

Ownership Structure, Voluntary R&D Disclosure and Market Value of Firms: The French Case

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ABSTRACT

R&D disclosure is a strategic decision directed at investors. However, voluntary R&D disclosure can lead to a higher proprietary cost and may benefit competitors. The main purpose of the present paper is to examine whether voluntary R&D disclosure impacts the firm's market value, and whether it is influenced by ownership structure. Using a sample of 84 French listed firms over the 2000-2004 period, we develop an R&D disclosure index composed of 32 hand-collected items from annual reports. The obtained findings provide some important insights. First, we show that voluntary R&D disclosure improves the market value of equity, suggesting that the benefits from disclosures of R&D activities exceed the disclosure costs. Second, we find that family- and institutional investor-firms are more prone to retain R&D information. Finally, we document that the more French firms invest in R&D, the larger the amount of R&D-related information they disclose. Also, R&D capitalization provides incentives for companies to disseminate more R&D-related information.

JEL Classifications: M41, G3

Keywords: R&D voluntary disclosure; proprietary cost; ownership structure; firm value; France

I. INTRODUCTION

Research and Development (hereinafter R&D) expenditures are found to lead to a higher market value (Chan *et al.*, 1990; Chauvin and Hirschey, 1993). At the same time, R&D activities are considered as an example of an investment that gives rise to agency problems between managers and investors. Hence, discretionary disclosure provides a potentially important tool that enables corporate managers to maximize firm value by reducing existing information asymmetries between insiders and outsiders (Healy and Palepu, 1993). Voluntary R&D disclosure is aimed at achieving specific goals, namely, reduced cost of capital, reduced agency costs arising from conflicts of interest, and reduced risk of a negative transfer of wealth. Verrecchia (2001) sees discretionary disclosure as a substitute for regulation, in order to mitigate information asymmetries. For R&D-intensive firms, monitoring the actions of the agent imposes costs, since there are few informative signals until the outcome of the innovation becomes known, at some future date (Holthausen *et al.*, 1995). When managers expect to bear the agency costs, they have incentives to provide voluntarily a greater level of disclosure about the firm's R&D activities.

However, existing research implies that not all R&D firms will have identical disclosure strategies (Healy and Palepu, 1993). Two reasons may explain why some firms do not disclose more information about R&D activities, and instead choose greater discretion. First, R&D activities need some discretion to avoid the possibility that their competitors might benefit from the information disclosed about these activities. Second, R&D-related disclosure differs from other information categories, because the proprietary costs of such disclosure are higher (Verrecchia, 1983; Dye, 1986; Jones, 2007). Disclosure will prevail only if disclosure costs are low enough, or if information asymmetry is sufficiently high. Jones (2007) tests Verrecchia's hypothesis, and finds that higher proprietary costs are associated with lower levels of disclosure about R&D activities. Studying French and Canadian firms, Ding *et al.* (2004) find differences between the two countries in their R&D information disclosing practices. However, the authors did not explain these differences. Ownership structures differ between these two countries and their different structural features may have important implications regarding R&D-related disclosure. While numerous studies have shown the existence of a relationship between ownership structure and corporate disclosure (namely, Ho and Wong, 2001; Chau and Gray, 2002; Gelb, 2002; Hannifa and Cooke, 2002; Eng and Mak, 2003; Ashiq *et al.*, 2007), researches on the link between ownership structure and voluntary R&D disclosure remain virtually nonexistent.

The objective of our research is to fill the existing gap in the literature, by studying how ownership structure affects the level of voluntary R&D disclosure, and the role of disclosure in improving the extent to which stock prices reflect R&D-related information. On the basis of 84 firms studied over the 2000-2004 period, we develop and hand-collect 32 items from annual reports to construct the voluntary R&D disclosure index. Using an instrumental variable analysis, our results provide some important insights. First, an increase in the level of voluntary R&D disclosure improves the firm's market value. Second, the results provide evidence that family firms are more inclined than others to retain R&D information. We document that foreign ownership dominates French ownership, in explaining the likelihood of

voluntary R&D-related disclosure. Finally, when French firms invest more in R&D, they are more likely to disclose R&D-related information. Also, R&D capitalization provides the market with incremental information.

The remainder of this paper is organized as follows. The next section develops the relationship between R&D-related disclosure and firm market value, on the one hand, and between R&D voluntary disclosure and ownership structure, on the other hand. Section III describes our research methods, data collection and analysis. Section IV presents and discusses our empirical findings. The final section concludes the paper.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A. Voluntary R&D Disclosure and Firm's Market Value

Some companies limit their disclosure to mandatory information, whereas others choose to disclose voluntarily beyond what is required. By analyzing the annual reports of 76 French listed companies and 110 Canadian listed companies, Ding *et al.* (2004) compared the respective practices of disclosing information on R&D in these two countries. Their results show that Canadian companies disclose more information about their R&D practices than French companies, especially those in the manufacturing, software and biotechnology industries. This is due both to the very intense pressure faced by Canadian companies in the financial markets, and to the different philosophies of transparency and full disclosure that prevail in Canada and France, respectively. In addition, the authors observe a positive and significant correlation between R&D disclosure and R&D intensity. This suggests that Canadian companies with high R&D express their willingness to disclose information regarding their R&D, primarily in order to reduce the cost of control of the company, and the cost of capital. In addition, Canadian companies also use non-financial information to provide information about their R&D, while French firms are limited to providing financial information and traditional accounting.

Little evidence has been found regarding the relationship between R&D disclosure and firm market value. Given that R&D expenditures lead to a higher market value (Chan *et al.*, 1990; Chauvin and Hirschey, 1993), it can be expected that the higher the R&D-related disclosure, the greater will be the shareholders' reaction. However, the magnitude of asymmetric information and uncertainty regarding R&D investments makes the evaluation of such information difficult for shareholders, who will not be able to translate the economic advantages expected from this investment into stock prices (Nagar *et al.*, 2003). In this case, no relationship can be expected between R&D disclosure and firms' market value. Jones (2007) finds that firms with a lower book-to-market ratio are more likely to disclose more detailed information about R&D activities. This is because the basic financial statements used in the book-to-market measure are less informative about market value. Lim *et al.* (2007) find that the market-to-book ratio leads to better information disclosure, although this effect is lower when strategic information, such as R&D, is considered. Our paper explores the value relevance of R&D disclosure, and examines to what extent voluntary R&D disclosure can raise the market value of equity. Our first hypothesis is then set as follows:

H₁: There is a positive relationship between the level of voluntary R&D disclosure and the firm's market value.

B. Ownership Structure and R&D Voluntary Disclosure

In our paper, we distinguish between ownership concentration, institutional ownership, family ownership, managerial ownership and director ownership.

1. Ownership Concentration

Several studies have focused on the relationship between ownership concentration and the quality of disclosure of financial information (see, e.g., Chau and Gray, 2002; Gelb, 2002; Eng and Mak, 2003; Lakhali, 2006). In their study of Malaysian listed companies, Haniffa and Cooke (2002) show a significant positive relationship between the proportion of shares held by the top ten shareholders and voluntary disclosure. Eng and Mak (2003) find that lower managerial ownership and significant government ownership are associated with increased voluntary disclosure. Xiao and Yuan (2007) show that voluntary disclosure increases as blockholders' interest in the firm increases. Lim *et al.* (2007) confirm this finding for Australian companies. Furthermore, Banghøj and Plenborg (2008) argue that a higher level of ownership concentration may provide less voluntary disclosure, since shareholders may privilege internal communication channels for obtaining information. Conversely, the presence of large shareholders may be considered a monitoring device that leads managers to disclose information voluntarily, thus reducing the information asymmetry problem. Using a sample of 207 French listed firms over the period 1998-2001, Lakhali (2007) finds a negative correlation between ownership concentration and voluntary earnings disclosures.

The preceding discussion leads to the following hypothesis:

H₂: There is a negative relationship between ownership concentration and the level of voluntary R&D disclosure.

2. Institutional Investors' Ownership

Institutional investors are more likely than other shareholders to exercise their voting rights. Because of their financial capacity and independence, they should have a critical and objective attitude towards business management. However, in order to value a firm, institutional investors require specific information (Lev, 1999). Consistent with the disclosure of R&D activities, two opposite points of view can be proposed. On the one hand, these institutions may prefer discretion, to avoid a decline in the information's quality, and the loss of their informational advantage. Hence, they may encourage managers to exercise myopic discretion in reporting more R&D activity. On the other hand, many authors find that firms where institutional investors have significant ownership interests are encouraged to hold public conference calls. In France, Lakhali (2006) distinguishes between domestic and foreign institutional investors, and finds that only foreign investors lead firms to disclose greater information, suggesting that the latter offer better protection for minority

shareholders, by constraining managers to adopt best corporate governance practices. The preceding discussion leads to the two alternative hypotheses:

H_{3a}: The larger the level of French institutional ownership, the lower is the level of voluntary R&D disclosure.

H_{3b}: The larger the level of foreign institutional ownership, the higher is the level of voluntary R&D disclosure.

3. Family Ownership

The French corporate landscape is dominated by family firms that feature highly concentrated ownership structures (La Porta *et al.*, 1999). According to Chen *et al.* (2006), family owners have longer investment horizons, better monitoring of management actions and suffer less from information asymmetry with managers. Chau and Gray (2002) find that the family firms are subject to less demand for corporate disclosure, compared to widely held firms, which suggests that controlling families have access to a large range of information, and thus have little incentive to disclose information in excess of the mandatory requirements. Ho and Wong (2001) and Hannifa and Cooke (2002) document evidence of a negative association between the presence of family members on the board and voluntary corporate disclosure. Ashiq *et al.* (2007) also examined the effect of family ownership on corporate disclosure quality, and found that the level of voluntary disclosure of family firms was lower than that of non-family firms. The discussion here leads to the following hypothesis:

H₄: There is a negative relationship between family ownership and the level of voluntary R&D disclosure.

4. Managerial Ownership

Managerial ownership mitigates agency costs, and therefore should reduce investors' information requirements (Gelb, 2000). From the agency theory point of view, we could argue that high managerial interests decrease the demand for information that is used to constrain managers' opportunism. Alternatively, greater insider ownership can also lead to managerial entrenchment (Morck *et al.*, 1988). Thus, when managers do not act in the best interests of shareholders, they may discourage voluntary disclosure, leading to a more opaque information environment. Eng and Mak (2003) examine companies listed on the Stock Exchange of Singapore in 1995, and find that lower managerial ownership is associated with increased voluntary disclosure. Therefore, managers who hold significant shares of capital withhold information, in order to increase their decisional power.

H₅: There is a negative relationship between managerial ownership and the level of voluntary R&D disclosure.

5. Director's Ownership

Jensen (1993) emphasizes the need to align the interests of outside directors with those of shareholders. This alignment of interests can strengthen critical directors' assessment of the performance and reliability of the process of preparing financial statements. Outside directors are likely to be more aligned with management and less with shareholders, because outside directors tend to have a smaller equity position than other directors. Beasley (1996) and Dechow *et al.* (1996) show a negative relationship between the proportion of shares held by outside directors and the issues raised in the preparation of financial statements. In contrast, outside directors do not become effective unless they have a personal stake in the business. Leung and Horwitz (2004) suggest that high director ownership reduces the informational environment of firms in Hong Kong. In our study, director ownership is used as a measure of board members' financial motivation to disclose more information.

H₆: There is a negative association between the level of director ownership and the level of voluntary R&D disclosure.

III. DATA AND RESEARCH DESIGN

A. Sample and Data Description

The initial sample was based on a panel sample of firms listed in the SBF 250 index over a period of 5 years (2000-2004). Among the initial population, the sample available for selection was reduced by removing finance, banking and real estate companies (20 companies). Also, we retained only firms that mention R&D in the audited components of their financial statements, and eliminated companies without R&D intensity, to alleviate the concern that a company might be penalized for not disclosing information about its R&D (115 companies). Another 31 of the remaining firms were excluded because of a lack of corporate governance data and/or financial data. Hence, the final sample consists of 84 companies over a period of 5 years, a total of 420 firm-year observations.

B. Dependent Variable: Market-to-book Ratio

The effect of fully expensing R&D spending is an understatement of the book value of equity on the balance sheet. Therefore, market-to-book measures reflect this accounting effect, as well as all other conservative accounting practices that may lead to lower book values. The market-to-book ratio (MTB) is computed as the end of period price per share, multiplied by the number of shares outstanding to book value of equity.

C. Instrumental Variable: R&D Disclosure Index

In order to measure the level of voluntary R&D disclosure, we adapted the disclosure score proposed by Botosan (1997). This score measures the overall level of disclosure as the sum of the scores achieved by five different categories of information. R&D-

related disclosures include (1) current and future information on spending, (2) inputs, (3) outputs, (4) information on accounting and budgeting and (5) strategy. All these categories are used in different degrees in Entwistle's (1999), Ding *et al.*'s (2004) and Jones's (2007) studies. We use the R&D disclosure score (R&D_DISC), from which we compile a list of items that are useful for valuing R&D activities (5 items for current and future information on spending, 7 items for inputs, 6 items for outputs, 8 items for accounting and budgeting, and 6 items for strategy). As in Cooke's (1992) study, content analysis was conducted to identify whether the information was present or not in the annual reports. To avoid subjectivity in our analysis, we did not weight any item for R&D information. The last step consists of calculating the level of R&D disclosure. We calculate the dependent variable (R&D_DISC) for each company by dividing its assigned total disclosure score over the potential maximum score¹.

D. Control Variables

R&D intensity (R&D): The users of financial statements are seeking information on R&D, especially when it represents a core business for a company. Entwistle (1999) shows a positive correlation between R&D intensity and R&D disclosure for Canadian firms. Ding *et al.* (2004) show that R&D intensity in Canadian firms has a stronger link with R&D disclosure than in France. In particular, they highlight that French companies are more prone to maintain privacy regarding their R&D activities. However, none of the authors cited above controlled for firms' ownership structure in their model. As in all previous studies, we measured the intensity of R&D by annual R&D expenditures deflated by sales.

R&D capitalization (R&D_CAP): French law gives companies the choice to capitalize R&D costs or not. Oswald and Zarowin (2007) show that R&D capitalization has a positive effect on the market value of a firm and corroborate the idea that R&D capitalization provides incentives for companies to disseminate more information these investments. Zhao (2002) stated that, for capitalizing firms, both the annual expenditures and the book value of capitalized R&D costs could influence stock prices. In the French context, Cazavan-Jeny and Jeanjean (2006) examine 197 firms during the period from 1993 to 2002 and find a negative impact of R&D capitalization on stock price and returns, which suggests that R&D capitalization leads to more managerial discretion.

Firm performance (ROA): The ROA is used to measure a company's profitability. Firms with high profitability may have an incentive to make more corporate disclosures, in order to communicate their quality to investors (Meek *et al.*, 1995; Ahmed and Curtis, 1999). Regarding R&D-related information, Lim *et al.* (2007) reveal that ROA is significant only for the disclosure of historical information, and is not significant with information as strategic details of R&D.

Sales growth (Δ SALES): Commercial effectiveness could lead companies to more disclosure of their ongoing R&D investment efforts. Firms aim to show steady sales growth in the foreseeable future thanks, among other things, to efforts in terms of R&D. This variable is used by such authors as Gul and Li (2007), for its suitability in measuring the impact of the voluntary disclosure of an innovation strategy, including R&D.

Leverage (LEV): Voluntary disclosures help reduce the conflicts of interest between debtholders and shareholders. Hence, good quality disclosure should reduce the cost of debt (Sengupta, 1998). In the Canadian context, Zéghal *et al.* (2007) provide evidence of a positive relationship between leverage and R&D voluntary disclosure. However, other researchers find a negative relationship between voluntary disclosure and debt level (Eng and Mak, 2003). Agency costs can be controlled by debt, which plays a substitutive role for the monitoring of management. As a consequence, the need to disclose information is weakened.

Firm size (SIZE): Managers of large firms seek to avoid political pressure by publishing more information (Watts and Zimmerman, 1990). Larger firms are also likely to make more voluntary disclosures because of their greater demand for outside capital, their lower average costs of collecting and disseminating information, and the greater demand for information by financial analysts (Hossain *et al.*, 1995). Accordingly, several studies attest to the existence of a significant and positive relationship between the firm size and its level of information disclosure (Hossain *et al.*, 1995; Ho and Wong, 2001; Lakhali, 2006; Lim *et al.*, 2007; Xiao and Yuan, 2007). Moreover, Jones's (2007) study shows a positive relationship between firm size and the level of voluntary R&D disclosure. Consistent with the above-mentioned studies, we measure firm size by the natural logarithm of total assets.

E. Research Design

A two-stage least squares regression (2SLS) model was used to estimate the effects of voluntary R&D disclosure on market-to-book valuation. In an ordinary least squares (OLS) model, R&D disclosure may be a significant determinant of the extent of value relevance, but it is also likely that R&D disclosure would be correlated with other characteristics that are themselves related to the market value of equity. Hence, placing both R&D disclosure and other firm characteristics on the right-hand side of the equation would raise endogeneity concerns. Following Larcker and Rusticus (2010), we adopt an instrumental variable estimation approach to conduct our research. These authors consider this method the most promising econometric approach to addressing the endogeneity problem. When more instrumental variables are available, two stage least squares (2SLS) provides a way of obtaining the optimal linear combination of instruments. Hence, in the first stage of the regression, we estimate the relationship between R&D disclosure and ownership structure. In the first equation, the dependent variable is the R&D voluntary disclosure index. This variable is explained by some ownership structure features, which are considered instruments in our model, and some selected control variables. In the first stage, we estimate:

$$\begin{aligned} \text{R\&D_DISC}_{it} = & \beta_0 + \beta_1 \text{MIN_OWN}_{it} + \beta_2 \text{FAM_OWN}_{it} + \beta_3 \text{FREINS_OWN}_{it} \\ & + \beta_4 \text{FORINS_OWN}_{it} + \beta_5 \text{MAN_OWN}_{it} + \beta_6 \text{DIR_OWN}_{it} \\ & + \beta_7 \text{R\&D}_{it} + \beta_8 \text{R\&D_CAP}_{it} + \beta_9 \text{ROA}_{it} + \beta_{10} \Delta \text{SALES}_{it} \\ & + \beta_{11} \text{LEV}_{it} + \beta_{12} \text{SIZE}_{it} + \varepsilon_{1it} \end{aligned} \quad (1)$$

In the second stage, we estimate the following regression using the fitted values (estimates) of R&D disclosure derived from the first stage:

$$MB_{it} = \alpha_0 + \alpha_1 \text{Fit}(\text{R\&D_DISC}_{it}) + \alpha_2 \text{R\&D}_{it} + \alpha_3 \text{R\&D_CAP}_{it} + \alpha_4 \text{ROA}_{it} + \alpha_5 \Delta \text{SALES}_{it} + \alpha_6 \text{LEV}_{it} + \alpha_7 \text{SIZE}_{it} + \varepsilon_{2it} \quad (2)$$

where MB = Market-to-book ratio; R&D_DISC = total disclosure score divided by the potential; maximum score out of 32 items; R&D = R&D expenditures to total sales; R&D_CAP = binary variable equals one if R&D is capitalized; and zero if R&D is considered an expense; MIN_OWN = proportion of shares owned by minority shareholders; FAM_OWN = binary variable equals one if some shares are owned by family members, 0 otherwise; FREINS_OWN = cumulative proportion of shares above 5% owned by French institutional investors; FORINS_OWN = cumulative proportion of shares above 5% owned by foreign institutional investors; MAN_OWN = proportion of shares owned by managers; DIR_OWN = proportion of shares owned by directors; ROA = return on assets measured as ratio of EBIT to total assets; Δ SALES = one-year sales growth; LEV = book value of long-term debt to total assets; SIZE = natural logarithm of total asset.

IV. RESULTS

A. Descriptive Statistics

Descriptive statistics for all test variables are reported in Table 1. The statistics of the continuous variables are reported in Panel A. The market-to-book variable indicates that, on average, companies have a market-to-book equal to 1.4183, with a minimum value of 0.0080 and a maximum value of 13.2966. The R&D voluntary disclosure index indicates that, on average, sample companies disclose 22.64% items out of the maximum possible voluntary disclosure items. This index ranges from a low value of zero to a high value of 62.50%. The average ratio of R&D intensity is 5.39%, and ranges from 0.01% to a highest value of 49.60%. Ownership dispersion (MIN_OWN), as calculated by the proportion of a company's free float share, varies from 3.57% to 99.99%, with a mean of 50.01%. The average ratios of French (FREINS_OWN) and foreign institutional ownership (FORINS_OWN) are 10.66% and 9.88%, respectively. The average percentage of managerial ownership (MAN_OWN) of the sample firms is equal to 14.79%, and the average of director ownership (DIR_OWN) is equal to 0.06%. Sales growth (Δ SALES) exhibits a large range of variation, having a mean of 17.43% with a minimum value of -91.33% and a maximum of 171.63%. Leverage (LEV), as measured by total liabilities to total assets, ranges from zero to 63.80%, with a mean of 23.18%. The ROA ratio ranges from -64.47% to 21.29%, with a mean of 2.41%. Finally, Panel A shows that the size of the sampled firms varies from a low of 22.06 to a high of 150737.9 million euro. Panel B of Table 1 reports the statistics of binary variables. These indicate that 28.33% of our sample firms use capitalization as an accounting method for their R&D, and that 44.52% have family in their capital.

Table 1
Descriptive statistics

Panel A. Continuous variables

Variables	Mean	Standard Deviation	Minimum	Maximum
MB	1.4183	1.7159	0.0080	13.2966
R&D_DISC	0.2264	0.1319	0	0.6250
R&D	0.0539	0.0909	0	0.4960
MIN_OWN	0.5001	0.2378	0.0357	0.9999
FREINS_OWN	0.1066	0.1349	0	0.7430
FORINS_OWN	0.0988	0.1583	0	0.7800
MAN_OWN	0.1479	0.1830	0	0.7481
DIR_OWN	0.0006	0.0040	0	0.0445
ROA	0.0209	0.0778	- 0.6447	0.2129
ΔSALES	0.1743	0.2745	- 0.9133	1.7136
LEV	0.2364	0.1349	0.0001	0.6380
SIZE	9375.876	10018.284	22.06	150737.9

Panel B: Frequency of dummy variables

Variable		Frequency
R&D_CAP	0	301 (71.67%)
	1	119 (28.33%)
FAM_OWN	0	233 (55.48%)
	1	187 (4.52%)

B. Results and Discussion

Table 2 reports the 2SLS regression results between R&D disclosure and ownership structure variables as instruments. The results show that, in contrast with our hypothesis H2, the float of companies' shares is not significantly associated with the disclosure of R&D-related information. We further examine whether different types of institutional investors (foreign and French investors) have different relationships with voluntary R&D disclosure. The results show that French institutional investors negatively influence the decision to disclose information on R&D. As insiders, they are able to obtain the requested information internally, and they are likely to encourage managers to exercise myopic discretion in reporting more R&D activity. Foreign institutional investors' ownership is however positively related to voluntary R&D disclosure, suggesting that foreign institutional investors act as a strong corporate governance device that constrains managers to disclose detailed information about their R&D activities. This result is similar to that found by Lakhil (2006) for voluntary earnings disclosures in France. Hence, hypotheses H3a and H3b are supported.

In line with our hypothesis H4, the effect of family ownership on R&D-related disclosure is negative and significant. As concluded by Ho and Wong (2001) and Hannifa and Cooke (2002) and Ashiq *et al.* (2007), our results show that, in French companies, family members are likely to withhold information. The coefficient on the dummy-variable “family” is negative and highly statistically significant. Family owners have little motivation to disclose information in excess of mandatory requirements. They have longer investment horizons than other shareholders (Anderson *et al.*, 2003). This implies that family owners stand to bear potential costs, such as proprietary costs, and they retain information about strategic activities. On the other hand, we do not find any significant relationship between the proportion of shares held by directors or managers, and the level of R&D voluntary disclosure.

The results provide support for the argument that firms with high levels of R&D intensity provide more voluntary disclosure. We point out that R&D firms with higher levels of R&D intensity are likely to disclose more about their R&D activities voluntarily. Both full and step-wise regressions show that R&D intensity has a positive and significant effect on R&D disclosure (0.621 and 0.655, respectively). Our result differs from those of Ding *et al.* (2004) and Jones (2007). These authors do not find any significant association between R&D intensity and the level of voluntary R&D disclosure, in the French and North American contexts, respectively.

Table 2

First stage regression – the relation between R&D disclosure and ownership structure

$$\begin{aligned} \text{Full regression: } R\&D_DISC_{it} = & \beta_0 + \beta_1 MIN_OWN_{it} + \beta_2 FAM_OWN_{it} \\ & + \beta_3 FREINS_OWN_{it} + \beta_4 FORINS_OWN_{it} + \beta_5 MAN_OWN_{it} + \beta_6 DIR_OWN_{it} \\ & + \beta_7 R\&D_{it} + \beta_8 R\&D_CAP_{it} + \beta_9 ROA_{it} + \beta_{10} \Delta SALES_{it} + \beta_{11} LEV_{it} + \beta_{12} SIZE_{it} + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} \text{Stepwise regression: } R\&D_DISC_{it} = & \beta_0 + \beta_1 FAM_OWN_{it} + \beta_2 FREINS_OWN_{it} \\ & + \beta_3 FORINS_OWN_{it} + \beta_4 R\&D_{it} + \beta_5 R\&D_CAP_{it} + \beta_6 ROA_{it} \\ & + \beta_7 \Delta SALES_{it} + \beta_8 SIZE_{it} + \varepsilon_{it} \end{aligned}$$

	Predicted sign	Full regression		Stepwise regression	
		Coef.	t-Stat	Coef.	t-Stat
MIN_OWN	+	- 0.030	- 1.01		
FAM_OWN	-	- 0.030	- 2.26**	- 0.033	- 2.76***
FREINS_OWN	-	- 0.121	- 2.51**	- 0.089	- 1.91*
FORINS_OWN	+	0.206	3.78***	0.117	2.58***
MAN_OWN	-	- 0.034	- 0.93		
DIR_OWN	-	- 1.124	- 0.81		
R&D	+	0.621	7.85***	0.655	8.85***
R&D_CAP	+	0.084	6.49***	0.082	6.57***
ROA	?	- 0.254	- 3.25***	- 0.238	- 3.16***
ΔSALES	?	- 0.030	- 1.93*	- 0.029	- 1.91*
LEV	?	- 0.002	- 0.04		
SIZE	?	0.026	3.35***	0.031	4.26***
Intercept		0.125	3.74***	0.090	3.39***
R-squared			0.3358		0.3220

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level.

The hypothesized effect of firm performance on voluntary R&D disclosure is not supported. Both ROA and sales growth impact (Δ SALES) negatively and significantly R&D-related disclosure. Hence, well-performing firms are more exposed than other firms to the proprietary cost problem, and they are then less likely to emphasize additional information about their R&D activities. In line with the political and the legal approaches of Watts & Zimmerman (1990), we found a positive impact of firm size on voluntary disclosure. The relationship is significant at the 1% level in the full and the stepwise regressions, respectively. Hence, firm size is effective in explaining the likelihood of R&D voluntary disclosure.

Table 3 shows the results of the second stage regression. Our findings shed some light on the spillover effects of disclosing R&D information to the public. The impact of R&D disclosure on the market-to-book ratio is strongly positive. These effects are significant at the 5% and 1% threshold levels, in the full and the stepwise regressions, respectively. In others words, R&D disclosure is a major determinant of the valuation of the firm by market participants. This finding suggests that the benefits from disclosing information about R&D activities exceed the disclosure costs. Conversely, we do not find any significant effect of R&D intensity on the market-to-book ratio. This result is inconsistent with that found by Cazavan-Jeny and Jeanjean (2006) although it is consistent with Zhao's (2002) findings. Investors pay more attention to information disclosed about R&D activities than to the intensity of R&D itself. Furthermore, we find that R&D capitalization has a negative and significant effect on the market value of the firm. This result is in contrast with Oswald and Zarowin (2007) but consistent with Cazavan-Jeny and Jeanjean (2006) in the French context. R&D capitalization is then less likely to improve the firm's market value.

Table 3

Stage 2 regression – the relation between market-to-book and fitted value of R&D disclosure

$$\begin{aligned} \text{Full regression: } R\&D_DISC_{it} = & \beta_0 + \beta_1 MIN_OWN_{it} + \beta_2 FAM_OWN_{it} \\ & + \beta_3 FREINS_OWN_{it} + \beta_4 FORINS_OWN_{it} + \beta_5 MAN_OWN_{it} \\ & + \beta_6 DIR_OWN_{it} + \beta_7 R\&D_{it} + \beta_8 R\&D_CAP_{it} + \beta_9 ROA_{it} \\ & + \beta_{10} \Delta SALES_{it} + \beta_{11} LEV_{it} + \beta_{12} SIZE_{it} + \varepsilon_{1it} \end{aligned}$$

$$\begin{aligned} \text{Second stage: } MB_{it} = & \alpha_0 + \alpha_1 \text{ Fitted } (R\&D_DISC_{it}) + \alpha_2 R\&D_{it} + \alpha_3 R\&D_CAP_{it} \\ & + \alpha_4 ROA_{it} + \alpha_5 \Delta SALES_{it} + \alpha_6 LEV_{it} + \alpha_7 SIZE_{it} + \varepsilon_{2it} \end{aligned}$$

	Predicted sign	Full regression		Stepwise regression	
		Coef.	t-Stat	Coef.	t-Stat
Fitted	+	5.422	2.05**	8.391	3.73***
R&D	+	1.278	0.62		
R&D_CAP	+	- 0.486	- 1.84*	- 0.849	- 3.34
ROA	+	4.315	3.45***	4.231	3.26***
Δ SALES	+	2.191	7.10***	2.111	6.49***
LEV	?	- 0.502	- 0.82		
SIZE	?	- 0.545	- 3.75***	- 0.768	- 6.34
Intercept		1.736	4.55***	1.875	4.24***
R-squared			0.1599		0.1491

* Significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Finally, the analysis shows a positive and statistically significant impact of the ROA and the sales growth on firms' market value. The relationship between firm size and market-to-book ratio is negative and statistically significant. The impact of leverage on market-to-book ratio is not significant.

V. CONCLUSION

Managers, being aware of the need to provide regular information to the various external partners, are often faced with a problem regarding the nature and level of the information to be disclosed. Regarding R&D, the decision to disclose information is not straightforward because of the proprietary cost, and the benefit of this strategic information to competitors. To understand shareholders' awareness of R&D-related disclosure, we first developed a voluntary disclosure R&D index. In the second step, we built a simultaneous equations model, in which voluntary R&D disclosure is a strategic choice, depending on the firm's ownership structure. We consider that the ownership characteristics of the firm may alter the relationship between the voluntary disclosure of R&D information and the firm's market value.

Overall, our research contributes to the literature by providing further evidence on the relationship between ownership structure and R&D voluntary disclosure. The results show that families and French institutional investors act as insiders, and are thus likely to retain information about R&D activities. However, the presence of foreign institutional investors is likely to influence positively the decision to disclose such information, suggesting that these investors are main actors in corporate governance, and may influence managers' decisions about disclosing R&D information. The results also show that both R&D intensity and R&D capitalization provide incentives for companies to disseminate more information about R&D investments, although they do not improve the firm's market. We show that R&D-related disclosure is a major determinant for firms' valuation by market participants, which suggests that the benefits from disclosing R&D activities exceed the disclosure costs.

One of the limitations of the study concerns the period chosen for our study (2000-2004). After this period, French companies were required to adopt IFRS for preparing their financial statements. This may have had a significant effect on the information displayed by French companies on their R&D activities. One further research avenue is to focus on the accounting harmonization process in France, following the adoption of IAS/IFRS, which would affect investors' perceptions of the usefulness of financial reports.

ENDNOTES

1. Details about items are available from authors on request.
2. According to Larcker and Rusticus (2010), it is common for accounting researchers to report the classic Hausman (1978) test for endogeneity. If the probability of the test is below 0.1000, then we reject the hypothesis of the exogeneity of the instrumented variable (related-R&D disclosure). Here, we find a probability of 0.0000. Thus, the instrumental variable estimates appear to be preferred over the OLS estimates.

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