et al., 2008; Liu et al., 2016). For instance, political connections (e.g., a member of the Communist Party of Vietnam) could reduce financial costs by helping politically-connected firms access to credit and formal loans and thus improve their performance in terms of return on asset and equity (Malesky and Taussig, 2009; Tran and Pham, 2020; Minh et al., 2021). Moreover, information and collaboration are considered benefits of connectedness, allowing firms to access relationship-based informal financing (Liu et al., 2016). However, lobbying activities and political donations could also be significant expenses for politically-connected firms to maintain political ties (Bertrand et al., 2018).

Besides political connections, firms having a state ownership (i.e., state-owned enterprise – SOE) structure could also benefit from government support and relationship-based informal financing. In Vietnam, the level of state ownership in the SME sector remains high (i.e., high state shareholdings) in strategically important industries, such as oil, mining, media, etc. Several studies indicated that state ownership structure has a

significant impact on firms' financial performance (Sun et al., 2002; Tihanyi et al., 2019). Similar to political connections, a high level of state ownership often links to limited disclosure, poor investor protection and reliance on a formal financing system. Thus, it is essential to investigate the relationship between state ownership and firm performance in Vietnam.

However, despite extensive research on the effects of diversified corporate ownership on corporate performance, the state-owned SMEs in Vietnam have received scant attention. Moreover, in a transitional economy like Vietnam, understanding the impacts of ownership structure and formality is critical to the development of the SME sector. For instance, formalisation and state-owned status could bring firms advantages, such as better credit access and greater opportunities to network with other large and government-owned firms (Nguyen et al., 2014; Archer, 2021). Therefore, in this study, we aim to close the gap by evaluating the role of firms' formality status and state ownership in improving SME firms' technical efficiency (TE) in Vietnam.

The remaining of this paper is organised as follows. Section 2 discusses the literature review. Section 3 describes the data and variables used in the analysis. Section 4 presents the methodology. Section 5 reports estimation results. Finally, Section 6 discusses and concludes.

## 2   Literature review

A wide range of methods has been applied to estimate the SMEs' TE, including data envelope analysis (DEA) (Burki and Terrell, 1998; Alvarez and Crespi, 2003; Charoenrat and Harvie, 2017; Dobrovič et al., 2021), stochastic production Frontier (SPF) approach (Chapelle and Plane, 2005; Roudaut, 2006; Charoenrat and Harvie, 2014; Hwang and Kim, 2021) and production function for panel data (Söderbom and Teal, 2004; Long and Anh, 2017), and its determinants has been conducted in many countries.

Existing literature has suggested that there are internal factors (e.g., firm size, capacity, investment, etc.) (Shao and Lin, 2002; Tran et al., 2008; Hoang-Khac et al., 2021; Bhaumik, 2022) and external factors (i.e., access to credit, the government supports, etc.) (Sena, 2006; Pham et al., 2010; Jin et al., 2021) that could influence firms' TE. In an analysis focused on Vietnamese SMEs, Vu (2003) found a relatively high TE of small-scaled SOEs and indicated a critical role of skilled workers, being located in big cities and engagement in export activities in determining firms' performance. They also suggested the importance of creating competitive environments, developing market-supporting institutions and encouraging technological innovation to promote productivity. Similarly, the study of Tran et al. (2008) showed that the quality and quantity of family labour, as well as a metropolitan location, are factors associated with the TE of small-scale businesses in Vietnam. Their results also identified the benefits of direct government financial and non-financial assistance to small business performance. Moreover, export orientation and trade openness could also positively influence the TE of small-scale manufacturing firms (Pham et al., 2010).

Moreover, firm efficiency is influenced by other factors, such as political connections or relationships with the state. Theoretically, it is hard to form a consistent definition of political connections since it depends on several social and cultural backgrounds in a specific nation or region. In Vietnam, some essential socio-political organisations, such as the Farmers' Union, Youth Union, Communist Party, Women' Union or Veteran's

Union, are solid components forming the unique political party in Vietnam (i.e., the Vietnamese Communist Party). Thus, members of these organisations can reasonably be considered 'politically connected' since they would have stronger links with the government and thus might have more advantages in terms of business, job-seeking, education, promotion, etc. For instance, political connections could help private firms quickly get more access to credit or legal systems (Li et al., 2008), and government lobbying might also facilitate the rent-seeking process for private companies (Liu et al., 2016).

Numerous studies have investigated the impact of political connections on firms' performances. For instance, Perez et al. (2015) investigated the performance of politically-connected firms in Spain where a director board member held a political position. Their results suggested that political connections affect the formation of the director board and corporate governance structure. In developing countries, political connections support firms to stay in business in countries where there is a lack of market-supporting institutions and government supports in industry development (Hoskisson et al., 2000). Malesky and Taussig (2009) recorded political connections as firms' relationships with provincial authorities (e.g., former Party, government or military officials) or former SOE's employers and employees, showing that political connections increase the firms' possibility of receiving loans. However, the authors revealed that allocating resources via non-business relationships in the banking industry is not optimal, especially in developing countries like Vietnam and China. Thus, in a further investigation, Markussen and Tarp (2014) found that the formal and informal relationships between household farmers and local authorities via having relatives working as government officials or joining formal 'mass organisations' (e.g., Farmers' Union, Women's Union, Youth Union, and Veterans' Union) could significantly impact the total investment on farming land.

In Vietnam, the political system is often more comparable to that in China. The study of Li et al. (2008) studied the impact of political connections on Chinese firms' performances, suggesting that political connections could help reduce different types of private firms' costs in transitional economy countries like China. Their study also raised a concern about the validity of measuring political connections by isolating them from human capital since entrepreneurs with better political connections are more likely to have better personnel. Their regression results indicated that businesses that connect with the Communist Party often have better performance in terms of both returns on assets and return on equity but also have higher opportunities to get access to credits and bank loans than those who do not have strong political connections. Moreover, in a study that compared the benefits of joining professional connections and political connections in China, the authors argued that managerial social connections are a good proxy for firms' social capital since solid social connections could help firms access relationship-based informal financing. The authors also suggested the vital role of industry associations in promoting communication and collaborations among firms in China.

The relationship between SME performance and political connections in Vietnam is also linked to corruption (Phan and Archer, 2020). The authors accounted for firms' political connections via the status and firm owners being as:

1    government officials

2    war veterans

3    members of the Communist Party

4    connected with politicians.

Their results showed that bribery might deter firms from getting bank loans, and thus political connections would generally benefit firms by quickly gaining access to formal loans. However, they found that political connections as members of the Communist Party do not significantly impact credit access. Moreover, the study of Tran and Pham (2020) found that the political connections of firms' CEOs do not substantially impact SMEs' corporate environmental performances in Vietnam. The authors indicated that political connections could otherwise indirectly indulge in unfair development by diminishing the effectiveness of formal punishment. Therefore, relationships with the local government might lead to bribery that could harm the corporate environment.

## 3    Data

### 3.1    Data collection

Our study uses an SME dataset obtained from a survey carried out in Vietnam in 2018. This dataset was a part of an annual SME survey conducted by the GSO in Vietnam. GSO is the largest statistics organisation in Vietnam that is responsible for major surveys and data-driven reports. The survey was conducted by GSO with the support of experts to ensure validity and representativeness. The data sources were also checked via internal and external auditing processes to ensure no false reports or misunderstandings of the survey questionnaire.

Our dataset contains comprehensive data focusing on domestic non-state and manufacturing SMEs. The GSO survey was conducted in different regions of Vietnam, including urban and rural areas. It covered the three largest cities in Vietnam and seven rural provinces in North, Central and South Vietnam. The sample was stratified to ensure the representation of different types of ownership based on the overall distribution of ownership in the population. The sample was also stratified by ownership form to ensure different ownership forms in the domestic-non state sector are included. Eligible firms were randomly selected from a complete list of enterprises in the surveyed districts. A sample of 2,864 enterprises was drawn from the official list of enterprise registrations in the selected provinces. A total of 2,821 enterprises were interviewed.

### 3.2    Descriptive statistics

The descriptive statistics of all variables, including firms' inputs and outputs, socio-economic characteristics and matching variables, are reported in Table 1. Firms' outputs lnOutput are the log of total output produced in 2017. Firms' inputs include: lnMaterial is the log of total material inputs (e.g., input costs of steel, oil, corn, grain, gasoline, lumber, forest resources, plastic, natural gas, coal, minerals, etc.), lnLabor is the log of the total number of labors, lnCapital is the log of total capital inputs and lnOtherCost is the log of other costs (e.g., costs of energy used, R&D cost, etc.) used in the production process.

The socio-economic control variables include: 'age' is a discrete variable capturing the age of the enterprise head; 'education' captures an enterprise head's number of years

of schooling from 1 to 12; 'male' is a dummy variable taking a value of 1 if an enterprise head is a male; 'export' is a dummy variable taking a value of 1 if a respondent firm has export activities; 'support' is a dummy variable taking a value of 1 if a respondent firm received government support and 'membership' is a dummy variable taking a value of 1 if a respondent firm belongs to an association. In addition to the socio-demographic control variables, the matching variables include: 'formality status' is a dummy variable taking a value of 1 if a respondent firm possesses formal accounting standards, makes mandatory social insurance contributions on behalf of employees and is subject to Vietnam's corporate income tax as defined by in the study of Xin-gang and Zhen (2019). Furthermore, in the spirit of Rand and Torm (2012), 'state ownership' is a dummy variable taking a value of 1 if the state owns a respondent firm.

**Table 1** Descriptive statistics

| Variables | Obs. | Definition | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|---|
| lnOutput | 2,401 | Total output produced in 2017 | 5.6923 | 1.6151 | 0.6908 | 14.6729 |
| lnMaterial | 2,394 | Total amount of material used to produce the output | 6.2209 | 1.4709 | –2.3126 | 15.7846 |
| lnLabor | 2,401 | Total number of labors in each firms | 1.9576 | 1.1422 | 0 | 6.2066 |
| lnCapital | 2,401 | Total capital used to produce the output | 1.8074 | 1.1464 | 0 | 5.7038 |
| lnOtherCost | 2,394 | Other costs occurred to produce the output | 6.8347 | 1.6151 | –2.3123 | 15.8226 |
| Age | 2,401 | Age of the enterprise's head in years | 54.7 | 10.613 | 26 | 83 |
| Education | 2,401 | Number of schooling years of firm's head | 9.5002 | 3.7217 | 1 | 12 |
| Male | 2,401 | If the enterprise head is male, 0 otherwise | 0.6309 | 0.4826 | 0 | 1 |
| Export | 2,392 | If the enterprise has export activities, 0 otherwise | 0.0593 | 0.2363 | 0 | 1 |
| Support | 2,401 | If the enterprise receives government support, 0 otherwise | 0.1441 | 0.3512 | 0 | 1 |
| Membership | 2,401 | If the enterprise participate the association, 0 otherwise | 0.0953 | 0.2938 | 0 | 1 |
| Formality status | 2,401 | If the enterprise is official, 0 otherwise | 0.3353 | 0.4721 | 0 | 1 |
| State ownership | 2,401 | If the enterprise is state owned, 0 otherwise | 0.1558 | 0.3672 | 0 | 1 |

We observe that the age of enterprise heads was, on average, 54.7 years old, and about 63% of them are male. Most enterprise heads graduated from secondary school (i.e., more than nine years of schooling). A majority of firms in our sample (i.e., about 94%) did not have export activities, meaning that they mainly produced domestic products.

Only 14.41% of firms had received support from the government. We also observe that only 33.5% of firms in our sample had a formality status, while the state-owned about 15% of firms (i.e., about 85% of them were private owners).

## 4    Methodology

### 4.1   SPF approach

Firms' outputs involve the combination of several different inputs, such as land, labour, capital and technology, which vary in terms of substitutability and quality. A firm's optimisation problem is to select the best combination of inputs-typically conceived of as the profit-maximising or cost-minimising set of inputs. Thus, a firm's productivity is commonly measured using the ratio of actual output to the maximum technologically feasible output level given a particular input (i.e., TE). TE is typically assessed through the estimation of production functions, modelling the maximum level of outputs produced from a specific set of inputs for a given level of available technology (Battese et al., 2004; Caudill et al., 1995; Battese and Coelli, 1988).

This article assesses the relationship between several production inputs (e.g., materials, labour, etc.) and TE. In particular, we apply an SPF approach, which includes different production inputs and their interaction terms as determinants of TE. Thus, firm $i$'s TE can be estimated using the model introduced by Aigner et al. (1977) and Meeusen and van Den Broeck (1977), in which production is assumed to follow a log-linear Cobb-Douglas form:

$$\ln y_i = \ln f\left(x_i; \beta\right) + v_i - u_i, \tag{1}$$

where $x_i$ is a $K \times 1$ vector of production inputs, $\beta$ is a $K \times 1$ vector of parameters to be estimated, vi corresponds to the regression error term (i.e., independently and identically distributed, $v_i \sim N(0, \sigma_v^2)$), the error term $u_i$ is assumed to be independently distributed, $u_i \sim N^+(\mu, \sigma_u^2)$ with truncation point at 0.

Under the endogenous effects of a firm's characteristics caused by 'formality status' and bias selection effects caused by 'State ownership' on a firm's TE or performance (Latruffe et al., 2017; Lien et al., 2018; Hosny, 2018; Zhang et al., 2011; Bonfiglio et al., 2020; Nguyen-Anh et al., 2021), $u_i$ or $TE_i$ is estimated in our study using a propensity score (PS) to mitigate these impacts. The following section will discuss this further.

### 4.2   Propensity score matching

PS is a statistical technique that is used to evaluate treatment effects of observational study, which could help reduce the selection bias (Austin, 2011; Rosenbaum and Rubin, 1985). One of the advantages associated with using PS is the creation of adequate counterfactuals when random assignment is infeasible or unethical (Austin, 2011). The popular PS methods are propensity score matching (PSM) and inverse propensity score weighting (IPW). These approaches have been widely used in numerous empirical studies (e.g., firm registration and state-private ownership (Sharma, 2014; Zheng et al., 2021) and proven to help mitigate the endogeneity and estimation bias (Rosenbaum and Rubin, 1985). PS is firstly estimated by robust probit models

$$R_i[0, 1] = f(X_i \beta), \tag{2}$$

where $R$ contains each of two predictor variables ('formality status' and 'state ownership'). $X$ is set of explanatory variables ('age', 'education', 'gender', 'export', 'support', 'membership').

Let the average treatment on the treated (ATT) that represents for the effects of potential outcomes are $TE^1$ and $TE^0$, where $TE^1$ is outcome with treatment ($R = 1$) and $y^0$ is outcome with control ($R = 0$). Note that unbiased estimates of $E[TE^0]$ and $E[TE^1]$ are required to determine the average effect. If the independence assumption $(TE^0; TE^1) \perp R$ is applied to ensure $R$ is independent from $TE^0$ and $TE^1$, then we have $E[TE^0] = E[TE^0 \mid R = 0]$ and $E[TE^1] = E[TE^1 \mid R = 1]$.

*Matching algorithms*

In this study, we employ two types of PSM algorithms: nearest-neighbours and Mahalanobis matching. 'Nearest' neighbour matching methodology is an agreed algorithm in which each treated unit is searching for the control unit with the closest PS (i.e., minimise the distance between all treated and control matches) at a ratio of 1: 1 to minimise bias because the matching algorithm simultaneously sought the smallest gap between two matching units (Caliendo and Kopeinig, 2008). In particular, when the PS of the $i^{th}$ unit, $\pi(\rho_i)$, is estimated with above probit model, given a formal firm $i$, the distance measure from the formal firm $j$ to the informal firm $i$ will be determined as $d_{ij} = |\pi(\rho_i) - \pi(\rho_j)|$. The same distance calculation is measured for private and SOEs.

Additionally, Rosenbaum and Rubin (1985) and proposed another way of matching on the PS, $\pi(\rho_i)$, to minimise the effects of sampling variation and greedy matching, which should fit on individual covariates by minimising the Mahalanobis distance of treated and control units to obtain balance on matching. In other words, PS is initially estimated, then matched based on Mahalanobis distance within PS stratification. Applying the theory of Mahalanobis distance to PSM is

$$d_M\left[\pi(\rho_i), \pi(\rho_j)\right] = \left[\left(\pi(\rho_i) - \pi(\rho_j)\right)^{\tau} S^{-1}\left(\pi(\rho_i) - \pi(\rho_j)\right)\right]^{\frac{1}{2}},$$

$[\pi(\rho_i) - \pi(\rho_j)]^{\tau}$ denotes the related transpose of $[\pi(\rho_i) - \pi(\rho_j)]$.

Moreover, the caliper is a distinctive strategy to avoid poor matches by exclusively selecting the matches within the caliper. Furthermore, Baltar et al. (2014) proposed that a caliper c to set the boundary for the maximum distance should be taken value at 0.2 of PS standard deviation is

$$d_M\left[\pi(\rho_i), \pi(\rho_j)\right] = \left[\left(\pi(\rho_i) - \pi(\rho_j)\right)^{\tau} S^{-1}\left(\pi(\rho_i) - \pi(\rho_j)\right)\right]^{\frac{1}{2}},$$

If $|\pi(\rho_i) - \pi(\rho_j)|$ 6 0.2.

Therefore, in this study, we employ the nearest-neighbour using greedy matching by matching two nearest treated and control observations based on the caliper width of 0.2 standard deviation of the estimated PSs (Formica et al., 2019; Bisleri et al., 2016).

Note that caliper 0.2 is considered as optimal caliper width for PSM in observational studies (Austin, 2011).

For IPW, we adopt a weighted fractional regression model to deal with dependent variable – firm TE, which is defined on the closed interval $TE_i \in [0, 1]$ (Papke and Wooldridge, 1996; Ramalho et al., 2011). To an extent, the doubly robust AIPW fractional regression is also applied as a robustness test for conventional weighted fractional regression. Doubly robust estimation consists of a formula of predicted regression with another model for the exposure (i.e., endogenous variables 'Formality status' and 'state ownership'. Note that the differences between the results of the conventional and doubly robust model could be due to missing data or causal inference of population average treatment effects estimation (Funk et al., 2011; Schulz and Moodie, 2021).

A descriptive introduction of the fractional regression model is generally described in the study of Wooldridge (2015) as follows:

$$E\left(TE_i \mid Z_i\right) = H\left(Z_i\beta\right),\tag{3}$$

where $Z_i$ represents a set of regressors described in equation (4), namely $X_i$ and $R_i$. For the logistic link-function $H(.)$ satisfying $0 < H(.) = \dfrac{\exp(.)}{1 + \exp(.)} < 1$ (Wooldridge, 2015), the fractional logistic model can be written as follows:

$$E\left(TE_i \mid Z_i\right) = \frac{e^{Z_i\beta}}{1 + e^{Z_i\beta}}.\tag{4}$$

The proposed estimator for $\beta$ is the quasi maximum likelihood estimator (QMLE), which maximises the following Bernoulli log-likelihood function (McCullagh and Nelder, 2019):

$$l_i(\beta) = TE_i \log\left[\left(Z_i'\beta\right)\right] + (1 - TE_i)\log\left[1 - H\left(Z_i'\beta\right)\right].\tag{5}$$

To minimise the endogeneity of $R_i$, our weighted regression approach employs the squared root $\sqrt{}$ of PSs $(1 / PS_i)$ as weights to estimate our models.

# 5   Estimation results

## 5.1   SPF estimates

Table 2 shows the results of the stochastic frontier model from the translog functional form. The mean TE is computed. The estimated mean TE of all firms in our sample is about 86.8%. Our results focus on the translog production function because of its inclusive capacity to capture the interaction terms of inputs compared to the Cobb-Douglas and quadratic functional forms.

The results of Table 2 suggest that material, labour and capital inputs have the expected positive sign on production, meaning that increasing the use and allocation of these factors increase firms' outputs. These results confirm the finding of the existing literature that material, labour and capital inputs are essential to improve the TE of SMEs (Nishimizu and Page, 1982; Wiboonchutikula, 2002; Lee and Zhang, 2012; Walheer and He, 2020). The coefficients of these puts are less than unity, meaning that as inputs increase by 1%, outputs increase less than 1%. Moreover, we also observe that increasing

other inputs (e.g., energy costs, R&D, etc.) harms productivity. This result could be because costs for other activities like R&D are promising but also expensive and risky for SMEs since they also often have a low capability and opportunity to access credit than larger-scale firms (Rese and Baier, 2011; Yu and Fu, 2021).

**Table 2**    Production function estimates from the translog model

| Variables | Coefficient | Std. err. |
|---|---|---|
| lnMaterial | 0.8666∗∗∗ | 0.0712 |
| lnLabor | 0.6452 | 0.1037 |
| lnCapital | 0.7331 | 0.1038 |
| lnOther cost | −0.8056 | 0.0822 |
| Quadratic terms lnMaterial × lnMaterial | 0.0627 | 0.0073 |
| lnLabor × lnLabor | 0.1104 | 0.0227 |
| lnCapital × lnCapital | 0.0715 | 0.0241 |
| lnOtherCost × lnOtherCost | 0.3226 | 0.0175 |
| Interaction terms lnMaterial × lnLabor | 0.2311∗∗∗ | 0.0343 |
| lnMaterial × lnCapital | 0.0009 | 0.0349 |
| lnMaterial × lnOther cost | −0.2939∗∗∗ | 0.0235 |
| lnLabor × lnCapital | −0.0022 | 0.0375 |
| lnLabor × lnOtherCost | −0.3681 | 0.0484 |
| lnCapital × lnOtherCost | −0.1286 | 0.0481 |
| Intercept | 1.3576∗∗∗ | 0.0847 |
| Mean TE | 0.868 (0.0470) | |
| Observation | 2396 | |

Note: ∗∗∗For significance at the 1% level.

Additionally, the results of the quadratic terms are not statistically significant, meaning that increasing the quantity of material, labour, capital, or other inputs will not improve output production. Moreover, our results also indicate a positive and significant interaction term lnMaterial × lnLabor, while lnMaterial × lnOtherCost is negative and significant. This result suggests that material and labor inputs are complementary, but material and other costs are substitutes for improving TE. In other words, an increase in the complementarity of material and labour inputs would lead to an increase in yield, and thus these pairs of inputs should be increased together to obtain high productivity. However, the substitution between material and other costs suggests the substitute relationship among these pairs of inputs, which could reduce SMEs' production outputs in the study area.

## 5.2    Matching estimation

The estimated PSs with the nearest matching using Mahalanobis and caliper 0.2 are presented in Table 3. The results of the causal effects of the firms' state ownership and formality status on their TE, as well as the indicators of matching quality from different matching algorithms, are reported in Table 4 and 5, respectively.

In Table 3, a probit model is applied to predict the probability of being state-owned or having formality status. We observe that variables, such as enterprise head's years of education, having export activities and receiving support from the government, tend to positively influence the probability of having state ownership. In contrast, these variables have negative impacts on the likelihood of having formality status. However, the age of the enterprise head could negatively impact the probability of being state-owned and having formality status. Moreover, gender is also a factor that influences the formalisation of SMEs. In particular, entrepreneurs of formal SMEs are more likely to be male than female. This result is in line with the existing literature that female business owners often face more barriers in the development of entrepreneurship, such as attitude toward risks or access to external resources of capital (i.e., credit, informal networks), compared to their male counterparts (Aidis et al., 2007; Babbitt et al., 2015; Martin et al., 2019). The distribution of PSs between treated (i.e., being stated-owned or having formality status) and untreated groups is presented in Figure 1. It should be noted that the PS estimation is used to obtain balanced distributions of variables 'state ownership' and 'formality status' in both treated and untreated groups.

**Table 3**      Probit model to estimate PS

| Variable | Formality status | | State ownership | |
|---|---|---|---|---|
| | Coefficient | Standard error | Coefficient | Standard error |
| Age | −0.0051* | 0.0026 | −0.0333*** | 0.0033 |
| Education | −0.2514*** | 0.0381 | 0.5142*** | 0.0556 |
| Membership | −0.3165** | 0.1028 | | |
| Male | 0.0942* | 0.0571 | 0.1062 | 0.0706 |
| Export | −0.7477*** | 0.1453 | 0.7481*** | 0.1212 |
| Support | −0.2564** | 0.0806 | 0.3095*** | 0.0877 |
| Intercept | 10.7024* | 5.2142 | 6.0511*** | 0.6541 |

Notes: Robust standard errors in parentheses. $*p < 0.1$; $**p < 0.05$; $***p < 0.01$.

In other words, it does not aim to give a prediction of selection into treatments.

Table 4 shows the standardised differences of covariates before and after matching. Note that the balancing powers of the estimations are considered as the reduction in standardised differences between matched and unmatched models. We observe the total bias reduction obtained by matching procedures using different matching algorithms. The results of Table 4 suggest that the nearest neighbour matching using Mahalanobis and caliper 0.2 provides better matching estimation results (i.e., low systematic differences in the distribution of covariates between groups) in both treatments 'state ownership' and 'formality status' compared to other models.

The estimates from the matching procedure presented in Table 5 indicate a negative and significant impact of being state-owned on SME firms' TE. This result is in line with the existing literature that political connections are often associated with lower firm efficiency in developing countries (Desai et al., 2011; Li et al., 2019). This result could be because, in developing countries like Vietnam, state-owned firms are more likely to employ their resources for rent-seeking activities for political reasons rather than operational and production activities that could help boost their efficiency (Desai et al., 2011; Li et al., 2019). Moreover, since our study observed that state-owned firms tend to

get more support from the government, the dependence on government support could be a reason that discourages state-owned firms' incentives to improve productivity (Li et al., 2019).

**Figure 1**   Overlap density graph for PS estimation, (a) formality status (b) state ownership (see online version for colours)
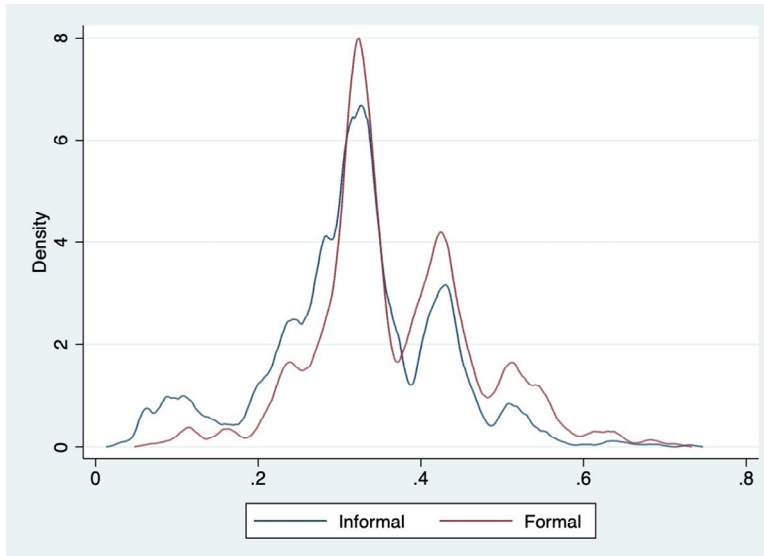


(a)
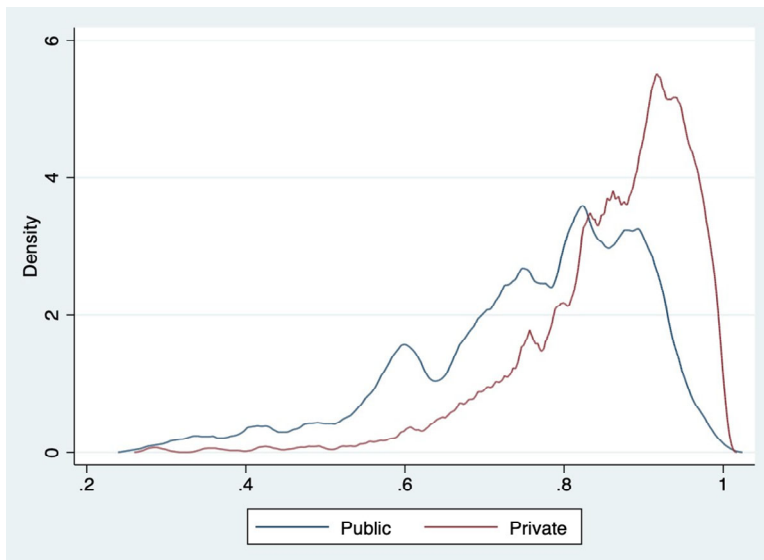


(b)

**Table 4**     Covariate balancing before and after matching with different matching algorithms.

| Variable | Standardised differences (before matching) | Standardised differences (after matching) | | | |
|---|---|---|---|---|---|
| | | Doubly robust AIPW fractional regression | IPW fractional regression | Nearest matching using Mahalanobis and caliper 0.2 | Nearest matching using caliper 0.2 |
| *Formality status* | | | | | |
| Age | −0.1257 | −0.0108 | 0.0183 | −0.0093 | −0.0009 |
| Education | −0.3531 | −0.0049 | 0.0082 | −0.0138 | −0.0658 |
| Membership | −0.1649 | 0.0133 | −0.0102 | 0.0000 | 0.0728 |
| Male | 0.0751 | 0.0068 | −0.0075 | 0.0000 | −0.0505 |
| Export | −0.2838 | −0.0241 | 0.0037 | 0.0000 | 0.0023 |
| Support | −0.1726 | −0.0228 | 0.0052 | 0.0000 | 0.0732 |
| *State ownership* | | | | | |
| Age | 0.4843 | −0.0663 | −0.0822 | 0.0439 | −0.1409 |
| Education | −0.5045 | −0.1284 | −0.1512 | −0.0746 | −0.1932 |
| Male | −0.1485 | 0.0219 | 0.0259 | −0.0051 | −0.1178 |
| Export | −0.3529 | −0.0131 | −0.0289 | 0.0000 | 0.0174 |
| Support | −0.2272 | −0.0012 | −0.0072 | 0.0000 | 0.1363 |

**Table 5**     Summary results of the average treatment effects

| Variable | Formality status | | State ownership | |
|---|---|---|---|---|
| | Coefficient | Std. err. | Coefficient | Std. err. |
| Doubly robust AIPW fractional regression | 0.0053** | 0.0017 | −0.0123*** | 0.0041 |
| IPW fractional regression | 0.0046** | 0.0018 | −0.0130 *** | 0.0033 |
| Nearest matching using Mahalanobis and caliper 0.2 | 0.0053** | 0.0021 | −0.0121*** | 0.0037 |
| Nearest matching using caliper 0.2 | 0.0038* | 0.0021 | −0.0117*** | 0.0036 |

Notes: Robust standard errors in parentheses. $*p < 0.1$; $**p < 0.05$; $***p < 0.01$.

Moreover, Table 5 suggests a positive and significant impact of formality status on firms' TE, suggesting that formalisation by possessing formal accounting standards and being subject to corporate income tax is crucial to improving firms' efficiency. More precisely, legallyregistered firms have a better capability of expanding their business activities through more accessible access to credit, more political approvals and contracts with governments and other businesses than informal ones (Fajnzylber et al., 2011; Distinguin et al., 2016). In other words, legal firms are often more prominent (i.e., to scale up and hire more workers, they are more likely to be formalised), also more visible by public authorities, and primarily some formal SMEs are owned by the state (Rand and Torm, 2012). On the other hand, smaller household businesses may fear that formalising could involve higher costs than benefits because of direct costs linked to higher business taxes and employment of certified accountants as well as indirect costs related to transparency

(e.g., more frequency and large size of bribery payments to local officials) (McKenzie and Sakho, 2010; Floridi et al., 2021).

## 6   Discussion and conclusions

Small and medium-scale enterprises play an essential role in a developing economy like Vietnam, which needs strong support from the government. Our study first examines the firms' TE using Vietnamese SME data from 2017 to 2018. We then investigate the effects of formality status and state ownership on the performance (i.e., TE) of small and medium-scale enterprises in Vietnam.

Our results of the PSM suggest that state-owned firms in Vietnam do not seem to perform more efficiently than those that do not have a state ownership status. This result could come from a reason that state-owned firms in Vietnam are more likely to rely on support from the government in their business activities. Thus, political resources could disincentivise their motivation to improve productivity (Desai et al., 2011; Li et al., 2019). For instance, economic privileges gained from state ownership (i.e., firm-state relationships) could come with a price, meaning that influential firms have to provide politicians with politically valuable benefits to exchange for subsidies and protection from the competition (e.g., more access to credits, marketability, etc.) (Desai et al., 2011). Consequently, state-owned firms are less likely to invest in operational and production activities (e.g., R&D) and thus become less productive than other counterparts. Therefore, it is essential that policies should focus on weakening cronyism in firm-state relations to incentivise small and medium-scale firms to efficiently use their resources in R&D investment to improve productivity.

Moreover, our results suggest that formalisation could bring advantages to small and medium-scale firms since formal firms have higher TE than informal ones. This result confirms the findings of existing literature that the informal sector is associated with low profits and productivity because of limited credit access and capacity (Rand and Torm, 2012). For instance, the legal system forces formalised firms to be more compliant with regulations, and thus the formality status helps improve their probability of getting access to formal credit (Fajnzylber et al., 2011; Distinguin et al., 2016). In addition, officially registered firms are often more willing to invest in R&D, operational and production activities than informal counterparts; thus, formality helps improve their productivity and long-term stability of their businesses (Rand and Torm, 2012). Therefore, policymakers should focus on providing information about the registration procedure, assisting SMEs with formalisation processes, and helping them realise their growth potential in the formal sector to encourage formalisation.

Our findings suggest some policy implications for the development of the political economy. Firstly, transparent government interventions are needed to avoid cronyism in firm-state relations since they would harm productivity. For instance, limited privilege access among favoured groups could be a mechanism for sustaining order in governments with low state capabilities. Secondly, it is essential to encourage legal registration, the levels of tax registration and the number of formal labour contracts by reducing the registration and transaction costs and lowering social security payments for hired labourers. Finally, policies should also emphasise raising firm owners' understanding of the benefits of formal registrations and the detrimental effects of political connections to

assist small and medium-scale firms in realising their potential in developing the formal sector in Vietnam.

Our results suggest the important role of formality in the development of the SME sector. However, most SMEs and microenterprises in many developing countries still remain informal despite the efforts of reforms for more than a decade (Bruhn and McKenzie, 2014).

Thus, it is important that future research should investigate drivers drawing evidence of why small and medium-scale firms formalise. Moreover, the informal sector, in practice, is highly diverse. Thus, it is interesting for further studies to examine the impact of different regulations for formalisation on productivity regarding the different SME firm sizes or scales since the policy recommendations could differ for dealing with different scales of informal enterprises. In particular, larger informal firms are more feasible (i.e., quite quickly formalised), and thus taxation regulations are more applied, while smaller informal firms require improvements in support services, assistance and easing of regulations to make sure their compliance (Benjamin and Mbaye, 2012).

## Data and code availability

The data and statistical codes (in Stata) used in this study are available from the authors upon request.

## Acknowledgements

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## Notes

1    The reports of the GSO of Vietnam can be found on the following official website https://www.gso.gov.vn/en/enterprises/.