Competition and firm performance: evidence from Vietnam

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Abstract

Purpose – This paper aims to examine the impact of competition on firm performance using a data set of 352 firms listed on Vietnam's stock exchanges from 2015 to 2019.

Design/methodology/approach – The two-step system generalized method of moments is used to estimate this impact.

Findings – The findings reveal an inverted U-shaped relationship between competition and firm performance. Competition improves firm performance if its intensity is moderate. However, if the competition intensity exceeds the optimal level, the performance deteriorates accordingly.

Research limitations/implications – The authors only studied Vietnamese firms due to the limited ability in data collection. It would be better to validate the findings using data from other transition economies.

Practical implications – The non-linear relationship between competition and performance implies that government should pay more attention to retaining competition at an appropriate level.

Social implications – Firms contribute a lot to the prosperity of Vietnam. Therefore, the findings have a meaningful implication for Vietnam's government to moderate competition to improve its firms' performance.

Originality/value – This paper contributes to the extant literature by providing firsthand evidence of the impact of competition on firm performance in Vietnam – a transition economy.

Keywords Boone indicator, Competition, Leverage, Performance, Vietnam

Paper type Research paper

1. Introduction

The impact of competition on firm performance is an attractive issue to researchers, leading to studies with mixed findings. According to the competition-inefficiency hypothesis, this impact is negative (Casu & Girardone, 2009; Assefa et al., 2013). In competitive markets, firms try to innovate, and products quickly become inferior. Clients tend to switch to providers who satisfy them the most, making firm–customer relationships unstable and short-lived. Then, firms must devote more resources to retaining and attracting customers.

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Under competition pressure, firms may reduce their investment, thus losing opportunities to expand.

In contrast, other studies found a positive relationship between competition and firm performance. The competition encourages firms to innovate, resulting in the efficient allocation of resources and productivity growth. A competitive market ensures that firms compete proactively and places them under pressure to provide high-quality products at better prices. Competition mitigates inefficiency by minimizing internal conflicts and enhancing quality monitoring. It also creates more choices for consumers, removing distortions and opportunities for corruption and rent-seeking (Moyo, 2018). Some empirical studies find an inverted-U-shaped nexus between competition and performance (Liu et al., 2013), implying that competition enhances firm performance, but this effect deteriorates after a certain threshold. Indeed, the competition encourages firms to innovate to mitigate costs and provide better products. Under competition pressure, managers work harder, reducing mistakes that harm their firm performance. However, if competition turns too intense, each firm only enjoys a marginal benefit, exacerbating its incentives and performance.

The existing studies on the competition–performance nexus come mostly from developed economies. Therefore, the findings may have limited use in transition economies (Hoskisson et al., 2000). Economic transformation may result in a significant increase in market competition. However, markets in transition countries have not been able to boost fair competition, and government interventions have prevailed. Despite extensive privatization, state-owned enterprises (SOEs) still play a role in vital economic sectors.

Vietnam is a transition economy with a strong presence of SOEs, a less robust regulatory and legal environment and rampant corruption. As a result, the country has witnessed a sharp rise in the number of firms and levels of product market competition since the 1990s. However, this issue has not got sufficient awareness by researchers in Vietnam (Nguyen & Nghiem, 2017; Le et al., 2020). Therefore, it is worthwhile to have further studies on the effect of competition on firm performance in this country. That stimulates us to conduct this paper to contribute to the extant literature by providing firsthand evidence of the relationship between competition and performance of 352 non-banking firms listed on Vietnam's stock exchanges from 2015 to 2019.

This paper proceeds as follows. Section 1 introduces it, followed by the literature review and hypothesis development in Section 2. Then, Section 3 discusses the Vietnamese corporate competition context. Section 4 specifies the empirical model to be estimated using the methodology identified in this section. Section 5 analyzes our findings. Finally, Section 6 concludes the paper and gives policy recommendations.

2. Literature review and hypothesis development

The "quiet life" hypothesis of Hicks (1935) notices the positive impact of competition on firm performance. In highly concentrated markets, monopolistic power allows managers to enjoy a "quiet life" without competition pressure, resulting in declined efforts. Increased competition forces them to work harder, leading to better performance. Leibenstein (1966) adheres to the "quiet life" hypothesis in two ways. First, owners better evaluate the capacity of managers in competitive markets because competition reduces information asymmetry. Second, higher competition causes more price elasticity of demand, inducing firms to innovate to reduce costs.

Obembe & Soetan (2015) reveal that competition spurs productivity growth of 76 non-financial firms in Nigeria from 1997 to 2007. Using a panel data set for 3,325 European

banks in 1995–2005, Schaeck & Cihák (2014) reveal that competition is stability-enhancing. This effect is stronger for healthy banks than for fragile ones. Similarly, Kasman & Carvallo (2014) indicate that competition enhanced the efficiency of 272 commercial banks from 15 Latin American countries from 2001 to 2008. Moyo (2018) studies the relationship between competition and efficiency of 17 South African banks from 2004 to 2015. The author finds that the Lerner index hurts efficiency, but the Boone indicator (BI) improves it. Nguyen & Nghiem (2017) indicate that competition slightly improved the efficiency of Vietnamese banks from 2000 to 2014. Le et al. (2020) found a positive relationship between competition and efficiency of 30 commercial banks in Vietnam from 2010 to 2017.

In contrast, the structure–conduct–performance paradigm argues that firms in concentrated markets perform better than those in competitive ones (Bain, 1951). Higher market concentration leads to lower competition by reinforcing collusive behaviors. In a highly concentrated market, a few dominating firms charge higher prices to raise profits. The competition-inefficiency hypothesis contends that increased competition results in decreased efficiency (Schaeck et al., 2009). In a competitive market, firm–client relationships are often short-lived because clients may switch to other preferred providers. The Schumpeterian theory also indicates that competition hinders firm growth (Schumpeter, 1950). In competitive markets, firms usually replicate rivals instead of innovating. Their products are thus outdated, leading to lower productivity growth.

Casu & Girardone (2009) point out a positive relationship between market concentration and efficiency for 2,701 commercial banks from 2000 to 2005. Tan (2017) found a negative link between competition and profitability of 100 Chinese commercial banks from 2003 to 2013, implying that lower competition in the deposit market results in greater profitability. Weill (2004) discovers the negative impact of competition on bank efficiency in 12 EU countries from 1994 to 1999. Pruteanu-Podpiera et al. (2008) found evidence for Czech banks from 1994 to 2005 that rejects the "quiet life" hypothesis. Kahyarara (2013) found a negative relationship between competition and productivity using the Hirschman–Herfindahl Index (HHI). Finally, Assefa et al. (2013) show that competition harms the repayment performance of 362 microfinance institutions in 73 countries from 1995 to 2008.

Empirical studies (Carlin et al., 2003; Liu et al., 2013) reveal a non-linear impact of competition on performance. Increased competition enhances firm performance if its intensity is reasonable. The competition urges firms to innovate to mitigate costs and improve executive functions. They also attempt to provide high-quality products at better prices, improving performance. Competition induces managers to work hard, minimizing mistakes, costs and internal conflicts (Beiner et al., 2011). However, firm performance will plunge if competition intensity exceeds the optimal threshold. Intense competition generates more consumer choices, so firms overuse resources to retain them. Fierce competition induces firms to postpone investment, losing profitable opportunities.

Carlin et al. (2003) show an inverted-U relationship between competition and performance for 3,300 firms in 25 transition countries in 1999. Aghion et al. (2005) also indicate an inverted-U relationship between competition and innovation. Moderate competition creates incentives for firms to invest in R&D, thus enhancing productivity. However, fierce competition no longer motivates firms, exacerbating their productivity. Nguyen et al. (2016) reveal an inverted-U shape of the competition–innovation nexus for banks in Vietnam, China and India from 1995 to 2011. According to Liu et al. (2013), increased competition improves bank stability in relatively uncompetitive markets and increases fragility in highly competitive markets.

Based on the above theories and empirical outcomes, we propose the following hypothesis:

H1. There is an inverted U-shaped effect of product market competition on firm performance.

3. Vietnamese corporate competition context

In 1986, Vietnam launched the economic reform called *Doi moi* to transform its centrally planned economy into a socialist-oriented market one and achieved significant economic growth (World Bank, 2021). That achievement turned Vietnam into a lower-middle-income country, with a noted contribution from its firms. A sharp rise in the number of firms in Vietnam signals increasing competition amidst the shrinking interventions of the government. In addition, the openness in foreign trade intensifies the competition among firms to outlet their output.

In Vietnam, the number of SOEs dropped from 0.8% of total enterprises in 2011–2015 to 0.4% in 2015–2019 (MPI, 2020). Although the number of SOEs comprised only 0.4%, they accounted for 25.6% of the country's capital (MPI, 2020), implying that most of the SOEs in Vietnam are large ones. The SOEs were responsible for 60% of non-performing loans in Vietnam's economy (OECD, 2021). A few large SOEs account for a high proportion of total investments, control key business fields and benefit from privileges from the government or access to credit from state-owned commercial banks. As a result, the competition in Vietnam appears unfair between SOEs and small- and medium-sized firms.

The government has strongly intervened in its product market. Under the Competition Law of 2004, the Vietnam Competition and Consumer Authority (VCCA) and the Vietnam Competition Council (VCC) jointly govern the market competition of the country. On July 1, 2019, the Competition Law of 2018 took effect, replacing the Competition Law of 2004. The VCCA and the VCC merged into the National Competition Commission (NCC). The functions of the NCC are to investigate and adjudicate cases involving restraint of competition and unfair competitive practices. The Competition Law of 2018 has expanded its scope, including local and foreign enterprises and individuals in case their actions have a competition restriction impact on the domestic market.

According to the 2018 annual VCCA report, competition violations (i.e. unfair competition in advertising, discrediting other firms or illegal multilevel marketing) soared from 14 in 2009 to 41 in 2012. However, the number declined to 3 in 2013 and 7 in 2014 and rose significantly to 20 in 2015–2016. In 2007–2012, the number of violations regarding the abuse of dominance and monopolistic power nearly tripled, from 5 to 14. However, it decreased significantly over 2012–2017, from 14 to 4 and slightly rose to 7 in 2018. According to its 2019 Annual Report, VCCA issued sanctioning decisions for four competition violations concerning misleading indications and one case regarding illegal multilevel marketing in 2019.

The government has tried to enhance competition, but many industries still have a high concentration, i.e. automobiles, motorbikes, construction, electricity, power electronics, plastics, industrial and medical equipment, food and beverage and energy. The regulation regarding competition is suboptimal, and the enforcement is weak, making unfair competition violations more likely (Malesky et al., 2020). In addition, Vietnam has a high level of corruption, adversely affecting competition because big firms can afford to pay substantial bribes to officials in exchange for government contracts, land occupation permits or licenses for natural resource exploitation, producing monopoly or oligopolistic rents (Maruichi & Abe, 2019).

4. Methodology

4.1 Empirical model

We specify the following model to test the proposed hypothesis:

$$Perf_{i,t} = \beta_0 + \beta_1 Comp_{i,t} + \beta_2 Comp_{i,t}^2 + \lambda \kappa_{i,t} + \varepsilon_{i,t} \quad (1)$$

In Model (1), $Perf_{i,t}$ is the performance of firm i in year t proxied alternatively by return on assets (ROA), return on equity (ROE) and return on sales (ROS); β_0 is the constant term; $Comp_{i,t}$ is the competition intensity facing firm i in year t measured by the BI; $Comp_{i,t}^2$ is the squared term of $Comp_{i,t}$; $\kappa_{i,t}$ is a set of control variables; and $\varepsilon_{i,t}$ is the error term of the model.

4.1.1 Competition variable. To measure competition, researchers follow a structural or non-structural approach. The first approach uses the HHI or the four-firm concentration ratio and argues that higher product market concentration means lower competition and vice versa (Fosu, 2013). The second approach derives the intensity of competition from market behavior. It refutes that higher concentration may not necessarily mean lower competition. For the efficiency–structure hypothesis, a high degree of competition probably results from pronounced efficiency or efficiency propels some firms to grow fast but others to downsize. Concentration may emerge from fierce competition driving inefficient firms out of the market (Boone et al., 2007). Therefore, concentration fails to reveal competition intensity.

To overcome the setback of the structural approach, Boone et al. (2005, 2007) and Boone (2008) created the BI, which is the percentage drop in profit when the marginal cost rises by 1%. In a highly competitive market, a 1% increase in marginal cost leads to a more than 1% decrease in profit. This indicator shows how sensitive a firm's profit is to its efficiency or highly competitive markets penalize inefficient firms more severely in lost profits. The BI that is simple in data requirements appears appropriate for empirical studies where it is hard to obtain relevant data. Therefore, many researchers use it in their studies (Fosu, 2013). The BI is estimated as follows (Tabak et al., 2012; Moyo, 2018):

$$\ln(\pi_{i,t}) = \delta + \psi \ln(MC_{i,t}) + \mu_{i,t} \quad (2)$$

where $\pi_{i,t}$ is the profit of firm i in year t measured by the ratio of profit to total assets. $MC_{i,t}$ is the marginal cost of firm i in year t, and $\mu_{i,t}$ is the error term of the model. Coefficient ψ is the BI. As argued, ψ is negative, implying that the larger the absolute value of ψ is, the higher the competition intensity will be.

As firms may incur losses, their profits can be negative. Thus, the variables in Model (2) are transformed using the inverse hyperbolic sine (IHS) transformation, i.e. $\ln^* X = \text{arcsin}h(X) = \ln\lfloor X + \sqrt{X^2+1} \rfloor$. The IHS transformation helps keep null and negative observation values and the properties of the logarithm transformation (Bellemare & Wichman, 2020). Calculating the BI requires marginal cost. We estimate the marginal cost using the following translog cost function (Phan et al., 2019):

$$\begin{aligned} \ln TC_{i,t} = {} & \alpha_0 + \alpha_1 \ln Q_{i,t} + \frac{1}{2}\alpha_2 (\ln Q_{i,t})^2 + \sum_{j=1}^{4} v_j \ln P_{j,i,t} + \frac{1}{2}\sum_{j=1}^{4}\sum_{k=1}^{4} \theta_{j,k} \ln P_{j,i,t} \ln P_{k,i,t} \\ & + \sum_{j=1}^{4} \gamma_j \ln Q_{i,t} \ln P_{j,i,t} + \tau_{1,t} T + \frac{1}{2}\tau_{2,t} T^2 + \tau_{3,t} T \ln Q_{i,t} \\ & + \sum_{j=1}^{4} \partial_j T \ln P_{j,i,t} + \omega_{i,t} \end{aligned} \quad (3)$$

where $TC_{i,t}$ is total cost of firm i in year t. $Q_{i,t}$ is total output of firm i in year t, measured by sales to yield the same unit across industries. The primary input prices used to estimate the cost function are the price of materials ($P_{1i,t}$), the price of labor ($P_{2i,t}$), the price of fixed capital ($P_{3i,t}$) and the price of administration ($P_{4i,t}$). Concretely, $P_{1i,t}$, $P_{2i,t}$, $P_{3i,t}$ and $P_{4i,t}$ are measured by the ratio of material costs to operating revenue, the ratio of personnel expenses to total assets, the ratio of fixed asset depreciation to fixed assets and the ratio of administrative expenses to operating revenue, respectively. T is the time trend used to capture the influence of technological progress and shifts in the business cycle that leads to changes in the cost function over time. The cost function must be homogeneous of degree one in the input prices, so the following restrictions are imposed on its parameters:

$$\sum_{j=1}^{4} v_j = 1; \quad \sum_{j=1}^{4}\sum_{k=1}^{4} \theta_{j,k} = 0; \quad \sum_{j=1}^{4} \gamma_j = 0; \quad \text{and} \quad \sum_{j=1}^{4} \partial_j = 0 \tag{4}$$

The marginal cost is estimated by taking the first derivative of the cost function as follows:

$$MCi,t = \frac{\delta TC_{i,t}}{\delta Q_{i,t}} = \frac{TC_{i,t}}{Q_{i,t}}(\alpha_1 + \alpha_2 \ln Q_{i,t} + \sum_{j=1}^{4} \gamma_j \ln P_{j,i,t} + \tau_{3,t} T) \tag{5}$$

The inclusion of $Comp_{i,t}^2$ considers the possible inverted U-shaped effect of competition on performance, as proposed by our hypothesis. If so, the coefficient $Comp_{i,t}$ is positive, and the coefficient $Comp_{i,t}^2$ is negative.

4.1.2 Control variables. In Model (1), $\kappa_{i,t}$ is a set of control variables that describes firm characteristics. The literature guides the choice of these variables. The first control variable ($Fage_{i,t}$) is the number of years in operation of firm i at year t. According to previous studies (Mnasri & Ellouze, 2015), the longer this duration is, the better the performance will be. Older firms often have low operating costs and rich market experience. Then, the coefficient $Fage_{i,t}$ is positive. Nevertheless, older firms would become conservative to changes if operating in saturated industries, leading to a lack of creativity, backwardness in technology and losing control of costs (Moyo, 2018). This argument means lower efficiency, so the coefficient $Fage_{i,t}$ is negative.

$Size_{i,t}$ is the natural logarithm of total assets of firm i in year t. According to the economies of scale theory, upsizing helps firms reduce production costs and lower prices to compete. As a result, large firms tend to buy more inputs, retain long-term contracts and benefit from diversification (Himmelberg et al., 1999). In contrast, small firms find it harder to access external finance and lack high-quality human resources. Thus, the coefficient $Size_{i,t}$ is positive (Tabak et al., 2012).

$Labor_{i,t}$ (i.e. labor productivity) is the sales-to-labor expenses ratio of firm i in year t. Human resource constitutes competitive advantages. Low labor productivity is a reason for overrunning costs, delaying schedules and poor planning and managing. To get higher labor productivity, firms must have a well-educated workforce. Thus, the higher labor productivity is, the better firm performance is (Charoenrat & Harvie, 2014). Consequently, the relationship between labor productivity and firm performance is positive. $Fass_{i,t}$ is the ratio of fixed assets to sales of firm i in year t, which indicates how well a firm uses fixed assets to generate sales. The higher this ratio is, the less effective using fixed assets is (Alhassan & Ohene-Asare, 2016). Thus, the coefficient $Fass_{i,t}$ is negative.

Leverage ($Lev_{i,t}$) is the debt-to-equity ratio of firm i in year t. It measures the level at which a firm finances its operation through debt versus shareholder equity. If leverage increases earnings by an amount greater than the cost of debt, performance improves. Concretely, leveraged firms may use tax-shield to enhance operating profits. The disciplining effect of debt strengthens monitoring mechanisms and reduces the amount of free cash flow, thereby mitigating agency costs and enhancing firm performance (Jensen, 1986). However, if interest cost outweighs the increase in earnings, the performance declines. An excessive level of debt may result in suboptimal investment due to the fear of default. Clients may suspect the product quality of highly leveraged firms (Maksimovic & Titman, 1991). Moreover, creditors tend to impose more restrictive covenants on highly leveraged firms, making it hard to access external finance.

$Growth_{i,t}$, a proxy for growth opportunities, is measured by the equity growth rate of firm i at time t. As equity growth affects investment opportunities, it can generate profits for firms. Furthermore, firm growth is positively related to subsequent profitability. Therefore, a higher growth rate means better prospects, so firms may capture profitable opportunities and extend market shares (Fuertes-Callén & Cuellar-Fernández, 2019). Therefore, the coefficient of this variable is positive.

$Perf_{i,t-1}$ is a one-year lagged performance of firm i, which divulges the persistence of firm performance over time. Firms often use part of the previous year's profit to invest and seize profitable opportunities. A positive value of the coefficient of this variable implies that firm performance is persistent. Thus, the coefficient $Perf_{i,t-1}$ is expected to be positive.

We include $Trade_{i,t}$ and $Manu_{i,t}$ to test for the possible gap in performance among firms in different sectors (i.e. manufacturing, trade and service). $Trade_{i,t}$ takes the value of 1 for trading firms and 0 otherwise. Likewise, $Manu_{i,t}$ takes the value of 1 for manufacturing firms and 0 otherwise.

$GDP_{i,t-1}$ is Vietnam's economic growth rate in year t-1, which is included to control macroeconomic performance. A high GDP divulges a favorable business environment for firms to reduce costs and capture profitable opportunities. Therefore, GDP is positively related to firm performance (Nguyen & Nghiem, 2017; Moyo, 2018).

4.2 Econometrics

Although the data set captures the dynamic nature of firm performance, it is affected by the endogeneity problem. Our empirical model takes the form of a dynamic panel regression model that contains unobserved individual effects. These effects are correlated to the lagged dependent variable, making the standard fixed effects (FE) or random effects (RE) estimators inconsistent. In such a circumstance, the GMM difference is the most appropriate estimator for tackling the endogeneity, unobserved heterogeneity, and autocorrelation problems (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998).

However, the GMM difference can be inefficient when the instruments are weak. Arellano & Bover (1995) and Blundell & Bond (1998) developed the system GMM that includes lagged levels and lagged differences. The system GMM assumes no correlation between the instruments' first differences and the fixed effects of the estimation model (Roodman, 2009). This assumption may increase the number of instrumental variables and improve the estimator's efficiency. Furthermore, a two-step system GMM may prevent unnecessary data loss, providing efficient and consistent estimates for the coefficients (Arellano & Bover, 1995). In this paper, we use the two-step system GMM to solve endogeneity. One or two-period lags in first-differences or levels of independent variables are instruments (Bontempi & Mammi, 2015).

Before running the two-step system GMM, we use unit-root tests (including the Hadri Lagrange multiplier and Phillips–Perron tests) to test our data's stationarity. If the data are stationary, it is appropriate to conduct the two-step system GMM. After running the two-step system GMM regression, we conduct post-diagnostic tests, including Arellano–Bond tests for AR(1) and AR(2), Hansen's J-test and Wald test. Arellano–Bond tests for AR(1) and AR(2) test the first and second-order autocorrelation of the residuals. According to Arellano–Bond tests, we need to reject the null hypothesis of no first-order serial correlation but not reject the null hypothesis of no second-order serial correlation of the residuals. Hansen's J-test is used to test the validity of the instruments of endogenous variables. Finally, the Wald test confirms the goodness of fit of our models.

5. Findings

5.1 Sample description

We use simple random sampling to create a panel data set of 352 Vietnamese listed firms in 2015–2019. The list of firms is from Vietnam's Stock Exchanges, and a random number generator (i.e. RAND function) is applied to select firms. We exclude financial firms and those providing insufficient information or under five years. Concretely, the sample comprises 232 manufacturing firms (accounting for 65.91% of the total), 47 trading firms (13.35%) and 73 service firms (20.74%). The mean ROA of the firms is approximately 6.1% and declined gradually over the studied period. The mean ROE of the firms is 12.16%. Their mean ROS is 7.07 and fluctuated slightly during that period. The performance in the service sector is highest due to higher value-added per unit of input (Table 1). Despite generating less value-added than the service sector, manufacturing remains vital in exports and innovation.

We use the BI to measure market competition ($Comp_{i,t}$). Its mean value is 1.04, 1.06 and 0.58 for the manufacturing, trade and service sectors, respectively (Table 1). There is a gap in the competition among these sectors, which is in line with the findings by Nguyen et al. (2013) and Malesky et al. (2020). The competition in the service sector is the lowest among the three sectors. Service mainly runs on human resources that are unique, rare, irreplaceable and hard to imitate. Managing and using appropriate human resources may help service firms gain sustained competitive advantages. On the other hand, a firm may find it hard to replicate the services of its competitors. The typical characteristics of services are less tradable and standardized (OECD, 2005). Hence, service markets are less competitive. Besides, regulatory obstacles in the service sector (i.e. licensing of professional service suppliers, rules on investing and restrictions on the movement of people) act as barriers to entry, limiting competition in this sector (Benz et al., 2020).

The mean age of the firms ($Fage_{i,t}$) is 28 years, revealing that most firms have relatively rich experience in their field of business. Firm size ($Size_{i,t}$) measured by the natural logarithm of total assets has a mean of 13.50. The size of the trading firms (13.79) outweighs that of the

Table 1.
Mean values of variables by sector

Sectors	ROA (%)	ROE (%)	ROS (%)	Comp (BI)	Fage	Size	Labor	Fass	Lev	Growth
Manufacturing	6.15	12.16	5.89	1.04	30.28	13.42	3,165.67	0.28	1.53	12.46
Trade	4.58	11.23	6.07	1.06	24.19	13.79	770.89	0.17	2.16	15.92
Service	6.92	12.76	11.46	0.58	23.25	13.57	3,353.99	0.40	1.41	16.82
Sample	6.10	12.16	7.07	0.95	28.01	13.50	2,884.97	0.29	1.59	13.82

Source: The authors' data set

others. The sales-to-labor expenses ratio ($Labor_{i,t}$) used to measure labor productivity is the highest in the service sector since the service firms generate the highest value-added. In Vietnam, a large proportion of low-pay and young laborers work in the service sector.

The mean of the fixed assets to sales ratio ($Fass_{i,t}$) is 0.28, 0.17 and 0.40 for the manufacturing, trade, and service sectors, respectively, meaning that the trading firms use better generate sales out of fixed assets because they have fewer fixed assets. The debt-to-equity ratio that measures financial leverage ($Lev_{i,t}$) has a mean of 1.59. Again, this variable has the highest mean (2.16) among the three sectors, implying that they are more efficient in using debts to finance their operation. Firm growth ($Growth_{i,t}$), measured by the equity growth rate, has a mean of 13.82%. The manufacturing sector has the lowest growth, indicating unpromising prospects for the firms in this sector.

The pair-wise correlation coefficients among explanatory variables are smaller than 0.8 ($0.0002 \leq |r_{ij}| \leq 0.546$). Besides, the mean values of the variance inflation factor are about 1.25, less than 10. These results indicate no evidence of multicollinearity (Gujarati, 2004). Similar results also hold for ROE and ROS, implying that the explanatory variables can predict the dependent variable or that our regression results are reliable.

5.2 Estimation results

Before conducting the regression, we performed unit-root tests to test the stationarity of the data, which indicated that the data did not contain unit roots. Thus, it is appropriate to use the system GMM approach. Wu-Hausman's test confirmed the endogeneity problem in our model. To solve it, we used instruments that are one or two-period lags in first-differences or levels of independent variables such as competition, growth, leverage, firm size and one-year lagged performance (Liu et al., 2013; Bontempi & Mammi, 2015). We used three different indicators to measure firm performance, so there are three estimation models in Table 2. In all models, the Arellano–Bond tests for AR(1) are significant at 1%, whereas the Arellano–Bond tests for AR(2) are insignificant. The results imply that the autocorrelation of the residuals is present in the first order but absent in the second order. Hansen-J-test is insignificant, indicating that the instrumental variables used to tackle the endogeneity problem are valid. The Wald tests are significant at 1%, divulging that all models are correctly specified. The post-diagnostic tests indicate that the empirical analyses are robust and consistent with the system GMM estimation.

The findings confirm our hypothesis of an inverted U-shaped effect of competition on firm performance (Figure 1). The coefficients $Comp_{i,t}$ are positive and statistically significant at 1%, 5% and 1% in ROA, ROE and ROS models, respectively (Table 2).

The coefficients $Comp^2_{i,t}$ are negative and statistically significant at the same levels. Taking a partial derivative of $Perf_{i,t}$ with respect to $Comp_{i,t}$ gives the following:

$$\frac{\partial Perf_{i,t}}{\partial Comp_{i,t}} = \beta_1 + 2\beta_2 Comp_{i,t} \tag{6}$$

Expression (6) helps compute the optimal level of competition corresponding to the highest performance of the firms:

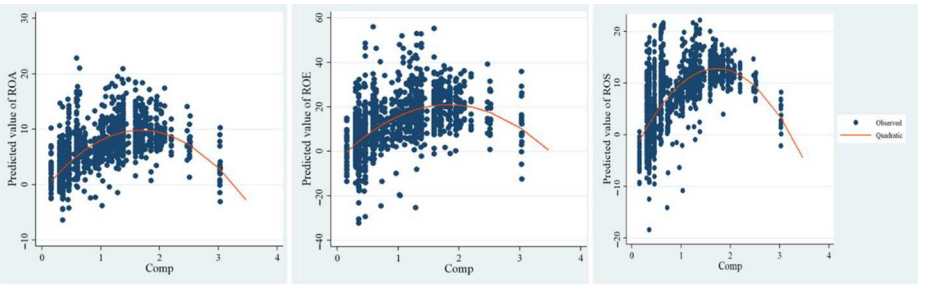
$$\beta_1 + 2\beta_2 Comp_{i,t} = 0 \text{ or } Comp_{i,t} = -\beta_1/2\beta_2 \tag{7}$$

In the ROA model, since $\beta_1 = 11.378$ and $\beta_2 = -3.247$, then $Comp_{i,t} = 1.752$. If the intensity of competition is below 1.752, competition will boost the performance of the firms and vice versa. This level of competition intensity is 1.884 for ROE and 1.854 for ROS.

Variables	ROA	ROE	ROS
Intercept	–6.734* (–1.880)	–22.180** (–2.410)	–16.176 (–1.560)
$Comp_{i,t}$	11.378*** (2.800)	25.044** (2.220)	22.646*** (3.450)
$Comp^2_{i,t}$	–3.247*** (–2.660)	–6.647** (–2.130)	–6.107*** (–3.440)
$Fage_{i,t}$	–0.005 (–0.320)	–0.027 (–0.880)	–0.033 (–1.000)
$Size_{i,t}$	0.175 (1.400)	0.732* (1.710)	1.024 (1.430)
$Labor_{i,t}$	0.000 (–0.630)	0.000 (1.350)	0.000 (–0.760)
$Fass_{i,t}$	–1.088** (–2.330)	–6.425** (–2.420)	–4.303** (–2.350)
$Lev_{i,t}$	–0.247** (–2.530)	–0.033 (–0.030)	–0.435*** (–2.620)
$Growth_{i,t}$	0.029*** (3.290)	0.074*** (2.890)	0.018** (2.520)
$Perf_{t-1}$	0.458*** (4.440)	0.703*** (6.750)	0.262** (2.090)
$Trade_{i,t}$	–2.262*** (–3.220)	–4.443** (–2.560)	–7.148*** (–4.080)
$Manu_{i,t}$	–2.213*** (–2.700)	–5.047** (–2.230)	–8.151*** (–4.840)
$GDP_{i,t-1}$	0.408** (2.280)	0.763** (2.200)	0.383** (2.110)
Number of observations	1,408	1,408	1,408
Number of groups	352	352	352
Wald test	1,042.010	1,297.350	329.930
Wald test *p*-value	0.000	0.000	0.000
AR(1) *p*-value	0.000	0.000	0.000
AR(2) *p*-value	0.288	0.363	0.309
Hansen-J test *p*-value	0.540	0.550	0.490

Notes: (***), (**) and (*) denote significant at 1, 5 and 10%, respectively. *Dependent variable*: Firm performance
Source: The authors' data set

Table 2.
Estimation results



Source: The authors' dataset

Figure 1.
Curve fitting plot between firm performance and competition

The coefficient $Size_{i,t}$ in the ROE model is positive and significant at 10%, divulging larger firms performed better than smaller ones. The coefficients $Fass_{i,t}$ are negative and significant at 5% in all estimation models. These findings imply that a higher level of fixed assets to sales ratio causes less efficient uses of fixed assets. The coefficients $Lev_{i,t}$ are negative and significant at 5% in the ROA model and at 1% in the ROS model. The coefficients mean that a higher debt-to-equity ratio hurts firm performance. The coefficients $Growth_{i,t}$ are positive and significant at 1% in the ROA and ROE models and 5% in the ROS model, suggesting that higher growth is associated with better performance.

The coefficients $Perf_{i,t-1}$ are positive and significant at 1% in the ROA and ROE models and at 5% in the ROS model, meaning that the performance in the preceding year continued over time. The coefficients $Trade_{i,t}$ are negative and significant at 1% in both the ROA and

ROS models and at 5% in the ROE model. The coefficients $Manu_{i,t}$ are negative and statistically significant at the same levels as the coefficients $Trade_{i,t}$. These findings mean that the service firms are more efficient than the others. In all estimation models, the coefficients $GDP_{i,t-1}$ are positive and significant at 5%, revealing that good economic conditions help firms take more advantages to increase their performance.

6. Conclusion and recommendations

This paper examines the impact of competition on firm performance in Vietnam using a data set of 352 firms listed on Vietnam's stock exchanges from 2015 to 2019. The findings reveal an inverted U-shaped relationship between competition and firm performance. Increased competition enhances performance if its level is reasonable. However, this effect deteriorates after the optimal threshold. Too intense competition no longer motivates firms, and firm performance declines accordingly. Besides, size and growth improve performance, while the fixed assets-to-sales ratio and the leverage have detrimental effects. We also find that service firms are more efficient than manufacturing and trading firms.

The findings are valuable to Vietnamese competition authorities and policymakers. The non-linear relationship between competition and performance implies that government should pay more attention to retaining competition at an appropriate level. The government should design better policies to contain fierce competition or monopoly, i.e. amending and supplementing the competition law and regulations. If market competition is lower than the optimal level, it is necessary to ease entry barriers to encourage the entry of new firms and motivate incumbent ones. Nevertheless, the government may tighten regulations to eliminate inefficient firms so that the market effectively operates when the competition turns excessively fierce. Additionally, the government may amend and supplement competition laws and regulations to create a conducive business environment. Besides, firms should use fixed assets efficiently by applying new technologies to enhance competitiveness.

We used the BI to measure competition, which may not be perfect. In addition, we only studied Vietnamese firms due to our limited ability in data collection. It would be wise to validate the findings of this paper using data from other transition economies. Despite these limitations, this paper still has contributions to the extant literature.

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Research data are not shared.