State ownership and firm profitability in emerging markets

A simultaneous equations analysis

Mouna Ben Rejeb Attia

*Higher Institute of Accountancy and Entrepreneurial Administration,
Manouba University, Manouba, Tunisia*

Naima Lassoued

Higher School of Business, Manouba University, Manouba, Tunisia, and

Mohamed Chouikha

Ministry of Finance, Kasbah, Tunisia

Abstract

Purpose – The purpose of this paper is to examine the relationship between state ownership and firm profitability in developing countries by considering the endogenous nature of state ownership and firm profitability.

Design/methodology/approach – A simultaneous equation analysis is applied to study 232 Tunisian firms over the 2001-2013 period. This analysis is compared with OLS estimates to show its power in terms of an endogenous setting and its potential to improve estimation.

Findings – Unlike the OLS estimates that show a non-significant relationship between state ownership and firm profitability, the simultaneous equation analysis reveals a non-symmetrical concave relationship. Specifically, state ownership affects positively firm profitability when it is relatively small and negatively when state ownership dominates. Specification test indicates that both state ownership and firm profitability are endogenous. Furthermore, the simultaneous model's explanatory power exceeds that of OLS estimates and proves to be a suitable estimation technique.

Practical implications – Taking into account public firms' categorization, the authors implicitly examine the effect of privatization and corporatization on firm profitability. The findings imply that privatization is not the only solution to the operational problems of public firms, but an internal governance system restructuring can also be favorable for these firms.

Originality/value – In addition to focusing on a new database of developing countries, the case of Tunisian firms, the main empirical analysis is conducted by considering the endogeneity issue. Thus, the findings improve understanding of the role played by state ownership and suggest that a partial state control appears to be beneficial to firm profitability.

Keywords Firm profitability, State ownership, Simultaneous equation analysis

Paper type Research paper

1. Introduction

Agency cost theory developed by Jensen and Meckling (1976) suggested that firm performance depends on the structure of share ownership among managers and other outside owners. Companies in many developing countries operate under a very exclusive ownership structure, making them different from companies in developed countries. A dominant characteristic of share ownership in developing countries is the state's equity ownership, either through direct investment or indirectly through public institutions (Bruton *et al.*, 2015; Cuervo-Cazurra *et al.*, 2014; Grossi *et al.*, 2015). In many developing countries where firms are still state controlled, we note that the state's contribution delays the country's economic development (Omran, 2007).

Although the relationship between state ownership and firm profitability has been widely researched, empirical evidence has provided mixed results (Yu, 2013). One view point is that the role of the state must be limited to a minimum for a better economic growth. This evidence may be explained by the political and social goals of the government leading to excessive employment (Shleifer and Vishny, 1997), excessive production (Bai *et al.*, 1997)

and waste of resources (Bai *et al.*, 2004). An alternative view proves the need for a government ownership of firms. For instance, Qi *et al.* (2000), Sun *et al.* (2002) and Wei *et al.* (2005) reported respectively a negative, a concave and a convex relationship between state ownership and firm profitability in emerging countries. However, Mrad and Hallara (2012) found that a very high level of state ownership is associated with an increase in firm profitability, while a low level of this ownership is associated with a decrease in firm profitability.

While prior studies provided important insights, the reliability of reported results may be affected by model misspecification. The mixed empirical results may be attributed to different model specifications. More specifically, Demsetz and Lehn (1985) disproved stability in a linear relationship between accounting measures and ownership variables and insist that the coefficients of single equation models are biased. Demsetz (1983) and Demsetz and Villalonga (2001) argued that firms modify their ownership structure in terms of their profitability. Ng *et al.* (2009) showed that state ownership affects profitability and that profitability affects state ownership. This result points to an endogeneity issue between the two variables. Furthermore, changes in state ownership and profitability are jointly influenced by organizational and strategic factors which are difficult to explicitly identify. The above discussion supported the view that ownership structure and firm profitability should be modeled as endogenous variables in order to avoid biased regression estimates.

Most of the empirical studies have focused on determining this relationship in transitional economies and Latin American countries. The literature is limited on this issue in other regions such as the Middle East and North Africa (Omran, 2007). The study of state ownership in MENA counties is very important for researchers and policymakers. Tunisia represents an important case to examine state ownership in emerging economies because the Tunisian Government is, currently putting in place vigorous economic and financial reforms, following a political transitional process. Those reforms justify the study of the Tunisian context to determine the necessary remedies to economic problems. As an emerging country to study state ownership, Tunisia has many of the typical characteristics: an inefficient capital market, a disturbed banking system and an important participation of political authorities in firm governance. The contributions of state ownership to economic activity, employment and the stipulation of the fundamental sector in Tunisia are very important. Currently, the Tunisian state owns more than 50 percent in 104 firms that mainly act in the transport, infrastructure, industry and banking sectors (The World Bank's Report, March 2014).

Tunisian state-owned firms suffer from governance problems related to their reporting transparency, budgeting functions, state ownership function; boards characteristics; control efficiency (The World Bank Report, March 2014). In particular, the diversity of the bodies managing state-owned enterprises makes difficult to coordinate and transfer information. Those companies have significant obligations which need sufficient financial and human resources for management and transactions. Furthermore, those companies do not have to publish their financial statements. The role of the state as a shareholder is not well identified and there is not a single public agency that manages state-owned firms. In fact, boards of these companies suffer from dependence and lack of expertise on decision making.

While some World Bank descriptive studies stipulate that state ownership affects Tunisian firm profitability, there is no empirical study examining this relationship in Tunisia. For this reason, one key purpose of this study is to examine the effects of state ownership on profitability using a larger, more recent sample of 232 Tunisian companies over the 2001-2013 period. This paper, to the authors' best knowledge, is the first to investigate empirically the effect of state ownership on firm profitability exclusively in the Tunisian context. Therefore, this study contributes to the literature on developing countries by providing recent empirical evidence on the relationship between state ownership and firm profitability using a new database of Tunisian firms.

The main objective of this paper is to investigate the direction, as well as the nature, of the relationship between state ownership and firm profitability in emerging countries. More specifically, the current study aims first, to examine state ownership and firm profitability relationship and to show, second, the potential usefulness of simultaneous equation analysis in a context with an endogeneity issue.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature, the theoretical frameworks and empirical evidence. Section 3 describes the research model and defines the variables. Section 4 reports on a univariate analysis while Section 5 presents our main empirical results. Finally, conclusions and implications are presented in Section 6.

2. Prior research

The state's role in corporate organizations may be examined through property ownership rights theory and agency theory. Agency theory suggests that separation of ownership structure and management leads to principal-agent conflicts since managers may privilege their own interests at the expense of shareholders and company performance (Jensen and Meckling, 1976). Conflict of interests between managers and shareholders may generate agency costs (Farrer and Ramsay, 1998). The nature of the principal-agent conflict depends on whether ownership is public or private (Stiglitz, 1994). Specifically, a state-dominated ownership increasing management monitoring may reduce agency costs and improve firm profitability (Bös, 1991). However, Hess *et al.* (2010) insured that government ownership may not be efficient in competitive markets because managers would prefer enforcing social and political goals as opposed to value maximization and this may lead to higher transaction costs. In particular, private owners are better motivated than government administrators to supervise and remunerate their agent-managers to improve firm profitability (Ng *et al.* 2009). Furthermore, ownership rights theory (Alchian and Demsetz, 1972) suggests that income rights given to private firms promote profit maximization and improve their profitability than income rights given to state-owned firms.

Minority shareholders' rights in the USA and UK are protected by a developed legal infrastructure, managerial labor market and active financial markets (Yu, 2013). Moreover, Claessens and Fan (2002) documented the limited protection of minority shareholders' rights in Asia. The disclosure and investor protection index reported by the World Bank shows that the MENA countries have the lowest scores and Tunisia in particular has the lowest level of disclosure and investor protection (2.4 for the period 1999-2004). Ownership in MENA countries is strongly concentrated, as in most emerging economies, with a significant proportion held by the state and families (Omran, 2007). As the state is a major block shareholder of Tunisian companies, this study tries to identify its role in firm profitability and to focus on the endogenous nature of the relationship between structure ownership and firm performance. This objective derives from two important hypotheses established by the earlier corporate governance literature. On the one hand, the persistence of the relationship between accounting indicators and ownership structure is not confirmed (Demsetz and Lehn, 1985). On the other hand, many studies argue that ownership structure should be treated as an endogenous variable in order to avoid biased regression estimates (Drakos and Bekiris, 2010).

The impact of state ownership on firm profitability

The empirical results of previous studies on the relationship between state ownership and firm profitability in emerging economies have been mixed. Qi *et al.* (2000) and Sun and Tong (2003) examined a sample of listed Chinese firms and found that state equity ownership is negatively associated with firm profitability. For example, Sun *et al.* (2002) and Tian and Estrin (2008) concluded that state equity ownership has an inverted U-shaped

relationship with profitability. Furthermore, Wei (2007) found evidence indicating that the relationship between state ownership and corporate profitability is non-linear. Specifically, state ownership has a significant negative impact on firm profitability only when the proportion is above 50 percent. However, there is no negative relationship when this proportion is smaller. This is inconsistent with Jiang *et al.* (2008) who found that state-owned share proportion has a linear and a positive effect on firm profitability. Moreover, Omran (2007) examined the profitability of Egyptian banks that were fully or partially privatized from 1996 to 1999. By comparing profitability across different bank groups, the author shows that privatized banks outperform majority state-owned banks but underperform state-owned banks. Ben Naceur *et al.* (2007) examined 95 newly privatized firms in Middle Easterner and North African countries. Comparing firms' profitability before and after privatization, they found a significant increase of profitability and a decrease of leverage. More recently, Boubakri *et al.* (2009) examined the impact of privatization and state ownership on profitability in a panel of 189 privatized firms from strategic industries in 39 countries. Consistent with the predictions of the privatization literature, the results show that state ownership is associated with lower profitability. In contrast, Ng *et al.* (2009) found a convex relationship between state ownership and firm profitability. Given the obtained mixed results, which mainly point to a non-linear relationship between the two variables, we predict an invert U-shaped relationship between state ownership and firm profitability.

The simultaneous equation approach
The mixed empirical results may be attributed to model specifications, variables measurement and sample selection techniques. Jiang *et al.* (2008) applied ordinary least square regressions to cross-sectional data. Boubakri *et al.* (2009) and Omran (2007) used the generalized-least square and fixed effect estimator developed for panel data models. Wei *et al.* (2005) incorporated all non-financial firms whereas Hovey *et al.* (2003) randomly selected 97 firms. Most studies use market-based variables to measure firm profitability (Lin *et al.*, 2009; Ng *et al.*, 2009; Sun *et al.*, 2002; Wei, 2007; Wei and Varela, 2003). Market stock prices can be particularly unstable and include a large noise component (Xu and Wang, 1999). Consequently, measures including share price information such as the market to book ratio and Tobin's Q may lead to a biased result.

To understand state ownership and profitability relationship, we suggest using a system of simultaneous equations to deal with important econometric issues. First, profitability and state ownership changes are each influenced by factors that do not affect the other. Second, these variables are jointly influenced by set variables that are difficult to specify. In particular, Himmelberg *et al.* (1999) indicated that corporate ownership structure and firm performance are endogenously affected by exogenous changes or other firm-specific factors and its environment. Examining the relationship between ownership structure, investment and firm value, Cho (1998), for example, found that investment affects firm performance, which in turn affects ownership status. Third, previous studies found an interactive relationship between state share ownership and firm profitability. In particular, Demsetz (1983) argued that firms change their ownership structure in response to their profitability. Furthermore, Demsetz and Villalonga (2001) found that ownership structure is chosen to maximize firm profitability. Loderer and Martin (1997) found evidence indicating that high performance leads to lower levels of managerial ownership. More specifically, Ng *et al.* (2009) examined the state ownership and firm performance relationship in a sample of Chinese firms during 1996-2003. Their results point to a convex relationship between state ownership and firm performance. This result is robust to both market and operating measures of performance. The stronger performance of high state ownership compared to high private ownership suggests a nonsymmetrical convex relationship. Firm profitability,

as measured by ROA ratio, affects positively and significantly state ownership. This finding highlights a reverse causality relationship between the two variables and consequently a potential endogeneity issue.

Most studies, which have examined state ownership, have not considered the endogeneity problem, and therefore they tend to misinterpret their results. Unlike previous studies that focused on state ownership and firm profitability, we aim to draw attention to the endogeneity issue and the potential usefulness of simultaneous equations as estimation techniques in this case.

3. Data and methodology

This study examines year-end financial statement data from 2000 to 2013 for 232 Tunisian firms. State ownership information is obtained from the Tunis stock exchange and firms. Table I presents the number and percent of firms by industry. The sample is diversified across industries with 16.810 percent in the manufacturing sector, 15.086 percent in the services sector and 18.534 percent in the transportation and public utilities.

To evaluate the interaction between state ownership and firm profitability, we use the following simultaneous-equations model:

$$PROFIT_{it} = \alpha + \alpha_1 STATE_{it} + \alpha_2 CONTROLS_{it} + \varepsilon_{it} \tag{1}$$

$$STATE_{it} = \beta + \beta_1 PROFIT_{it} + \beta_2 CONTROLS_{it} + \varepsilon_{it} \tag{2}$$

To deal with the endogeneity problem, the equations system consists of two equations. Table II presents the variables in these equations, defines them and their measurement. State ownership (STATE) and corporate profitability (PROFIT) are the endogenous variables and CONTROLS is a vector of variables. PROFIT appears as an independent variable in Equation (2), consistent with the view that state ownership affects firm profitability, which in turn might determine state ownership. Firm profitability is measured using different accounting-based indicators to test the comprehensiveness and robustness of our analysis as in Boubakri *et al.* (2005). Specifically, we use return on assets (net income to total assets), return on equity (net income to equity) and sales ratio (net income to sales). State ownership is measured by the percentage of state-owned shares, like in Ng *et al.* (2009) and Wei and Varela (2003).

We include a range of firm-specific variables in our analysis (CONTROLS) to control the sources of profitability differences between state-owned and other firms and sources of state ownership differences between profitable and other firms. CONTROLS includes two groups of variables, one group common to the two equations and the other is used to identify the

Industry	Number	%
Agriculture, Forestry and Fishing	10	4.310
Mining	5	2.155
Construction	16	6.896
Manufacturing	39	16.810
Transportation and Public Utilities	43	18.534
Wholesale and retail Trade	19	8.189
Finance, Insurance and Real Estate	25	10.775
Services	35	15.086
Public Administration	40	17.241
Total	232	100

Source: Prepared by authors

Variables	Measure
Dependents variables	
Return on assets (ROA)	Net income/total book value of assets
Return on equity (ROE)	Net income/total book value of equity
Return on Sales (ROS)	Net income/total book value of sales
State ownership (STATE)	Percentage of shares owned by government
Common explanatory variables	
Investment opportunities (INVES)	Capital expenditure /lagged total assets
Firm size (SIZE)	Logarithm of total assets
Variables for profitability equation	
LEVERAGE	Total debt/total assets
STATE^2	Square of percentage of shares owned by government
Variables for ownership equation	
Stock exchange (SE)	1 if firms is listed on Stock exchange and 0 else
Income tax expense (TAX)	Income tax expenses /operating income before tax
Source: Prepared by authors	

Table II.
Specification of
regression variables

simultaneous equations system. Consistent with previous studies (Wei and Varela, 2003; Boubakri *et al.*, 2005; Ng *et al.*, 2009) firm size, which we use as our proxy for the natural logarithm of total assets (SIZE), and investment opportunities, which we measure with capital expenditure/lagged total assets (INVES), are used as common control variables in the two equations. Firm size is believed to be an important factor affecting firm profitability and state ownership. Particularly, the state may maintain high control over big firms to protect its monetary and financial interests. Moreover, firm size serves to control political and agency cost's influence on firm profitability. Firms with low investment opportunities are less likely to invest their current cash in positive net present value projects (Jensen, 1986). Belkhir *et al.* (2013) suggested that lower growth opportunities increase the possibility of going private. Furthermore, the effect of ownership structure on firm performance depends on the presence or absence of investment opportunities (Reyna, 2012).

Finally, we include in all regressions indicator variables for year and industry in order to control for potential variation in firm profitability and state ownership attributable to unobserved industry or time-varying economy-wide factors, such as the regulatory system and state ownership reforms that can alter a firm's profitability and its ownership structure. The strategic industry status is introduced by Wei and Varela (2003) and Boubakri *et al.* (2009) as a main determinant of state equity ownership and firm profitability. In order to avoid an arbitrary definition of a strategically important industry, we test all industries by dummy variables.

The order and rank conditions are applied and therefore the equation system is identified. In a model of M simultaneous equations, an equation is identified if it excludes at least $M-1$ variables included in the model (Gujarati, 2003). More specifically, an equation is just identified, when it excludes $M-1$ variables alone and it is over identified when it excludes more than $M-1$ variables. Therefore, other control variables are used to identify the simultaneous equations system.

To identify Equation (1), the PROF equation, we use LEVERGE and STATE^2 as specific equation variables. Following Yu (2013) and Drakos and Bekiris (2010), LEVERAGE (total debt divided by total assets) is included in order to control for financial risk, debt cost and debt holders' influence on firm management. To control a probability of a non-linear relationship between state ownership and firm profitability, we include STATE^2 like in Ng *et al.* (2009) and Sun *et al.* (2002). This variable is calculated as the percentage of state shares squared.

The second equation describes a reverse relationship between firm profitability and state ownership in which state ownership was treated as endogenous. We identify the STATE equation using TAX and EXCHANGE in order to control other determinants of state ownership (Akhtar, 2016). In fact, greater tax expenditure may increase firm risk due to agency-related conflicts (Burgman, 1996). Furthermore, tax saving especially resulting from the deductibility of interest payments, differs considerably between firms that go private and those that remain public (Halpern *et al.*, 1999). TAX (income tax expense attributable to operating income/operating income before tax) is, thus, proposed by Akhtar (2016) and Kaplan (1989) as a determinant of the likelihood to going private. Unlike Ng *et al.* (2009), EXCHANGE is coded 1 if a firm is listed on the stock exchange and 0 otherwise to better accommodate the Tunisian context where there is only the Tunis stock exchange and most state owned firms are not listed. Indeed, the Tunisian state may reduce its participation in listed firms to motivate transactions in the financial market. Ng *et al.* (2009) has not treated this variable in this way, since they consider firms listed on the Shanghai or Shenzhen Stock exchange.

In identifying and specifying control variables, we follow prior ownership structure and performance studies (e.g. Boubakri *et al.*, 2005; Ng *et al.*, 2009; Akhtar, 2016). Since existing theories on firm ownership and operating performance overlap significantly, we based the identification of our model on the Barton's (2001) method. Specifically, we calculate the Spearman rank correlation of each identifying variable with the dependent variables to ensure that it is significantly correlated only with the dependent variable of the equation it is proposed to identify and we over identify the system to reduce dependence. In the same vein, the selection of the independent variables was determined by the sample's sensitivity to the use of these variables. For example, although the inclusion of LEVERAGE as an independent variable to the state equation resulted from the model of Ng *et al.* (2009), this variable created serious problems to the explanatory power of the model.

4. The univariate analysis

Table III shows Spearman rank correlations between the dependent and independent variables. In summary, the correlations between state ownership and firm-profitability are negative. Moreover, LEVARAGE, TAX and EXCHANGE significantly correlate only with the dependent variables of the equations they identify. However, INVES and SIZE correlate simultaneously with state ownership and profitability indicators. Except for the high correlation coefficients between STATE and $STATE^2$ (0.980), multicollinearity does not appear to be a problem disturbing the regression results. In particular, STATE and $STATE^2$ are derived from each other and their strong correlation is expected.

	STATE	$STATE^2$	ROA	ROE	ROS	INVES	SIZE	LEVE	EXCH	TAX
STATE	1.000									
$STATE^2$	0.980**	1.000								
ROA	−0.204*	−0.187**	1.000							
ROE	−0.015	−0.017	–	1.000						
ROS	−0.181*	−0.171**	–	–	1.000					
INVES	−0.265**	−0.250**	0.054*	0.024	0.089*	1.000				
SIZE	−0.114**	−0.103**	−0.074*	−0.013	0.015	0.141**	1.000			
LEVE	0.085✔	0.074	−0.423**	0.045	−0.257**	−0.013	−0.015	1.000		
EXCH	−0.864**	−0.834**	0.192✔	0.017✔	0.186✔	0.213**	0.262**	−0.054	1.000	
TAX	−0.083*	−0.075**	−0.123✔	−0.019✔	−0.058✔	−0.036	−0.045	0.195**	0.102**	1.000

Notes: ✔ denotes the use of these variables as identifying variables in the simultaneous-equations model. *,**Significant at 0.05 and 0.01 level (two-tailed tests), respectively

Table III.
Spearman correlations coefficients

The initial question we address in our empirical analysis is whether state ownership variation affects firm profitability. Thus, we compare profitability indicators and firm characteristics between four groups divided according to state ownership degree. Following Quiang (2003) and Ng *et al.* (2009), we define five groups: privately controlled firms ($0 \leqslant STATE < 10$), partial state controlled firms ($10 \leqslant STATE < 30$), ultimate state controlled firms ($30 \leqslant STATE < 50$), ultimate state controlled firms ($50 \leqslant STATE < 100$) and solely state controlled firms ($STATE = 100$ percent).

Table IV reports the results of the test for differences in firm profitability across the different groups. Privately controlled firms with state ownership that varies between 0 and 10 percent have significant higher profitability indicators than ultimately and solely controlled firms at more than the 1 percent level. The partial state controlled group with a state ownership ranging between 10 and 30 percent has the highest profitability indicators and investment growth and the lowest leverage ratio and tax expenses at the 1 percent level.

The univariate analysis indicates that the group of the ultimate state controlled firms has significant lower profitability than privately controlled firms and partial state controlled firms at the 1 percent level. In particular, the group of ultimate state controlled firms, with a state ownership varying between 50 and 100 percent, has the lowest profitability at the 1 percent level. This group includes firms classified as state-owned firms according to Tunisian regulations where government ownership is at least 50 percent.

The most surprising result is that solely state-controlled firms recorded higher profitability than ultimate state-controlled firms significant at the 1 percent level. However, profitability improvement is relatively negligible. This improvement is more important for public and non-administrative institutions, which have significant higher profitability than ultimate state-controlled firms and other solely state controlled firms. This result is consistent with the findings of Oum *et al.* (2006) indicating that unique government-owned airports are more efficient than other airports. Furthermore, public and non-administrative institutions have lower leverage and higher investment than ultimate state-controlled firms because they are financed by the state budget through public subsidies.

The above findings indicate that profitability depends essentially on internal governance mechanisms and not on ownership structure. Thus, corporatization and governance reform can probably be more efficient than a privatization reform. Specifically, profitability of solely controlled firms may increase by restructuring their internal governance system. Aivazian *et al.* (2005) believed that corporatization may improve firm profitability by improving internal governance mechanisms and by increasing investment channeled by government-subsidized credit. However, the other public firms suffer from a duplication of administrative processes of firm's management and government administrative procedures (Oum *et al.*, 2006).

	Private controlled firms 0-10%	Partial state controlled firms 10-30%	Ultimate state controlled firms 30-50%	Ultimate state controlled firms 50-100%	Solely state controlled firms 100%	Public and non-administrative institutions 100%	χ^2
ROA	0.067	0.072	0.0178	−0.006	−0.003	0.026	97.063***
ROE	0.104	0.160	0.077	0.054	0.086	0.169	54.818***
ROS	0.204	0.250	0.084	0.039	0.011	0.147	131.625***
INVES	0.099	0.149	0.069	0.019	0.014	0.076	71.990***
SIZE	18.747	18.563	18.129	17.226	18.447	16.233	160.533***
LEVERAGE	0.553	0.428	0.084	0.759	0.650	0.619	51.630***
TAX	−0.023	−0.184	−0.132	−0.127	−0.179	–	15.383***

Table IV.
Variables differences across groups of state controlled firms

Note: *,**,***Significance at the 0.10, 0.05 and 0.01 levels, respectively

Overall, ultimate and solely controlled firms have lower profitability than private or partial state controlled firms. The results on firm profitability support the hypothesis of a non-linear relationship between state ownership and firm profitability. In particular, there is a positive impact of state ownership on profitability when the proportion of state-ownership is below 30 percent and a negative impact otherwise. The direction of the relationship between the two variables changes at the threshold of 30 percent, probably, because of the Tunisian trade regulation. Specifically, the state can block the decision of the ordinary general meeting when it holds at least one third of the voting rights. Thus, a proportion of state ownership of 30 percent is sufficient to have an ultimate control of a company. The state disposes of higher authority compared with small investors (Yu, 2013) and especially in Tunisia with an authoritarian regulatory regime characterizing the study period.

A limitation to these results is that comparing profitability across the different groups is done through the univariate analysis. A potential extension would be to incorporate firm characteristics simultaneously to take into account the endogeneity problem. Furthermore, we integrate industry, exchange and time variables that may affect firm profitability and its ownership structure.

5. The multivariate regression

The main advantage of a multivariate regression analysis is that it allows us to control for the impact of other variables that may affect firm profitability independently from state ownership. The two-stage least squares (2SLS) estimation technique is initially used because the system is over-identified. This method is robust to the presence of multicollinearity and specification error (Kennedy, 1998). Moreover, we use the three-stage least squares to take into consideration covariance between the residuals of the two equations in the simultaneous system.

The 2SLS and 3SLS estimation methodologies report very similar results as shown in Table V. The relationship between state ownership and firm profitability is examined by the variables, STATE and $STATE^2$. These variables represent, jointly, the nature of the relationship between state ownership and firm profitability. The results show that the coefficient of STATE positively and significantly related to firm profitability. This implies that state ownership is, to some extent, beneficial to firm profitability. We note that the 3SLS estimate of STATE coefficient is higher than under 2SLS. Unlike the 2SLS method, the 3SLS exploit information from the correlation between residuals to potentially improve efficiency of estimation (Beaver et al., 1997). This correlation result from the common variables omitted in each equation. Further, the coefficient of $STATE^2$ variable is negative and significantly related to firm profitability at the 1 percent level. This result implies that high state controlled firms have a lower level of profitability. Taken together, our findings indicate that only a partial state control appears to be beneficial to firm profitability and that the Tunisian state maintains just a partial control of highly profitable companies. With significant positive STATE and negative $STATE^2$ coefficients, the relationship between state ownership and firm profitability initially positively relates to profitability, but beyond an inflection point the relationship changes to negative. This result reveals a concave curve relationship like in Sun et al. (2002), which confirms our predictions.

Mean differences analysis and the simultaneous equation analysis show, jointly, that the relationship between state equity ownership and firm profitability is concave and not symmetrical. Specifically, state-owned Tunisian companies with a state ownership superior to 30 percent significantly underperform privately controlled companies. This implies that private ownership is beneficial to firm profitability and that private owners retain strong control of highly profitable firms. Unlike the results of Kapopoulos and Lazaretou (2007) that ownership concentration relates positively to higher firm profitability, our results indicate that only private ownership concentration improves firm profitability and

	STATE	ROA	STATE	ROE	STATE	ROS
Panel A: two-stage least square						
STATE		0.470**		1.426**		3.092***
STATE^2		−0.370**		−1.105*		−2.193***
TAX	−0.127***		−0.496		−0.199***	
ROA	−1.805***					
ROE			−5.061**			
ROS					−1.700***	
EXCHANGE	−0.757***		−0.893		−1.335***	
INVEST	0.339***	0.145***	1.912**	0.409**	0.321**	0.259**
LEVERAGE		−0.108***		−0.042		−0.204***
SIZE	0.039***	0.005	0.081*	0.016*	0.035***	0.001
Year dummies	Included	Included	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included	Included	Included
R^2 (%)	70.12	20.36	13.54	26.2	46.30	22.06
Panel B: three-stage least squares						
STATE		1.785***		1.524**		4.411***
STATE^2		−1.449***		−1.104**		−3.299***
TAX	−0.024		−0.027		−0.118**	
ROA	−1.657***					
ROE			−4.822**			
ROS					−1.614***	
EXCHANGE	−0.791***		−1.025*		−1.335***	
INVEST	0.315***	0.205***	1.824	0.408**	0.317**	0.362***
LEVERAGE		−0.106***		−0.043		−0.180***
SIZE	0.042***	0.011***	0.093*	0.016*	0.038 **	0.008***
Year dummies	Included	Included	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included	Included	Included
R^2 (%)	72.10	47.63	26.30	32.44	50.03	48.47

Table V.
Simultaneous
equations estimation

Note: *,**,***Significance at the 0.10, 0.05 and 0.01 levels, respectively

especially when it is accompanied by a partial state ownership. Thus, ownership structure affects firm profitability by the interaction of two principal dimensions: ownership concentration and identity of the ultimate shareholder.

Our findings that highly state-owned firms are less profitable than other firms are consistent with a number of studies (Qi *et al.*, 2000). Poor profitability of those firms is, mainly, attributed to the political motivations of the government to reduce unemployment and social pressures (Du and Boateng, 2015) or to increased bureaucracy and information asymmetry (Boycko *et al.*, 1996).

In the pursuit of social and political goals, the government can provide financial support, tax rebates and foreign exchange assistance for state-controlled firms (Guariglia *et al.*, 2011; Luo *et al.*, 2010). Those state-controlled firms conducting outward investment, for example, face fewer financial constraints compared to privately owned firms (Lin and Bo, 2012). In addition, Shailer and Wang (2015) found that firms under government control have a lower debt cost than firms under private control. Particularly, the government's political support and business connections provided through state ownership are necessary to improve firm profitability (Sun *et al.*, 2002) and especially when private investor protection is poor as in the Tunisian context. However, our results indicate that privately controlled firms tend to benefit from higher profitability only from lower state ownership. Thus, firms with a partial state ownership are greatly respected by the market and outperform privately controlled firms.

We therefore argue that the political and economic advantages given to state-controlled firms increase, efficiently, firm profitability only in case of a partial state control.

When increased at a threshold of 30 percent, the drawbacks of state ownership exceed its benefits and the control of the state becomes less efficient. Partial state firms benefit simultaneously from political advantages because of the state's involvement and the management efficiency of private investors. Additionally, the control of long-term creditors in partial state-controlled firms is likely to be more efficient than that in ultimate state-controlled firms. Those creditors are motivated to control partially controlled firms more than ultimately controlled firms where banking loans are guaranteed by the state.

All profitability coefficients, in the STATE equation, are negative and significantly relate to state ownership at less than the 1 percent level. This result indicates that the government tends to maintain its ownership in less profitable firms, which are less able to attract private investment in order to achieve social and political goals. An interesting result is that the state ownership variables (STATE and STATE^2) have the highest coefficients in the PROFIT equation and PROFIT has the highest coefficients in the STATE equation. This implies a strong causality relationship between state ownership and firm profitability and that the two variables are the main determinants of each other. This result highlights the main feature of the Tunisian context: involvement of state in the economy.

In most regressions, the control variables (SIZE and INVES) significantly and positively relate to firm profitability and state ownership. Those variables are important factors affecting state ownership and profitability. Wei and Varela (2003) argued, for example, that the state holds higher ownership in bigger firms with important investment growth because of a stability concern and high employment levels. Debt ratio negatively relates to firm profitability, consistent with previous studies (Yu, 2013).

Focusing on the OLS estimates, as reported in Table VI, we observed that the coefficient of state ownership variables decreases and loses its significance indicating that state ownership does not affect firm profitability. This estimation method confirms Lassoued and Ben Rejeb Attia's (2014) findings. The OLS results are different from the simultaneous equation analyses showing that the relationship between state ownership and firm profitability is concave. Furthermore, the explanatory power of the two estimation methods as measured by adjusted R^2 is largely different. In particular, the simultaneous equation method points to an explanatory power which is considerable higher than that of the OLS estimates.

To check for the endogeneity hypothesis of state ownership and firm profitability we run the Hausman (1978) exogeneity test. We conducted this test for the state ownership and the

	STATE	ROA	STATE	ROE	STATE	ROS
STATE		−0.128		−0.390		0.095
STATE^2		0.051		0.176		−0.081
TAX	−0.010		0.010		−0.012	
ROA	−0.322*					
ROE			−0.060			
ROS					−0.209	
SE	−0.768***		−0.762***		−0.852***	
INVEST	0.066	0.131**	0.032	0.368**	0.030	0.168**
LEVERAGE		−0.092***		−0.004		−0.126***
SIZE	0.038***	0.005	0.037***	0.015	0.037***	−0.001
Year dummies	Included	Included	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included	Included	Included
R^2 (%)	15.59	16.60	14.73	10.32	15.08	11.17
Hausman test p-value	0.02	0.04	0.03	0.06	0.01	0.02

Note: *,**,***Significance at the 0.10, 0.05, and 0.01 levels, respectively

Table VI.
Ordinary least
squares regressions

firm profitability variables. First, we regresses STATE on its independent variables and we obtained the residuals. Then, we estimate the PROFIT equation with the inclusion of the residuals to check whether its coefficient is significant. We repeated this two-step testing endogeneity for the PROFIT variable. The p-value, as reported in Table VI, denotes the significance of the coefficient of the residuals obtained from each equation. The results indicate that both firm profitability and state ownership variables correlate with the regressions' residuals. More specifically, the null hypothesis that the variable in question is exogenous is rejected for STATE and PROFIT. These imply that both STATE and PROFIT are endogenous and, therefore, the OLS estimates are not consistent.

The empirical results indicating that state ownership is considered as an endogenous variable support *H2*. Specifically, the relationship between state ownership and firm profitability variables depends only on the endogeneity nature of state ownership. Indeed, there is no difference between the simultaneous and OLS estimates about the effect of profitability on state control.

Based on the Hausman test results, the poor explanatory power of the OLS method derives principally from the reverse causal relationship between state ownership and firm profitability and the potential measurement error induced by omitted unobserved factors. By demonstrating that state ownership determines firm profitability and that firm profitability determines state ownership, our empirical analysis found evidence on the interactive relationship between the two variables. As we use secondary data, our analysis cannot control, for example, the potential effects of firm's strategy and human resources policy that might impact firm profitability and state ownership. Thus, the OLS estimate coefficient is potentially biased because of the endogeneity issue due to the omitted variables that may contribute to potential measurement error in firm profitability. Furthermore, state ownership relates to other omitted variables affecting differently firm profitability. Therefore, it is not known whether the OLS estimates of the STATE coefficient are uniquely attributable to differences in state ownership between firms or whether it reflects other correlated variables.

Consistent with our predictions, the difference between the estimation methods' results reflects the sensitivity of the relationship between state ownership and firm profitability to an endogeneity issue. Specifically, the above discussion reveals the increased power of simultaneous equation analysis and its ability to capture the positive influence of STATE. This implies that the alternative OLS estimates method is not consistent and the simultaneous equation analysis is more appropriate to analyze the effects of state ownership on firm profitability. The 2SLS method is appropriate under endogeneity and potential measurement error in firm profitability and state ownership. Furthermore, the 3SLS method considers omitted variables that may contribute to potential measurement error in the included variables. Particularly, if the residuals are correlated due to potential omitted variables and measurement error, the 3SLS method produces more efficient estimates than the 2SLS by considering all available information (Barton, 2001). Consequently, the OLS results were rejected due to endogeneity induced by a reverse causality relationship between state ownership and firm profitability, a potential measurement error and omitted variables bias.

6. Discussion and conclusion
This paper investigates the relationship between state ownership and firm profitability for 232 Tunisian companies over the period of 2001-2013. The univariate tests that compare firm profitability across different groups of firms divided according to state-ownership level show that partial state-controlled firms (10 percent $\leqslant$ STATE < 30 percent) have higher profitability level followed by privately controlled firms (0 $\leqslant$ STATE < 10 percent). However, other firms with ultimate or a unique state control have relatively a lower level of profitability. The results

reveal that the government can improve profitability in Tunisian firms just when it acts as a partial controller and not as an ultimate or a unique controller, mainly if its shareholding is under 30 percent. Moreover, the univariate analysis shows that public and non-administrative institutions have a higher profitability than ultimate and solely controlled companies. This result is explained by the specific structure of these institutions, suggesting that a potential governance reform may improve public firm profitability.

OLS estimates in this and prior studies reveal different results about the relationship between state ownership and firm-profitability. These results may be biased due to the endogeneity problem. Hausman (1978) tests indicated that the null hypothesis that state ownership and firm profitability are exogenous can be rejected. The simultaneous equation analysis in this study unaffected by this bias shows that the relationship between state ownership and firm profitability is concave. Particularly, increases in state ownership are initially associated with a higher firm profitability until an inflection point (about 30 percent), at which high state ownership levels start to have negative effects on firm profitability. This concave relationship is robust to different firm profitability measures and to both the 2SLS and 3SLS estimation techniques. Furthermore, the simultaneous model's results show that firm profitability affects negatively state ownership. This implies that state equity ownership is not mainly profit driven, but is politically motivated. Whoever, private investors are interested in owning high performing firms in order to have political and economic benefits. This result confirms the reverse causal relationship between state ownership and firm profitability.

Considered together, the univariate and multivariate analyses indicate that only partial state ownership (10-30 percent) relates to stronger firm profitability. Government support can be beneficial to those firms through stronger monitoring or political connections (Sun *et al.*, 2002). Partial state-controlled firms have the highest profitability probably because of the preferential treatment given by the government and the privileged they enjoy to access financial resources (Sun *et al.*, 2002). The concave relationship appears to be non-symmetrical with a lower profitability for high state ownership compared to high private ownership. According to agency cost theory, private ownership contributes to align the interests of managers with those of outside owners to increase firm value (Jensen and Meckling, 1976).

The main contribution of this paper is an improved understanding of the role played by state ownership. By providing support in terms of financing and resources, lower levels of state ownership have positive repercussions on firm profitability. The empirical results indicate that the simultaneous equation analysis is necessary to address the endogeneity problem because of a reverse causal relationship between state ownership and firm profitability, omitted variables and potential measurement error. The usefulness of this analysis is reflected in the considerably higher adjusted R^2 compared to the OLS methods. In sum, this study reveals the importance of selecting empirical tools for a better information use. Specifically, this study makes an important contribution by showing the usefulness of the simultaneous equation analysis to investigate the relationship between state ownership and firm profitability. Our findings that state ownership affects firm profitability, and that profitability affects state ownership, highlight the endogeneity issue.

From the previous literature, we found that most state ownership studies have focused, principally, on developed economies and some Asian countries. The purpose of our study is to fill this gap by examining the case of Tunisia as an example of the MENA countries and a more recent database of emerging economies. Except for Ben Naceur *et al.* (2007) who focused on the profitability of 13 newly privatized Tunisian firms during the period of 1995-1997, this study provides the first empirical evidence on the relationship between state ownership and firm profitability in the Tunisian context. Because Tunisian firms operate in an interventionist economy with a dominance of state, evidence of the effect of state ownership on firm profitability is informative.

The main policy implication of the study's findings for local and international policymakers is to improve profitability of state-owned companies in developing countries. Given that Tunisian state-owned companies are actually subject to an important reform conducted by the ministry of finance under the supervision of the World Bank and the international Monetary Fund, the current paper is useful for policymakers to modify ownership structures of state-owned firms. Indeed, our study's findings of a concave relationship propose an important map as to what extent state control should be maintained or abandoned in order to improve firm profitability. Like Shirley (1999), who found that privatization and corporatization reform complement each other, we suggest that these reforms can be combined to improve Tunisian firm profitability.

Despite these contributions, our study is not without limitations. First, the empirical analysis was conducted on a relatively large sample size and on different industries. However, this sample only involved a single country and only state-owned firms operating throughout the study period and we excluded confiscated firms. This prevents generalization of results to firms from other countries and to new state-acquired firms.

Due to the lack of data on governance mechanisms and measurement difficulties, we could not control variables, such as firms' political connection, to capture its effect on firm profitability. This variable is difficult to measure after the 2011 Tunisian revolution as the political authority grew confused. Time dummies are included to minimize this problem.

Another limitation relates to construct validity. The chosen measures of the dependent variable may imperfectly reflect underlying firm profitability. We examined one dimension of firm performance: profitability. We did not consider market performance, for example, because most Tunisian state firms are not listed on the stock exchange. Therefore, different profitability measures are used to minimize this problem.

We call for an interesting research question that how does family ownership; institutional ownership and banking ownership affect corporate performance in emerging markets. We are also interested to know whether state-ownership and family ownership produce similar effects on corporate performance. A fine-grained comparative empirical analysis based on archival sources in both developed and emerging markets would make meaningful contributions to public economics and management literature.

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About the authors

Dr Mouna Ben Rejeb Attia is a Professor of Accounting & Finance with more than 13 years of academic experience. She holds a Habilitation in Accounting from the University of Manouba. She has published in numerous international journals in Elsevier, Emerald and Inderscience and she has reviewed research papers for international scientific journals. Her main research interests include audit quality, corporate governance, financial reporting, earnings management and firm performance. Mouna Ben Rejeb Attia is the corresponding author and can be contacted at: mouna.attia15@laposte.net

Dr Naima Lassoued is an Associate Professor of Accounting & Finance with more than 13 years of academic experience. She holds a Habilitation in Finance from the University of Manouba. She has published in numerous international journals in Elsevier, Emerald and Inderscience and she has reviewed research papers for international scientific journals. Her main research interests include corporate governance, financial reporting, Islamic finance, risk management, earnings management and firm performance.

Mohamed Chouikha is a Graduate from the National School of Administration, is a Controller General of Finances. He has about 20 years of professional experience in managing, supervising and auditing Tunisian Government institutions and firms. Since 2013, Mohamed Chouikha, in his capacity as a General Manager of State Shareholdings, has been in charge of supervising the restructuring program of banks and state controlled firms and in particular the implementation of their governance framework.

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