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Article

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Threshold effect in the relationship between family ownership and firm performance: A panel smooth transition regression analysis

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Abstract: This paper examines the relationship between family ownership and firm performance over the period 2009–2017 for a large sample of French-listed firms. Previous research showed that family ownership can bring both benefits and costs to firms. Empirical results in whether it enhances or undermines firm performance are inconclusive. This paper aims to further our understanding of the complex relationship between family ownership and firm performance. It clarifies how family owners influence on firm performance depends on their ownership levels. By performing Panel Smooth Transition Regression model (PSTR), we find that the relationship between family ownership and firm performance is non-linear. The model has one threshold at the 37.62% of family ownership and two extreme regimes. The results show that below the threshold, the relation is negative. Family members have fewer incentives to bear the cost of effective monitoring. However, above the estimated threshold, family ownership has a positive impact on firm performance. This paper supports the view that family owners are more motivated to enhance performance when they hold large stake of capital in the firm as family wealth is closely related to firm profitability. These findings provide useful insights for

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PUBLIC INTEREST STATEMENT

This paper examines the relationship between family ownership and firm performance in France. The presence of families in the firm ownership can bring both benefits and costs. Family ownership is associated with long-term commitment, less conflicts with managers and sustainable links with stakeholders that enhance the firm performance. Conversely, family owners are prone to take actions that benefit only to the family which adversely affect the whole firm performance. This study supports that the behaviour of family owners depends on the importance of the stakes they hold on the firm. Below the threshold of 37.62% of family ownership the relationship is a negative as family owners do not have enough incentives to bear the costs of monitoring. Above the threshold level, family ownership has a positive effect on firm performance. Family members are provided substantial incentives to supervise managers as the family wealth is closely related to firm performance.

investors seeking investment opportunities in firms with family ownership as the latter constitute a large proportion of publicly listed firms in the world.

Subjects: Finance; Corporate Finance; Business, Management and Accounting; Corporate Governance

Keywords: Firm performance; family ownership; agency theory; PSTR model; Threshold effect
JEL Codes: G34

1. Introduction

Family firm is the most common organizational structure in the world (Boubaker et al., 2016; Gómez-Mejía et al., 2011; Luo & Liu, 2014; La Porta et al., 1999, 2002). Several scholars on corporate governance investigated whether there are benefits or costs associated to family ownership. Studies examining the relationship between family ownership and firm performance lead to a mix of positive and negative results (Anderson & Reeb, 2003; Martin et al., 2017; Miller et al., 2013; Tsao & Chen, 2012; Villalonga & Amit, 2006). Because of the empirical inconclusiveness, we propose to examine the hypothesis of non-linearity between these two variables. Family ownership and firm performance may not have a linear relationship; instead, they could be presented in nonlinear terms that exhibit both negative and positive features. Indeed, it is widely identified that the major owners of firms around the world are families (Anderson & Reeb, 2003; Feldman et al., 2019; Fernando et al., 2014; Sener, 2014). Family owned businesses constitute about 70% of US publicly traded firms (Gómez-Mejía et al., 2011). Faccio and Lang (2002) found that 44.29 % of publicly held firms in Western Europe are family controlled. Consequently, the last two decades were characterized by a significant growth of studies in the field of family business. However, doubt about whether family ownership is associated to potential benefits or disadvantageous for firms financial outcomes still remain. Based on the agency theory and the resource-based view, prior research report generally less traditional principal–agent agency problems related to family ownership and greater principal–principal conflicts, with more risk aversion of family owners (Fernando et al., 2014; Martin et al., 2017). Furthermore, family owners may provide firms with specific human and relational capital (Boyd & Solarino, 2016; Matzler et al., 2015). Recent developments point out that family owners develop also multiple objectives beyond financial gains in firms mainly related to the preservation and the development of their socio-emotional wealth (Martin et al., 2017). According to these divergent objectives of family owners, it is difficult to distinguish how family ownership can influence firms' performance. Mixed and conflicting results are reported in this context. Maury (2006), Andres (2008), Chu (2011), and Jin and Park (2015) reported positive effect of family ownership on firm performance, whereas, Klein et al. (2005), Filatotchev et al. (2011), and Muntahanah et al. (2021) showed a negative relationship. This inconclusiveness in literature can be explained by a possible non-linearity in the relationship between family ownership and firm performance. The purpose of the study is to identify if there are specific levels of family ownership where its potential benefits in firms' performance outweigh the potential costs. In contrast to other studies those are mainly based on an arbitrary level of family ownership used to split the sample, we use the Panel Smooth Transition Regression model (PSTR) that permits the determination of a precise threshold family ownership level. Our study is the first to apply this nonlinear threshold model on the relationship between ownership structure and firm performance.

We focus on the French stock market characterized by the dominance of family controlling blockholders (Faccio & Lang, 2002; Sraer & Thesmar, 2007). Family is the typically largest controlling shareholder for the French publicly listed firms and control about 42% of firms' voting rights (Boubaker et al., 2016). Furthermore, France is a civil law country that provides less minority shareholders' rights protection than common law countries (La Porta et al., 1999, 2002). Minority rights expropriation is more common in family firms. Indeed, family shareholders may use their position as dominant owners to extract private benefits at the cost of minority shareholders (Andres, 2008; Jin & Park, 2015). Furthermore, prior studies investigating the relationship between family owners and firm

performance in civil law countries from the European continent (as French, Italian or Spanish markets) showed mixed evidence, that varies from positive to negative or irrelevant (Barontini & Caprio, 2006; Boubaker et al., 2016; Gómez-Mejía et al., 2007; Sciascia & Mazzola, 2008).

Consequently, the French market can provide an interesting environment to gain deeper insight into the firm performance and family ownership relationship. To the best of our knowledge, the asymmetric relationship between family ownership and firm performance of French firms has not been previously studied. So, examining the French context can be of interest.

The empirical analysis uses a large sample of publicly listed French firms for the period from 2009 to 2017. We test whether there is an optimal level of family ownership which maximizes firm performance. We find that the relationship between family ownership and firm performance is nonlinear. The results show that above a certain family ownership, agency problems between shareholders are reduced and family owners act in order to enhance firm performance. However, low levels of family ownership negatively affect firm performance as family owners tend to extract private benefits at the expense of others shareholders.

The remainder of the paper is structured as follows. Section 2 assesses the previous literature regarding the impact of family ownership on firm performance. Section 3 describes the sample, the used variables and the methodology. Section 4 provides and discusses the main empirical findings to finally conclude the paper in the last section.

2. Literature review

Based on agency theory and resource-based view, studies related to family ownership have provided substantial attention to the implications of these owners on company performance. However, theoretical arguments and empirical works in this context lead to mixed results, indicating either positive, negative or no association between family ownership and corporate performance (Anderson & Reeb, 2003; Boubaker et al., 2016; Jin & Park, 2015; Miller et al., 2013; Muntahanah et al., 2021; Tsao & Chen, 2012; Villalonga & Amit, 2006). The question of how family ownership can result in a competitive advantage or disadvantage constitutes "a huge puzzle" and calls for additional research (Jiang & Peng, 2011).

Family ownership can enhance firm performance at least for the four following reasons. First, family firms suffer less agency problems stemming from conflicts between managers and shareholders (Jensen & Meckling, 1976). Family owners monitor firms' decisions and management more effectively than other shareholders as their wealth is often closely linked to firm prosperity (Anderson & Reeb, 2003; Martin et al., 2017). They are generally interested in value creation for the whole family and focus on safe guarding family business to succeeding generations. This focus is more pronounced when a significant proportion of the family wealth is invested in the firm (Block, 2012; Munari et al., 2010; Roger & Schatt, 2016). Second, compared to other shareholders, families have long term perspective and exert influence over strategic decisions to efficiently allocate resources to value creation. Third, family owners provide firms with their expertise, specific human capital as well as social links and knowledge to better perform (Boyd & Solarino, 2016; Matzler et al., 2015; Munari et al., 2010; Sanchez-Famoso et al., 2015). Fourth, family ownership competitive advantages may result from the deep emotional link between business and families. As the firm represents their family's fortune, a source of their personal satisfaction and reputation, family owners act to safeguard their assets and outperform other companies (Anderson & Reeb, 2003; Miller et al., 2007).

Empirically, many studies show that family ownership is beneficial to firm performance (Chu, 2011; Maury, 2006; Miller et al., 2007; Villalonga & Amit, 2006). Barontini and Caprio (2006) examined the relationship between corporate performance and ownership structure in the continental Europe. The results are mixed and differ across countries. They highlighted a positive effect of family ownership in France, Belgium, Spain and Germany. Jin and Park (2015) report a positive association between large family ownership and firm accounting performance in South Korea.

Conversely, family ownership can dampen firm performance. First, firms with family ownership are more prone to experience greater principal–principal conflict. Indeed, family owners can have the incentives to pursue actions that benefit themselves and adversely affect minority shareholders that may lead to suboptimal strategic decisions and poor firm performance (Anderson & Reeb, 2003; Jiang & Peng, 2011). The expropriation of private benefits can be more pronounced with the increase of family holdings. Filatotchev et al. (2011) suggest that large family ownership lead to an abuse of private information and an increase in agency costs (Alsan & Kumar, 2012; Ang et al., 2000; Boyd & Solarino, 2016; Matzler et al., 2015). Second, the resource-based view states that family members often take key management positions even if they lack the required qualifications that adversely influences decision-taking processes and results in less performance (Bigliardi & Galati, 2016; Burkart et al., 2003; Dyer, 2006; Sener, 2014). Third, some recent studies support that family owners are interested in pursuing non-economic goals, to support their socio-emotional wealth at the expense of pecuniary gains (Gomez-Mejia et al., 2014; Martin et al., 2017; Sanchez-Famoso et al., 2015). They may engage in strategies that promote family goals and preserve personal and social reputation. Barontini and Caprio (2006) reported a negative association between family ownership and firm performance measured by ROA and Tobin's Q for Italian firms. Studying a sample of 1237 family-owned Spanish olive mills, Gómez-Mejía et al. (2007) supported that family owners can accept higher risk for lower performance in order to maintain family control. The authors indicated that family owners aim to preserve their socio-emotional wealth rather than economic gains. Ibrahim and Abdul Samad (2011) show that family ownership reduces firm value measured by Tobin's Q and ROA for a sample of publicly listed Malaysian firms during the period 1999–2005. Recently, Muntahanah et al. (2021) examine the relationship between family ownership and firm performance for all listed companies in the Indonesian Capital Market Directory during the period 2008–2018. The results suggest that family ownership significantly reduces firm performance.

Other studies failed to find significant association between firm performance and family ownership as those of Sciascia and Mazzola (2008) for a sample of small and medium Italian companies, Bambang and Hermawan (2013) and Juanda and Jalaludin (2018) for different samples of Indonesian firms.

More recent evidence highlights the alternative that the relationship between family ownership and firm performance is nonlinear. Anderson and Reeb (2003) and Shyu (2011) estimate quadratic models as they add the square of family ownership in their fixed effect panel models. Anderson and Reeb (2003) results indicate a nonlinear relationship between family ownership and U. S. firm performance. Above a 30% ownership threshold, family shareholders expropriate wealth at the expense of minority shareholders. Shyu (2011) shows that a non-linear relationship (inverted U-shaped curve) exists between profitability measured by ROA and family ownership for a sample of Taiwanese firms. First, firm profitability increases and then decreases when families have more than 30% of the firm, suggesting a greater potential for family entrenchment resulting on poor performance. More recently, Sener (2014) estimates piecewise regression and investigates the influence of different level of family ownership on Turkish firm performance. She found that the impact is negative for lower levels of family ownership, and then becomes positive at middle levels (between 20% and 50%). No effect is reported at higher family ownership levels. Examining the Chinese Publicly listed companies from 2004 to 2008, Luo and Liu (2014) report a nonlinear relation between family-controlled firms and corporate value measured by Tobin's Q. Using quadratic model form they find a significant inverse-U-shaped relationship. Poutziouris et al. (2015) showed a non-linear relationship between family ownership and firm performance for a sample of UK companies listed on the London Stock Exchange (LSE) during the period from 1998 to 2008. To test the non-linearity, they used regressions including the percentage of family ownership and the percentage of family ownership squared. The results indicated an inverted U-shaped relationship with a break point at about 30% family ownership.

Thus, according to previous literature, there are conflicting results on how family ownership impacts firm performance. In this paper, we use the PSTR model to investigate the relation between family ownership and firm performance. We support that whether family ownership is

beneficial or harmful for firm performance depends on the importance of family stakes and we develop the following hypothesis:

The relationship between family ownership and firm performance is nonlinear.

3. Data and model specification

3.1. Data and variables

Our sample consists of the non-financial French firms listed on the CAC All Shares index that have family ownership in their capital structure. Financial sectors (as banks and insurance companies) were not considered in the sample as they are subject to specific regulations.

After removing firms with missing data, we have 180 firms over the period 2009 to 2017, which results in a balanced panel data of 1620 firms-years observations. Firm financial performance, family ownership and control variables were collected from Thomson Reuters Database and completed with companies' annual reports.

The financial performance is the dependent variable and it is measured by Return on Assets (ROA). ROA is the ratio of net income to the book value of total assets (Anderson & Reeb, 2003; Sener, 2014; Shyu, 2011). The independent variable is family ownership. To measure family ownership we follow previous studies (Block, 2012; H-L. Chen & Hsu, 2009; Jiang & Peng, 2011; Shyu, 2011), and calculate the percentage of shares held by families' members (including founders and descendants). Family members are identified as those having the same family name. The family ownership data are collected from Thomson Reuters Database and companies' annual reports.

We control for firm-level characteristics namely, firm size, leverage and the percentage of independent directors in the board (Anderson & Reeb, 2003). Firm size is measured by the natural logarithm of the market value of the firm (LNMV). For leverage, we consider the ratio of total liabilities to total assets (TDTA).

To control for the general economic and industry-specific conditions, we include the GDP growth (GDPG) and the average industry ROA (ROAIND), respectively. Average industry ROA is measured as the arithmetic average of ROA for all the firms, listed in the CAC all Shares, in the same industry and the same year as the firm under consideration. Definitions of the dependent and independent variables are summarized in Table 1.

3.2. Panel smooth transition regression model

In this paper, we use the panel smooth transition regression model to investigate the potential nonlinear relationship between family ownership and firm performance. Panel data models with polynomial or piecewise specifications, traditionally used to examine nonlinearity, have some drawbacks that the panel smooth transition model can resolve. Polynomial regression model imposes arbitrary the order of the polynomial functions and the nature of the relation between the variables. Once the model is identified, all the firms will have an identical family ownership—firm performance relationship. This can be misleading because family members' incentives and monitoring ability evolve as their ownership changes. Accordingly, high and low family ownership would not necessarily have the same impact on firm performance. In the piecewise regression the choice of the levels of family ownership is purely subjective and the results and the conclusions are sensitive to this choice. For PSTR models, observations are divided into homogenous groups or regimes according to the value of the threshold variable (González et al., 2005; Lin, 2013). Firms can move between groups and over time depending on changes in this variable. The estimated coefficients vary between firms and also with time that deals with firm heterogeneity and time instability of coefficients (Fouquau et al., 2008; Li et al., 2015). Compared to polynomial regression models and piecewise regressions, PSTR model gives more flexibility and consistency as it

Table 1. Variables definition

Variables	Measures used	Abbreviations
Financial performance	the ratio of net income to the book value of total assets	ROA
Family ownership	Percentage of capital held by one or more families' members (including founders and descendants)	FO
Size	log of firm's market capitalisation	LNMV
Leverage	Total debt scaled by total assets	TDTA
Independent directors	Percentage of independent directors on the firm board	INDBRD
Industry performance	The arithmetic average of ROA for all the firms in the same industry and the same year as the firm under consideration.	ROAIND
GDP growth	The percentage of GDP growth	GDPG

determines the threshold level of family ownership endogenously and examines its impact on firm performance both above and below the threshold level.

PSTR model presents other advantages. First, González et al. (2005) emphasize that the PSTR allows coefficients to change smoothly as a function of the threshold variable and avoids the abrupt changes through regimes as in Hansen (1999) panel threshold regression model (PTR). Second, temporal variability of coefficients in the PSTR model permits to deal with the endogeneity problem (Béreau et al., 2012; Yu, 2013). Fouquau et al. (2008, p. 299) explain that "the PSTR model limits the potential endogeneity bias because, for each level of threshold variable, there is a particular value of the estimated regression parameter".

The PSTR model was first introduced by González et al. (2005) to investigate the effects of capital market imperfections on corporate investment decisions. Recently, this methodology has been widely adopted to examine nonlinear relationships between variables, for instance, in macroeconomics (Ben Cheikh & Ben Zaied, 2020; Doumbia, 2018; Fouquau et al., 2008; Khue & Lai, 2020; López-Villavicencio & Mignon, 2011; Zortuk & Çeken, 2015), in environmental economics (Ben Lahouel et al., 2020; Duarte et al., 2013; Wang & Wei, 2020), in energy economics (Apergis, 2019; Chiu, 2017), in social responsibility field (Chen et al., 2018; R.C. Chen & Lee, 2017) and in finance (Kadilli, 2015; Namouri et al., 2018). Despite the contribution of PSTR models in investigating nonlinear relationships and threshold effects, they have not been used intensively in corporate governance (Hu et al., 2020). Recent research suggests that the relationships between ownership structure, firm performance and corporate decisions are not necessarily linear (Amin & Liu, 2020; Pucheta-Martinez & Chivas-Ortells, 2019).

3.3. Model specification

The Panel Smooth Transition Regression (PSTR) developed by González et al. (2005) is given by equation (1):

$$y_{it} = \mu_i + \alpha' z_{it} + \beta_0' x_{it} + \beta_1' x_{it} g(q_{it}, \gamma, c) + \varepsilon_{it} \quad (1)$$

Where i = 1, ……, N and t = 1, ……., T denote the cross-section and time dimensions of the panel, respectively. In this model, y_{it} represents the dependent variable. μ_i indicate the fixed individual effects and ε_{it} are the error terms. x_{it} is a vector of k explanatory variables.

The PSTR model is based on a transition function $g(q_{it}, \gamma, c)$ which depends on a transition variable denoted q_{it}. González et al. (2005) consider the following logistic transition function:

$$g(q_{it}, \gamma, c) = \left(1 + exp\left(-\gamma \prod_{j=1}^{m}(q_{it} - c)\right)\right)^{-1} \text{ with } \gamma > 0 \text{ and } c_1 \leq c_2 \leq \ldots \leq c_m \quad (2)$$

where c_j and γ represent the parameters of the threshold and the smooth transition parameter, respectively. z_{it} represent a vector of explanatory variables that will have constant coefficients over time and individuals and will not enter the nonlinear part of the model.

The coefficient of a variable is β_0 if the transition function is equal to 0 and it is β_1 if the transition function is equal to 1. Between the two extreme regimes, the coefficient is equal to $\beta_0 + \beta_1 g(FO_{it}, \gamma, c)$.

To explore the relationship between firm performance and family ownership, we use the following econometric model:

$$ROA_{it} = \mu_{it} + \alpha_1 ROAIND_{it} + \alpha_2 GDPG_{it} + \beta_0^0 FO_{it} + \beta_0^1 LNMV_{it} + \beta_0^2 TDTA_{it} + \beta_0^3 INDBRD_{it} + \left[\beta_1^0 FO_{it} + \beta_1^1 LNMV_{it} + \beta_1^2 TDTA_{it} + \beta_1^3 INDBRD_{it}\right] g(FO_{it}, \gamma, c) + \varepsilon_{it}$$

ROA is the dependent variable and it measures firm performance. *FO* is the transition variable. We investigate the hypothesis that the impact of family owners on firm performance depends on the importance of family ownership. *LNMV, TDTA* and *INDBRD* are control variable that we assume that their impacts on firm performance depend on the transition variable. *ROAIND* and *GDPG* have constant coefficients over time and their influences are independent of the family ownership.

Before estimating the PSTR model, we have to perform some statistical tests. First, we examine the correlation coefficients between variables and we compute the Variance Inflation Factor (VIF) values to test for multicollinearity. Second, we test for the stationarity of all the variables used in the model by performing two unit roots tests, namely, the Levin et al. (2002) and Phillips and Perron (1988). Third, we test the linearity hypothesis against the PSTR model. Finally, we test the no remaining non linearity hypothesis to identify the number of regimes.

PSTR model estimation consists of the two following steps (González et al., 2005). We eliminate the individual effects μ_i by removing individual specific means and then we apply the non-linear least squares to the transformed model.

4. Model estimation and results

4.1. Summary statistics and multicollinearity test

Table 2 shows the descriptive statistics of all the variables. We report a mean value of 3.3% for ROA and 45.9% for family ownership. Barontini and Caprio (2006) reported that families are the most frequent largest shareholders with a mean of 52.3% for a sample of European firms. For the French firms, they showed that the family largest shareholder has on average 63.2% whereas Boubaker et al. (2016) found an average of 41.6% with a more recent data. Sciascia and Mazzola (2008) indicated that the average value of family ownership in their sample of Italian firms is 77.24%.

The multicollinearity problem could produce biased estimations and occurs when two or more independent variables are highly correlated. Correlation coefficients and VIF test are used to detect it. Table 3 shows that the highest VIF is 1.08 less than the 10 threshold above which multicollinearity is an issue (Gujarati & Porter, 2009). Additionally, the highest absolute correlation

Table 2. Descriptive Statistics of Variables

	Mean	Median	Std. Dev.	Minimum	Maximum
ROA (%)	3.277	3.538	11.114	−91.963	89.281
FO (%)	45.879	50.3	23.195	0	97.37
LNMV	19.129	18.891	2.072	14.668	25.364
TDTA (%)	28.343	25.715	18.919	1	76.517
INDBRD (%)	30.911	33.333	22.58	0	85.7
GDPG (%)	0.843	1.095	1.467	−2.873	2.26
ROAIND (%)	2.912	3.573	3.072	−11.849	14.96

between independent variables is 0.242 which is below the 0.8 threshold (Gujarati & Porter, 2009). Accordingly, we can conclude that multicollinearity does not pose a problem in our estimations.

4.2. Panel unit root tests

González et al. (2005) suggest that the PSTR model estimation requires that variables are stationary to avoid spurious regression. Results of panel unit root tests are reported in Table 4. The Levin et al. (2002) test and the Phillips and Perron (1988) test reject the null hypothesis of the existence of panel unit root at the 1% level of significance for all the variables used in the model. Thus, all the variables are stationary.

4.3. Linearity tests

To verify that the relationship between firm performance and family ownership is nonlinear, we conduct a test of linearity against the PSTR model. The null hypothesis of this test H_0: $\beta_1 = 0$ against H_1: $\beta_1 \neq 0$. As the PSTR model contains unidentified nuisance parameters, this test is not standard. We replace the transition function $g(q_{it}, \gamma, c)$ by its first-order Taylor expansion around $\gamma = 0$. The null hypothesis is expressed in function of γ, H_0: $\gamma = 0$.

The model (1) can be rewritten as following in model (4):

$$y_{it} = \mu_i + \alpha' z_{it} + \beta_0^{*'} x_{it} + \beta_1^{*'} x_{it} q_{it} + \ldots + \beta_m^{*'} x_{it} q_{it}^m + \varepsilon_{it}^* \tag{4}$$

Where the parameters vectors $\beta_1^{*'}, \ldots \beta_m^{*'}$, are multiples of γ and ε_{it}^* is equal to ε_{it} plus the residual of Taylor development. After the transformation, the linearity can be tested with standard tests. We use the three following tests; the Wald Test, Fisher test and the Likelihood ratio test. We consider SSR_0 the panel sum of squared residuals under H_0 (linear panel model with individual effects) and SSR_1 the panel sum of squared residuals under H_1 (PSTR model specification).

The Wald LM tests can be written in the equation (5) as:

$$LM_w = \frac{NT(SSR_0 - SSR_1)}{SSR_0} \tag{5}$$

González et al. (2005) suggest the use of the Fisher statistics (LM_F) for small sample which is presented in the equation (6) as:

$$LM_F = \frac{NT(SSR_0 - SSR_1)/mk}{SSR_0/(TN - N - mk)} \tag{6}$$

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Table 3. Variance Inflation Factor (VIF) and Pearson correlation matrix

Variables	VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ROA		1.000						
(2) FO	1.02	0.130*	1.000					
(3) LNMV	1.07	0.153*	−0.064*	1.000				
(4) TDTA	1.02	−0.102*	0.021	−0.034	1.000			
(5) INDBRD	1.08	−0.074*	−0.095*	0.242*	0.071*	1.000		
(6) GDPG	1.01	0.006	−0.012	0.050*	0.066*	0.030	1.000	
(7) ROAIND	1.01	0.267*	0.089*	0.013	−0.058*	0.038	0.017	1.000

Notes: The variance inflation factors (VIF) are presented in the second column. The Pearson correlation coefficients are presented. * denotes the correlation coefficients significant at the 0.05 level or higher.

Where ROA is the return on assets, FO is the family ownership, LNMV is the natural logarithm of market capitalization, TDTA is the ratio total debt to total assets, INDBRD is the percentage of independent directors in the board, GDPG is the GDP growth and ROAIND is the average industry ROA.

Table 4. Panel unit root test in level

Variables	LLC		PP-Fisher	
	Statistic	p-value	statistic	p-value
ROA	−14.017	0.000***	1401.767	0.000***
FO	−104.000	0.000***	676.347	0.000***
LNMV	−7.116	0.000***	467.295	0.001***
TDTA	−13.173	0.000***	469.604	0.000***
INDBRD	−22.606	0.000***	434.066	0.004***
GDPG	−3.162	0.001***	5654.615	0.000***
ROAIND	−16.042	0.000***	951.795	0.000***

Notes: ***,**,* indicate statistical significance at 1, 5 and 10 percent level of significance, respectively.

Where ROA is the return on assets FO is the family ownership, LNMV is the natural logarithm of market capitalization, TDTA is the ratio total debt to total assets, INDBRD is the percentage of independent directors in the board, GDPG is the GDP growth and ROAIND is the average industry ROA

Where k is the number of explanatory variables and m is the number of thresholds in the transition function. The LM_F statistic follows a Fisher distribution with mk and $TN\text{-}N\text{-}mk$ degrees of freedom. Linearity tests follow a Chi 2 distribution with k degrees of freedom under the null hypothesis.

Results of linearity tests reported in Table 5 show that the hypothesis of linearity is rejected at the 5% significance level for the three tests. The results suggest that the relationship between firm performance and family ownership is nonlinear.

4.4. The number of regimes

To determine the required number of transition functions to absorb all the possible non-linearity, we compute the Fisher statistic LM_F and Likelihood ratio test LR statistic to test the two following hypotheses: the linearity hypothesis (H_o: $r = 0$ versus H_1: $r = 1$) and the no remaining nonlinearity hypothesis (H_o: $r = 1$ versus H_1: $r = 2$).

The results, reported in Table 6, confirm again that the linearity hypothesis (H_o: $r = 0$) is rejected at the 5% significance level for the likelihood ratio test. The no remaining nonlinearity hypothesis (H_o: $r = 1$) cannot be rejected for the two tests confirming that the model has one transition

Table 5. Linearity tests

Tests	statistic	p-value
Lagrange multiplier (Wald test) LM_W	17.457	0.0257**
Lagrange multiplier (Fisher test) LM_F	1.949	0.0493**
Likelihood-ratio test (LR)	17.552	0.0248**

Notes: ***,**,* indicate statistical significance at 1, 5 and 10 percent level of significance, respectively.

Table 6. Tests for the number of regimes

Tests	r = 0		r = 1	
	statistic	p-value	statistic	p-value
Lagrange multiplier (Fisher test) LM_F	11.069	0.198	3.746	0.441
Likelihood-ratio test (LR)	2.240	0.022**	0.891	0.468

Notes: ***,**,* indicate statistical significance at 1, 5 and 10 percent level of significance, respectively.

function. This means that the relationship between firm performance and family ownership has one threshold and two extreme regimes.

4.5. PSTR results

Table 7 indicates that the estimated threshold value for family ownership *c* is equal to 37.62% and the smoothing parameter of transition γ is equal to 5.42. This means that the impact of family ownership on firm performance differs depending on whether family ownership is below or above the threshold value. When family ownership is below 37.62%, the impact of family ownership on firm performance is negative and statistically significant at the 1% level. Hence, for low level of ownership, family owners are not willing to bear the full costs of monitoring and tend to accumulate private benefits at the expenses of other shareholders. This negative impact of low family ownership level is in line with the findings of Sener (2014) that examined the nonlinearities between family ownership and firm performance using piecewise regressions in Turkey. She found that when family ownership is lower than 20%, it negatively influences firm performance.

However, above the estimated threshold the opposite effect on firm performance occurs. Indeed, above a family ownership of 37.62%, its impact on firm performance is positive and statistically significant at the 1% level. For high level of stockholdings, family owners have more incentives to enhance long-term firm performance than to search some short-term private benefits (Burkart et al., 2003; Claessens et al., 2002; Demsetz & Lehn, 1985). This positive influence of high family ownership levels on firm performance (above the threshold of 37.62%) corroborates the empirical findings of Barontini and Caprio (2006), and Jin and Park (2015). Indeed, Barontini and Caprio (2006) support a general positive effect of large family ownership on the financial performance for a sample of European firms. We confirm also Sener (2014) findings for family ownership levels between 20% and 50%. We similarly support Jin and Park (2015) results that report a positive association between large family ownership and Korean firm performance.

Table 7. Parameter estimation using PSTR, 2009–2017

Variables	PSTR		
	coefficient	T-stat	Prob.
ROAIND GDPG FO	1.021 −0.120 -0.128	9.346 −0.865 -2.580	0.000*** 0.386 0.009***
LNMV	1.886	4.292	0.000***
TDTA	0.016	0.577	0.564
INDBRD	−0.052	−1.727	0.084*
FO*TRANSF	0.180	2.817	0.004***
LNMV*TRANSF	−0.165	−1.039	0.298
TDTA*TRANSF	−0.054	−1.579	0.114
INDBRD*TRANSF	0.0714	1.960	0.050*
	Transition parameters		
c	37.62%		
γ	5.423		
AIC/BIC	4.151/4.190		

Notes: ***,**,* indicate statistical significance at 1, 5 and 10 percent level of significance, respectively.

Where ROA is the return on assets FO is the family ownership. LNMV is the natural logarithm of market capitalization. TDTA is the ratio total debt to total assets. INDBRD is the percentage of independent directors in the board. GDPG is the GDP growth. ROAIND is the average industry ROA.

For control variables, we note the positive relation between the performance of the firm and that of the industry in which it operates. Conversely, the GDP growth is not statistically significant. For firm-level characteristics, we note the positive relation between firm performance and the size of the firm when family ownership is below the threshold. Conversely, we note a positive impact of the presence of independent directors in board on performance for high level of family ownership. These independent directors have an important role to protect minority shareholders when ownership is concentrated.

5. Conclusion

This paper explores the relationship between family ownership and firm performance for a large sample of French firms over the period of 2009–2017. Results from Panel Smooth Transition Regression (PSTR) model indicate that the investigated relationship is nonlinear. Our model has one threshold at the 37.62% of family ownership and two extreme regimes. Moreover, we find a statistically negative relationship between family ownership and firm performance below the threshold. This result indicates that for low level of ownership, family members do not have enough incentives to bear the costs of effective monitoring and they rather search for some private benefits at the expense of other shareholders. Above the threshold level, family ownership has a positive effect on firm performance. This result suggests that for high level of ownership, the family wealth is closely associated to the firm survival and prosperity. Thus family members are provided substantial incentives to supervise managers and improve firm performance (Burkart et al., 2003; Claessens et al., 2002; Demsetz & Lehn, 1985).

This study contributes to a better understanding of the relationship between family ownership and firm performance. It reconciles the studies that found positive impact and those that found negative relation by showing that this relationship can better be presented in nonlinear terms that exhibit both negative and positive aspects. Our findings provide useful insights for companies and investors who assess the best investment opportunities. Firms with family ownership constitute a large proportion of publicly listed firms in France. Sraer and Thesmar (2007) report that more than one-third of French listed firms are family controlled. Investors are generally reluctant to invest in these firms because of the information asymmetry and agency problem that characterizes family firms. This study suggests

that the level of family ownership should be taken into account when deciding to invest in family firms and provides a threshold level that can help investors to identify value enhancing ownership structure.

There may be some limitations to this study. Our empirical was restricted to the nature of the relation between family ownership and firm performance and we did not investigate the channels through which family members enhance or impede performance. It would be interesting in future research to consider these issues and investigate whether the impact of family ownership on financing and investment decisions can be presented in nonlinear terms. Moreover, we will examine the influence of some others characteristics of family firm on its performance such as family involvement in the management and the transgenerational orientation of the family.

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