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Does Nomination Committee Matter for Innovation?

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ABSTRACT

This study analyzes how the presence and the composition of nomination committees could influence innovation. Specifically, we focus on the committee size, the frequency of meetings, and the presence of independent and female members. Innovation is measured by (1) the firm's ability to produce innovations such as new or improved products/processes and the number of patents, and (2) innovation expenditures (R&D spending and the number of scientists and experts per R&D teams). This study is drawn on firms listed on the SBF120 index, between 2002 and 2016. It provides the following results: First, the presence of nomination committees is negatively associated with the number of patent applications and the number of scientists and engineers in R&D teams. Furthermore, most of the nomination committee's attributes (such as the presence of independent and women members) have no significant association with innovation proxies. We show, also, that large nomination committees are prone to increase innovation income (such as the R&D expenditures and the number of scientists and experts per R&D teams) as well as the number of filed patents. Turning to the committee functioning provides evidence that the frequency of meetings could reduce asymmetric information regarding innovation projects and lead to an increase of R&D expenses. This article brings practical insights to board structures issues. This study contributes to the current debate on how boards should be organized, specifically; the nomination committees. It shows that boards should pay attention to the nomination committee features as they could undermine innovation projects, specifically in innovation-sensitive industries.

KEYWORDS

Innovation; Corporate Governance; Committee Structure; Committee independence

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1. Introduction

Innovation is qualified as a complex and risky activity, which needs human capacities such as imagination, ingenuity, and creativity (Torchia et al., 2011). However, to face the increasingly tough competition and maintain a sustainable competitive advantage, firms are forced to innovate and increase their capacity to integrate individuals displaying diverse types of knowledge, abilities, and networking. In fact, several initiatives and programs have been introduced in order to increase diversity and the presence of minorities in top management positions. For instance, the appointment of female directors on boards could enhance board diversity and comply with the gender quota laws of Copé-Zimmermann[1], introduced in 2009 and implemented in 2011 in France. This law on gender diversity required companies with more than 500 employees, or with a yearly turnover of €50 million or more, to have at least 40% of female directors by the end of 2017. These initiatives intend to boost companies rethinking their board of directors' composition by choosing diverse directors' profiles and adopting more inclusive nomination policies.

In recent years, several searches have effectively shown that governance mechanisms could influence innovation activities (Lodh et al., 2014; and Wang et al., 2017). Innovation literature has investigated several aspects of innovation like firm size, market structure, profitability, and growth influence innovative activity (Bhattacharya and Bloch, 2004). Moreover, it has strongly supported the idea that board involvement is a key factor in innovation performance (see among others Torchia et al., 2011; Pathan and Faff 2013; Galia and Zenou 2013; and Galia et al., 2015). In fact, based on agency theory (Fama and Jensen, 1983), many studies have confirmed that the role of directors on board could have a positive influence on innovation decisions (Torchia et al., 2011 and Pathan and Faff, 2013). According to resource-dependence theory (Pfeffer and Salancik, 1979), governance literature has shown how the board of directors could provide large and diverse resources to the firm, such as strategic advice, knowledge, and networking which could be value-enhancing for innovation (Talke et al., 2010; Torchia et al., 2011; Pathan and Faff, 2013; Galia and Zenou, 2013; and Galia et al., 2015). Therefore, innovation strategies depend closely on board members (Barker and Mueller, 2002; Kor, 2006; Balsmeier et al., 2014, and Galia et al ., 2015) specifically on their personal traits, such as age (Galia and Zenou, 2013; and Barker and Mueller, 2002), educational degree (Kuo et al., 2018), nationality (Kerr and Lincoln, 2010; and Pathan and Faff, 2013), and gender (see among others Torchia et al., 2011; Østergaard et al., 2011; Díaz-García et al., 2013; Galia and Zenou, 2013; Pathan and Faff, 2013; and Galia et al., 2015). However, several areas in innovation literature are not yet fully explored, for instance, despite the central role of boards in corporate governance, there is relatively little understanding of how the internal organization of boards, specifically the structure of board committees could shape strategic decisions such as innovation.

Many studies have highlighted the importance of committees in the functioning of the board (Adams et al., 2010; and Guo and Masulis, 2015). The literature has largely supported that board effectiveness is primarily accomplished through committees (Jiraporn et al., 2009): board committees provide tools and mechanisms for better governance. They aim to facilitate special tasks and address important corporate concerns. Effectively, the board delegates most of the responsibilities to the committees (Guo and Masulis, 2015). In the same vein, Klein (1998) argues that most board activities take place in committee meetings, and not in board meetings. Hence, the most influential board decisions are taken at the committee level (Kesner, 1988). For instance, the audit committee oversees the integrity and compliance of the firm's financial reporting. The compensation committee focuses on human resource policies and procedures, most notably the compensation of top executives. The nomination committee recommends new candidates for the board and other top executive positions (Adams, 2003). Directors have a stronger and more direct impact on executive compensation, directors' selection, and other important actions that significantly affect corporate performance, under specific conditions, such committees' members have

[1] https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000023487662&categorieLien=id

to serve on board committees with primary responsibility for these functions. Board committees have become more regulated and formal components of the board of directors over time. Beginning in 1940, the Securities and Exchange Commission (SEC) recommended that outside directors should be appointed to audit committees. In the 1970s, SEC adopted rules requiring firms to disclose audit committee composition (Reeb and Upadhyay, 2010). In 2002, the major stock exchanges NYSE and NASDAQ mandated that firms have compensation and governance committees. The first studies on committees have focused, especially, on audit committee: they show how composition audit committees could influence the quality of financial disclosure (Karamanou and Vafeas, 2005; and Mangena and Pike, 2005), internet reporting (Kelton and Yang, 2008), on earnings management (Bédard et al., 2004; and Klein, 2002), and financial performance (Zhou et al., 2018). These works confirm that in order to perform their role effectively, board committees should have adequate resources and authority to discharge their increasing responsibilities (Mangena and Pike, 2005).

Moreover, most of existing studies have covered the effect of appointing independent members on committees (Deli and Gillan, 2000; Klein, 2002; and Choi et al., 2007). They underline that independent committees help to improve managerial monitoring (Xie et al., 2003; Byrd and Hickman, 1992; and Rosenstein and Wyatt, 1990). They could also improve financial performance (Choi et al., 2007).

However, looking at the existing literature, we point out that it has neglected several forms of directors' attributes in key committees and their influence on the firm's activities, specifically, in nomination committees (hereafter NCs).

Although audit and remuneration committees have both had widespread and prompt endorsement, nomination committees, have generally been the last to be established (Kaczmarek et al., 2012). Hence, its existence, structure, and impact are least explored (Ruigrok et al., 2006). Despite being the committee responsible for shaping the characteristics of the board and other sub-committees (Clune et al. 2014), only recently it has started to receive academic attention (Eminet and Guedri, 2010). In fact, nomination committees are among the most influential board committees in firms: they help the firm to appoint the "right" persons to the right positions like top management positions (Ruigrok et al., 2006). They improve the board's effectiveness through managing its composition, by raising the directors' qualifications and board independence. In fact, by recommending new members, nomination committees could have a strong influence on composition and structure of board (Jensen, 1993, Ruigrok et al.,2006), which could affect the firm's activities such as innovation investments.

Despite corporate governance codes typically encourage boards to establish nomination committees to achieve a more transparent and effective nomination policy, there is relatively little understanding of how the structure of nomination committees, could influence firm's activities. In other words, the literature on nomination committees functioning and attributes, specifically members' attributes and their influence on innovation activities, is not yet fully explored.

The current paper tries to address this gap in investigating how and to which extent the structural features of NCs and the demographic attributes of their members could influence innovation projects. This study focuses not only on the presence of outside committee members and the committee size but also on the presence of women, as well as the committee functioning (the frequency of meetings). In this work, we apply multi-theoretical approach to develop the testable hypotheses. The theories are agency theory and behavioral theories (social identity theory, similarity attraction theory, and groupthink theory). These theories provide different viewpoints to look at the impact of nomination committee attributes on firms' activities. In order to measure innovation, previous studies have most often relied on the R&D expenditures to assess the level of innovation intensity, also called innovation effort (Ruiqi et al., 2017; Sariol and Abebe, 2017; and Kuo e al., 2018). However, these proxies for innovation, measure only the income required for innovation. When it comes to innovation performance, research focuses mainly on the number of patents (Choi et al., 2011; Balsmeier et al., 2014; and Chen et al., 2016). Few studies have

considered varied types of innovation such as product, process organizational and marketing innovations (Torchia et al., 2011; and Galia et al., 2015). In the current paper, we consider different proxies for innovation: innovation performance proxies and innovation effort ones.

This study is drawn on firms listed on the SBF120 index, between 2002 and 2016. It provides the following results: First, the presence of nomination committees is negatively associated with the number of patent applications and the R&D expenses. Our results are not consistent with the idea that committees can enhance the involvement of directors in innovative activities (Harrison, 1987). Moreover, our findings are consistent with evidence showing that nomination committees are more likely to first, serve shareholder interests (Agency theory, Fama and Jensen, 1983): they will recommend candidates who are likely to prefer short-term profitable projects at the expense of uncertain and long-term profitable activities. Usually, they seem to select directors who are reluctant to adopt transformational leadership that could lead to the introduction of new changes (Ruigrok et al., 2006).

Second, tuning to the committee composition, most of the nomination committee's attributes (such as the presence of independent and women members) have no significant association with innovation proxies. One explanation could be the outside directors most often are not familiar with the day-to-day business operations. Besides, despite the introduction of gender quota law, female directors re not appointed to strategic committees on the board, such as nomination committees. Only 13% of women sit on nomination committees in our study. In fact, the complexity of the board selection process (Peterson and Philpot, 2007), in addition to many gender stereotypes (glass ceiling" theory, ILO, 2001), still makes it more difficult for a woman to be nominated on boards as well as on committees (Brière and Rinfret, 2010). This is in line with studies on board committees who show that women directors are unlikely to be appointed to the strategic, nominating and compensation committees (Adams and Ferreira, 2009; Bugeja et al., 2016).

Third, our results provide evidence that large nomination committees are prone to have a valuable diversity of views which increases innovation investments. Unlike Lin et al. (2009), large committees could suffer interests' conflicts and could lead to unnecessary debate and delay in making decisions (Yang and Krishnan, 2005). Consequently, it could influence negativity communication and decision-making processes (Jensen, 1993; and Linck et al., 2008). Our funding is not consistent with Karamanou and Vafeas (2005) who highlight that large committees are prone to suffer from process losses and diffusion of responsibilities, specifically in long term and uncertain projects, such as R&D projects.

Finally, turning to committee functioning, the number of committee's meetings is positively associated with innovation effort (R&D expenditures). Board committees seem to have more information about the current problems and are more concerned about R&D investments. Our result is consistent with Raghunandan et al. (2001) who highlighted that frequency of meetings could have a positive influence on the strategic role of board committees, specifically on how they perform their roles. This is in line with the idea that frequent meetings can help outside directors interacting with insiders. They could, therefore, be better informed about firm activities. In fact, a large frequency of meetings can stimulate entrepreneurial thinking: particularly, outside directors could suggest innovative initiatives when they are given the opportunity.

This paper is structured in the following. The theoretical framework and hypotheses are presented in section (1). The data and methodology are detailed in the "Methodology" section. Section (3) discusses the results. The last section concludes the study and presents future research perspectives.

2. Theoretical Framework and Hypotheses Development

The function of nomination committees is to help the firm to appoint the "right" persons to the right positions like top management positions (Ruigrok et al., 2006). They can help to resolve the problems of asymmetric power between corporate boards and management.

Based on agency theory (Fama and Jensen, 1983), board members are primarily responsible for reducing managerial opportunism and protecting shareholders' wealth through enhanced oversight. However, a well-constructed board of diverse members is the key condition for mitigating agent-client conflict. Therefore, the existence of a nominating committee and its structure could passively mitigate profit manipulation by appointing more independent and impartial members on boards (Osma and Noguer 2007). In other words, the establishment of a well-structured nomination committee, independent from management, could ensure a fair and transparent recruitment process and could improve the possibility of appointing more women members to the board and reduce agent-client conflict.

Past literature has frequently used socio-psychological behavioral theories to understand sub-committee composition and its consequences. In nomination committee literature the most frequently used behavioral theories are similarity attraction theory, social-identity theory, relational demographic theory, and groupthink theory.

The similarity attraction theory (Byrne, 1971) portrayed, generally demographically similar individuals share the same views, life experience and values, and thus become more attractive and desirable (Westphal and Zajac, 1995). Therefore, members of the nominating committee generally tend to recommend people who are demographically similar to the board (Kaczmarek et al., 2012), and not necessarily skillful directors who have the necessary qualifications to stimulate innovation activities.

According to social identity theory (Turner and Oakes, 1986; Hogg and Terry, 2000) individuals tend to perceive themselves as members of certain social groups. A person categorizes himself/herself based on various social groups such as gender, nationality, education, or profession (Kaczmarek et al., 2012). As per this theory individual achieve a certain level of comfort and confidence while surrounded by the people of same demographics. In line with this theory a firm appointing new board members without any clear selection measures and decision processes can end up demographically homogeneous board members due to behavioral limitations and bounded rationality explain in this theory (Ruigrok et al., 2006).

Moreover, referring to relational demographic theory (Turban and Jones, 1988), directors tend to evaluate others more favorably if they have similar demographic characteristics (Goldberg et al., 2008; Walton et al., 2012; and Barragán Díaz et al., 2019). In fact, when people share characteristics such as sex, birth-date, name, educational level, race, or age, they are more willing to trust and work with those with whom they share the same characteristics (Burger et al., 2004; Jiang et al., 2010; Polman et al., 2013; and Hirsch et al., 2020).

Furthermore, groupthink theory (Janis, 1972) supposes that the members of a closely interrelated (less diverse) group sacrifice their views and perspectives to maintain harmony and cohesion of the group. However, a heterogeneous group can diminish the adverse effect of groupthink, by introducing diverse perspectives and solutions to the group (Lee and Farh, 2004; and Abbott et al., 2012). Hence, a nomination committee composed of diverse (independent and female) members can diminish the harmful effect of groupthink and recruitment biasness by appointing more diverse members to the board.

In conclusion, based on these socio-psychological behavioral theories, it can be argued that non-existence of nomination committee or a homogeneous nomination committee can lead to biased recruitment process of corporate directors and end up having a more homogeneous board. On the contrary, a nomination committee composed of mostly independent and demographically divers members (e.g. gender, age, education, background) can diminish the internal coalition and groupthink of insiders, constrain flawed selection process, and offer an unbiased selection process of female directors.

2.1. Presence of NC

Committees are important tools to monitor corporate activities and play a valuable role in the protection of

shareholders' wealth (Kesner, 1988). From an agency perspective, committees can allow directors to better perform their control role. The specialization of committees and the large amount of information that directors can share during meetings, increase the potential to monitor executives and protect shareholders' wealth. Moreover, the introduction of a NC effectively delegates the director selection process to a group (instead of a single person) of directors: The nomination process is, therefore, more transparent and does not depend on the executive management. When NC plays fully its function, it becomes powerful enough to make independent recommendations serving the firm's interests (Jensen, 1993; Van Den Berghe and Levrau, 2004).

Nomination committees are more likely to serve shareholder interests (Agency theory) and recommend candidates who have the necessary expertise to accomplish their roles (Kesner, 1988). However, they seem to recommend candidates who are likely to prefer short-term profitable projects at the expense of uncertain and long-term profitable investment such as innovation activates. They select directors who are reluctant to adopt transformational leadership that could lead to the introduction of new changes (Ruigrok et al., 2006).

Given these considerations, we can hypothesize a negative relationship between the presence of nomination committees and innovation.

Hypothesis 1. The presence of nomination committees is negatively associated with innovation.

2.2. Independent Directors

In the 1990s, the Cadbury Report (Cadbury Committee, 1992) and several research studies (Greenbury, 1995; and Hampel, 1998) have recommended the appointment of more independent directors to corporate boards and to their key committees (i.e. audit, compensation, and nomination committees) to improve boards and the committees' effectiveness (Klein, 1998). In fact, several studies emphasize that board's independence enhances board's effectiveness and improves firm performance (Choi et al., 2007), as well as innovation performance (Chen and Hsu, 2009, Choi and Lee, 2011, Lodh and al., 2014, Shapiro and al., 2015, and Sena et al., 2018).

Most of the papers confirm that independent board committees provide more effective monitoring of managerial decisions and activities (Xie et al., 2003 and Guo and Masulis, 2015). Based on the agency theory it can be argue that the existence of bigger nomination committees comprised of more independent members can reduce agency conflict by diminishing CEO power over the selection process and selecting more demographically diverse board members with better monitoring capabilities. Conyon and Mallin (1997) argue that establishment of nomination committees, consist of mostly independent directors, can overcome current issues related to the selection process. Independent directors are prone to reduce agency conflicts and to ensure management. In fact, the high attendance rate among independent members can be explained by their essential role in complying with the good practices of governance (Adams and Ferreira, 2009). Furthermore, from a resource-based perspective, outsiders can be seen as providers of access to scarce or strategic resources (Lynall et al., 2003; and Tuggle et al., 2010). Independent members can also increase the awareness of implementing new projects and bring new opportunities from their industries (Hillman and Dalziel, 2003; and Tuggle et al., 2010): They have outside contacts and typically bring a broader range of experience due to their address book (Chen, 2013) they have a good knowledge of many businesses, and they are more concerned about the firm's internal development (Choi et al., 2012). Therefore, independent directors in nomination committees are likely to have enough knowledge and skills to appoint new members, who have the required qualifications for innovative activities. Specifically, they could offer different perspectives on innovative investments and growth opportunities. They could also mobilize new resources coming from their networks. In light of the previous discussion, we expect that independent members in NCs have a positive impact on innovation.

Hypothesis 2. The presence of independent directors in NCs increases innovation.

2.3. Gender

Prior research has pointed out several reasons to hire more women on corporate boards as well as on board committees. For instance, Daily et al. (2003) state that boards are increasingly appointing female members. In fact, the absence of gender diversity on board may result in a negative market image. Moreover, Kesner (1988) argues that firms are prone to elect the most powerful and influential women in their committees. Most often, they are concerned about the firm image without consideration of the women's potential contributions (Tokenism, Kanter, 1977).

However, Elstad and Ladegard (2012) show that the presence of female directors changes the decision-making dynamics inside the board. In fact, in line with the dependence resource theory, women have different experiences and qualifications from their male counterparts, they could, therefore have different values and analysis perspectives. This could lead to more interactive dynamics in boardrooms (Bilimoria, 2000; Peterson and Philpot, 2007). They could have most often more connections to external sources, which make them, wanted in boards and on specific board's committees, such as audit, governance, ethics and environment committees (Singh and Vinnicombe, 2004; Adams and Ferreira, 2009).

Besides, female directors display greater diligence in monitoring and are most often appointed to corporate governance committees (Adams and Ferreira, 2009). Gender-diverse committees can provide better advice, legitimacy, effective communication and resources (Hillman et al., 2007) than male-dominated committees. Female directors exhibit more independent thinking (Adams et al., 2010), which facilitates decision-making and increases transparency (Adams et al., 2010; and Srinidhi et al., 2011). Thus, the appointment of female directors to decision-making committees can be a source of competitive advantage. Also, many studies have strongly supported that their presence on board can contribute to broadening the range of new products and services (Østergaard et al., 2011; Teruel et al., 2015; Lio et al., 2019) as women have specific knowledge of consumer markets, consumer behavior and customer needs (See Kang et al., 2007; Torchia et al., 2011; Díaz-García et al., 2013; Teruel et al., 2015; Chen et al., 2018). Thus, they are likely to identify the most successful innovations. When female directors are appointed to the nomination committee, they will recommend "creative" candidates who can develop and introduce new products.

On the other hand, female members will be inclined to prefer and encourage the nomination of other female candidates (Similarity attraction theory, Byrne 1971). For instance, Gregory-Smith et al. (2014) examine the appointment of new directors and confirm that the likelihood of female appointments is significantly higher if the immediate predecessor was a female. Female members in NCs may recommend more female candidates to increase their feelings of security, identity, and self-esteem (Social identity theory, Hogg and Terry 2000, Ashforth and Mael 1989, Turner and Oakes 1986). In addition, they would like to have more support in board discussions, specifically in male-dominated boards (theory groupthink theory, and homosocial reproduction): when there are few women on boards, they are not taken seriously and their ideas are not supported (Singh and Vinnicombe, 2004). Therefore, by appointing more female directors, women in NCs seem to select members who share a similar demographic characteristic and not necessarily skillful directors who have the necessary qualifications to fulfill their responsibilities.

In addition, studies on board committees show that women directors most often serve on specific committees: they face a second ceiling barrier in boardrooms while they are supposed to achieve high top management positions: the glass cliff (Ryan and Haslam, 2005). For instance, they can easily join audit, CSR, and corporate governance committees while they are unlikely to be appointed to the strategic, nominating and compensation committees (Adams and Ferreira, 2009). In a recent study, Bugeja et al. (2016) highlight that when women sit on these committees, CEO salaries; bonuses and total compensation are decreased. Their presence on these committees could lead to an increase in transparency.

Furthermore, there is a large consensus in the literature arguing that women are risk-averse (Faccio et al., 2016; and Crosen and Gneezy, 2009). Female directors are labelled as more risk-averse than men (Croson and Gneezy, 2009) which could drastically decrease long-term profitable and uncertain activities. Consequently, to increase risk averseness on board, female directors in NC could be prone to select risk-averse profiles on board which can marginalize innovation activities. Based on these conclusions, we can assume that appointing women to committee boards has a negative influence on innovation.

Hypothesis 3. The presence of women in NCs negatively related to innovation.

2.4. NC's Size

Large NC could provide the necessary and diversity of views to ensure effective monitoring (Bédard et al. 2004). However, large committees could suffer interests' conflicts and could lead to unnecessary debate and delay in making decisions. Consequently, communication and decision-making processes could become poor (Lin et al., 2009). In addition, large committees are prone to suffer from process losses and diffusion of responsibilities, specifically regarding long term and uncertain projects, such as R&D projects (Karamanou and Vafeas, 2005; and Yang and Krishnan, 2005). Accordingly, we state that large nomination committees are supposed to decreases innovation opportunities.

Hypothesis 4. The committee's size is negatively related to innovation.

2.5. Frequency of Meetings

Committee meetings are quite useful to disclose information and to discuss views. They are also a proxy for the members' involvement (Tuggle et al., 2010). In the past literature (Raghunandan et al., 2001; Karamanou and Vafeas, 2005; and Xie et al., 2003) board and audit committee meeting frequencies have been associated with better communication, coordination, and efficiency of those groups. For instance, audit committees that meet more often would have more time to perform the role of monitoring (Karamanou and Vafeas, 2005) and are more likely to be well informed, more diligent and knowledgeable about the current problems (Raghunandan et al., 2001). The frequency of meetings has a positive influence on the strategic role of board committees, specifically on how they perform their roles. It improves, therefore, the quality of control. Moreover, from a resource-based perspective, frequent meetings can help outside directors to interact with insiders and to be well informed about firm activities. A large frequency of meetings can stimulate entrepreneurial thinking, particularly of outsiders who could suggest innovative initiatives when they are given the opportunity. However, too many meetings per year may also be perceived as a sign of organisational issues by the shareholders. The recommendations demand for establishment of nomination committee of certain size and independence, however it does not specify the number of times the committee should meet per year. Accordingly, we state the following:

Hypothesis 5. High frequency of NC meetings is positively associated with innovation.

3. Data and Methodology

3.1. Sample and Data Collection Process

Our sample consists of all firms listed on the SBF120 index between 2002 and 2016. We have included the firms belonging to the banking and finance sector in our study because we have found that most of these institutions have introduced new innovations or have filed patents such as Axa, CNP Assurances, Crédit Agricole, Société Générale …

We have collected our data as follows: First, we have retained the list of companies listed on the SBF120 index

during 2016. Second, we have extracted data related to these firms from different databases.

Governance and ownership structure datasets are hand-collected from annual reports available on the firms' websites. Based on Factset-IODS and Bloomberg databases, we have collected the financial dataset. Finally, innovation datasets are provided by the surveys on Innovation conducted by the INSEE[2].

3.2. Measures

Table (1) lists the definition of all the variables used in this study.

Dependent variables:

- PAT is the total number of patents filed by the firm per year.
- PROD is a dummy variable that is equal to 1, if the firm has introduced at least a new good or service or a significantly improved existing good or service, and 0 otherwise.
- PROC is a dummy variable that is equal to 1, if the firm has introduced at least a new process in the production/supply procedures, and 0 otherwise.
- R&D is the R&D expenses to total assets ratio.
- H-R&D is the average yearly number of hours spent by scientists and experts in R&D projects.

Independent variables:

- NC is a dummy variable that is equal to 1, if there is a NC on the board, and 0 otherwise.
- C-GEN is the percentage of female directors on NC.
- C-IND is the percentage of independent directors on NC.
- C-SIZE is the total number of directors on the NC.
- FRQ is the yearly number of meetings on the NC.
- MERG is a dummy variable that is equal to 1, if compensation and nomination committees have been merged, and 0 otherwise.

Control variables:

- B-SIZE is the total number of directors on board
- B-GEN is the percentage of female directors on board.
- B-IND is the percentage of independent directors on board.
- B-FOR is the percentage of foreign directors on board.
- IN-O is the institutional investors' share of capital.
- ST-O is the state's share of capital.
- FO-O is the foreign investors' share of capital.
- FA-O is the family's share of capital.
- TA is the total assets
- ROA is the return on asset ratio.
- LEV is the debt book value to total assets ratio.

Table 1. Variable definition.

Variable	Definition
Dependent variables	
PAT	Is the total number of patents filed by the firm per year.
PROD	Is a dummy variable that is equal to 1, if the firm has introduced at least a new good or service or a significantly improved existing good or service, and 0 otherwise.

[2] (Project Governance and Innovation in France 2016)

PROC	Is a dummy variable that is equal to 1, if the firm has introduced at least a new process in the production/supply procedures, and 0 otherwise.
R&D	R&D expenses to total assets ratio.
H-R&D	Is the average yearly number of hours spent by scientists and experts in R&D projects.
Independent variables	
NC	Is a dummy variable that is equal to 1, if there is a NC on the board, and 0 otherwise.
C-GEN	Is the percentage of female directors on NC.
C-IND	Is the percentage of independent directors on NC.
C-SIZE	Is the total number of directors on the NC.
FRQ	Is the yearly number of meetings on the NC.
MERG	Is a dummy variable that is equal to 1, if compensation and nomination committees have been merged, and 0 otherwise
Control variables	
B-SIZE	Is the total number of directors on board.
B-GEN	Is the percentage of female directors on board.
B-IND	Is the percentage of independent directors on board.
B-FOR	Is the percentage of foreign directors on board.
IN-O	Institutional investors' share of capital.
ST-O	State's share of capital.
FO-O	Foreign investors' share of capital.
FA-O	Family's share of capital.
TA	Total assets
ROA	Return on asset ratio.
LEV	Debt book value to total assets ratio.

3.3. Descriptive Statistics

The sample consists of 120 listed companies on the SBF120 index between 2002 and 2016: 20% of the firms belong to the consumer goods and services, 23% of the firms belong to the technology and communication sector. Almost 21% are in the machinery and industrial sector, also 14% are in the banking and finance sector (Table 2a).

Table 2a. Sample composition.

Industry	Percentage
Technology and Communication	23%
Consumer goods and services	20%
Industrials	21%
Financial	14%
Utilities	4%
Drugs and Healthcare	8%
Oil and Gas	5%
Basic Materials	5%
Total	100

Our data indicates that 35.40% of firms with a nomination committee belong to the consumer goods and services industry. Then, 18.58% of firms are categorized under industrials, while almost 5.31% of firms are classified under both the utilities and drugs and healthcare sectors. Lastly, the table highlights that only 0.88% of

firms operate in the oil and gas industry (Table 2b).

Table 2b. Composition of firms with NC.

Industry	Percentage
Technology and Communication	12.39 %
Consumer goods and services	35.40 %
Industrials	18.58 %
Financial	17.70 %
Utilities	5.31 %
Drugs and Healthcare	5.31 %
Oil and Gas	0.88 %
Basic Materials	4.42 %
Total	100

Statistics on innovation measures (Table 3, Panel A) show that only 15.38% of firms have introduced a new or a significantly improved product or service and 14.46% have implemented a new or a significantly improved process. Turning to patents, there are on average, 27.48 filing patents. Regarding the R&D team structure, almost 80 hours on average are dedicated to R&D projects (Table 3, Panel B).

Table 3. Descriptive statistics of variables.

Panel A – Descriptive statistics of qualitative variables: table of frequencies

Variables		N	Percentage
PROD	0	1276	84.62%
	1	232	15.38%
PROC	0	1290	85.54%
	1	218	14.46%
NC	0	289	19.16 %
	1	1219	80.84 %
MERG	0	422	31.49%
	1	918	68.50%

Panel B –Descriptive statistics of quantitative variables

Variables	Obs	Mean	Std, Dev	Min	Max
PAT	1508	27.48873	141.2631	0	2449
H-R&D	1497	79.99599	458.9115	0	7057
C-SIZE	1508	3.058355	1.80629	0	8
C-GEN	1508	13.88934	20.39647	0	100
C-IND	1100	59.5698	36.87005	0	100
FRQ	1178	3.444409	2.22397	0	15
B-GEN	1468	17.45547	14.15293	0	63.6363
B-IND	1466	49.03985	22.28997	0	100
B-FOR	1470	20.32871	20.43091	0	100
B-SIZE	1502	12.37617	3.568168	3	24
R&D	1505	0.06925	0.5381281	0	9.898537
TA	1505	73895.79	253750.1	23.581	2077758
ROA	1504	3.734984	6.799714	-47.98642	62.31266
LEV	1497	25.09769	16.26187	0.73564	34.4873
IN-O	1463	32.1589	25.72713	0	98.63
ST-O	1451	4.492919	15.06595	0	100
FO-O	1448	9.078687	17.89149	0	80.48

FA-O	1453	11.27223	17.44759	0	90.94

Notes: PAT is the yearly number of patents filed during the year by the firm. PROD is a dummy variable equal to 1, if the firm has introduced at least a new good/service or significantly improved existing good/service, 0 otherwise. PROC is a dummy variable equal to 1, if the firm has introduced at least a new process in the production/supply procedures, 0 otherwise. H-R&D The average yearly number of hours spent by scientists and experts in R&D projects. C-GEN Percentage of female directors on nomination committee. C-IND Percentage of independent directors on nomination committee. C-SIZE Total number of directors on the nomination committee. FRQ Number of meetings on the nomination committee. MERG is a dummy variable, is equals to 1, if compensation and nomination committees have been merged, and 0 otherwise. NC is a dummy variable, is equal to 1, if there is a nomination committee, 0 otherwise. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. R&D expenses to total assets ratio. LEV Debt book value to total assets.

In table (3), panel (B) shows that NCs on average consist of 3 directors: one of them (59.5%) is independent. This is low in comparison with Leung et al. (2014) who found 72% of the nominating committee members are independent in non-financial firms listed on Hong Kong Stock Exchange market. Moreover, we notice that most often committee members are men (86%). We underline that the percentages of independent and male members significantly vary among firms (between 0 and 100%). Turning to the committee functioning, panel (B) shows that, on average, 3 meetings are yearly, organized. Most active committees meet 15 times per year.

Furthermore, in line with Godard and Schatt (2005), descriptive statistics on board directors (Table 3, Panel B) show that the average board consists of 12 members, half of them (49%) are independent and two of them (20%) have a foreign nationality. We underline that the percentages of independent and foreign directors significantly vary among firms, particularly in multinational companies (between 0 and 100%).

Regarding gender diversity, the percentage of female directors on boards is almost 17.45%. This low level is consistent with many studies in other countries: Kang et al. (2007) had a percentage of 10% on Australian firms, and Mahadeo et al. (2012) only 3% on Mauritanian firms.

Turning to the presence of NC, unlike Leung et al. (2014) who find that 76% of firms do not have a nomination committee, panel (A) in table (3) shows that 19% of firms do not establish a NC.

Finally, our data shows a very specific feature, 68.50% of firms have merged their compensation and nomination committees (Table 3, Panel A): 30.50% of firms are in consumer goods and services industry and almost 21% of firms belong to industrials as well as to financial sector (Table 4).

Table 4. Industry distribution of firms with merged compensation and nomination committees: Table of frequencies.

Industry	Percentage
Technology and Communication	12.20%
Consumer goods and services	30.50%
Industrials	20.70%
Financial	21.35%
Utilities	4.25%
Drugs and Healthcare	2.18%
Oil and Gas	1.63%
Basic Materials	6.32%
Total	100

The correlation matrix in table (5) shows some significant coefficients that exceed 0.5. However, the variance inflation factor values range from 1.05 to 2.25: they are below the accepted threshold of 3. There is, therefore, no multicollinearity problem.

Table 5. Pearson Correlation Matrix.

Variables	H-R&D	PROD	PROC	R&D	PAT	C-SIZE	C-GEN	C-IND	FRQ	MERG	B-FOR
H-R&D	1.0000										
PROD	0.0566*	1.0000									
PROC	0.0569*	0.8700*	1.0000								
R&D	0.2062*	0.1171*	0.0926*	1.0000							
PAT	0.3724*	0.1472*	0.1470*	0.0961*	1.0000						
C-SIZE	0.0042	0.0550*	0.0124	-0.0271	-0.0025	1.0000					
C-GEN	-0.0588*	-0.0044	0.0119	-0.0760*	-0.0785*	0.3331*	1.0000				
C-IND	-0.0322	0.0408	0.0157	-0.1000*	-0.0230	0.3852*	0.4070*	1.0000			
FRQ	0.1448*	0.0231	0.0061	-0.0288	0.0484	0.3186*	0.1135*	0.2636*	1.0000		
MERG	0.0136	-0.0158	-0.0133	0.0043	-0.0424	0.1138*	-0.0891*	0.0627*	0.1757*	1.0000	
B-FOR	-0.0572*	-0.1468*	-0.1354*	-0.0519*	-0.0155	0.0520*	0.0182	0.2474*	0.1452*	-0.0333	1.0000
B-IND	-0.0132	-0.0379	-0.0051	0.0117	0.0653*	0.2698*	0.0374	0.3377*	0.2156*	0.0807*	0.2781*
B-GEN	-0.0516*	-0.0146	-0.0495	-0.1174*	-0.0160	0.2703*	0.5225*	0.5465*	0.1656*	-0.0732*	0.1052*
ROA	-0.0140	0.0437	0.0507*	0.0623*	0.0453	-0.0190	-0.0067	-0.0058	-0.0640*	-0.0110	-0.0147
LEV	-0.0048	-0.0277	-0.0401	-0.0669*	-0.0774*	-0.0166	0.0486	0.0004	0.0062	-0.0034	-0.0360
B-SIZE	-0.0128	0.1283*	0.1594*	-0.0774*	0.0024	0.2485*	0.1805*	0.1028*	0.1132*	-0.1713*	-0.0236
TA	-0.0167	0.0182	-0.0024	-0.0319	-0.0366	0.1054*	0.1240*	0.0416	0.0819*	-0.1916*	-0.0268
IN-O	-0.092*	0.0149	0.0513*	0.0370	-0.0882*	0.2612*	0.2657*	0.3899*	0.1678*	0.1577*	0.0591*
ST-O	-0.0145	0.0538*	0.0630*	-0.0342	-0.0466	0.1117*	-0.0190	0.0123	-0.0194	0.0163	-0.0829*
FA-O	0.0422	0.1278*	0.1007*	0.0162	0.0464	-0.2269*	0.0068	-0.0633*	-0.0997*	0.0169	-0.0464
FO-O	-0.0562*	-0.0990*	-0.1031*	-0.0104	-0.0451	0.0721*	0.1277*	0.1226*	0.1330*	-0.0653*	0.2376*
NC	-0.0054	0.0722*	0.0516*	0.0010	-0.0721*	0.8260*	0.3317*	0.3856*	0.2374*	0.1416*	0.0049
VIF				1.05		2.25	1.57	2.08	1.28	1.48	1.32
Variables	B-IND	B-GEN	ROA	LEV	B-SIZE	TA	IN-O	ST-O	FA-O	FO-O	NC
B-IND	1.0000										
B-GEN	0.0922*	1.0000									
ROA	-0.0194	-0.0257	1.0000								
LEV	-0.0313	-0.0032	-0.1799*	1.0000							
B-SIZE	-0.0786*	0.0342	-0.0732*	0.1245*	1.0000						
TA	-0.0060	0.1013*	-0.1146*	0.1458*	0.3133*	1.0000					
IN-O	0.0407	0.3926*	-0.0385	0.1044*	0.1364*	0.1010*	1.0000				
ST-O	-0.2112*	0.0532*	-0.0810*	0.0172	0.3539*	0.0334	0.1611*	1.0000			
FA-O	-0.1434*	-0.0011	0.1068*	-0.1432*	-0.1497*	-0.1202*	-0.1302*	-0.1336*	1.0000		
FO-O	0.0880*	0.0974*	0.0370	0.0470	-0.0406	-0.0816*	0.2124*	-0.0980*	-0.1733*	1.0000	
NC	0.2473*	0.2302*	0.0409	-0.0430	0.2075*	0.0483	0.2252*	0.1023*	-0.1517*	0.0674*	1.0000
VIF	1.58	2.01	1.12	1.21	1.65	1.52	1.62	1.65	1.36	1.31	1.98

*Notes: PAT is the yearly number of patents filed during the year by the firm. PROD is a dummy variable equal to 1, if the firm has introduced at least a new good/service or significantly improved existing good/service, 0 otherwise. PROC is a dummy variable equal to 1, if the firm has introduced at least a new process in the production/supply procedures, 0 otherwise. H-R&D The average yearly number of hours spent by scientists and experts in R&D projects. C-GEN Percentage of female directors on nomination committee. C-IND Percentage of independent directors on nomination committee. C-SIZE Total number of directors on the nomination committee. FRQ Number of meetings on the nomination committee. MERG is a dummy variable, is equals to 1, if compensation and nomination committees have been merged, and 0 otherwise. NC is a dummy variable, is equal to 1, if there is a nomination committee, 0 otherwise. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. R&D expenses to total assets ratio. LEV Debt book value to total assets. *p < .05.*

Table (6) presents the mean difference tests between firms with at least one innovation and firms without innovation. It shows that innovative firms have large boards as well as large nomination committees. Also, they invest more in R&D activities.

Table 6. Mean difference tests between firms with at least one innovation and firms without any innovation.

Variables	PAT=1	PAT=0	Difference	PROD=1	PROD=0	Difference	PROC=1	PROC=0	Difference

C-SIZE	3.186	2.865	0.3211**	3.256	2.9615	0.295065**	3.257606	2.961576	0.296030**
C-GEN	13.76	14.07	-0.308	14.46	13.608	0.8550021	14.38713	13.64755	0.739585
C-IND	61.345	58.65	2.695	61.927	57.64	4.2777**	61.72655	57.66702	4.0595 **
FRQ	3.76	3.43	0.33**	3.7112	3.594	0 .1167283	3.717678	3.591588	0.1260906
B-GEN	14.22133	18.30364	-4.08231***	16.96834	17.54319	-0.5748499	15.74124	17.7416	-2.0003***
B-IND	53.16047	47.95735	5.203124**	47.05003	49.39873	-2.348699	48.76	49.08664	-0.3266481
B-FOR	17.73239	21.00843	-3.276***	13.25554	21.6002	-8.3***	13.5548	21.4577	-7.90***
B-SIZE	12.60932	12.02662	0.582700**	13.48682	11.8335	1.653 ***	13.49287	11.83383	1.65904***
R&D	0 .114	0,043	0.1144***	0.12172	0.04354	0 .0007 **	0.12221	0.04345	0.078 **
TA	128513	37685	90827 ***	122267.6	50188.79	72078***	122709.2	50116.14	73895 ***
ROA	4.205259	3.0244	1.18079 **	3.648851	3.77724	-0.128388	3.647031	3.777873	-0.130842
LEV	22.56371	28.885	- 6.322***	25.20276	25.04656	0.1562017	25.16793	25.06372	0.104218
IN-O	29.91568	35.525	- 5.609***	30.6387	32.88976	-2.251063	30.41522	32.99199	2.57676 **
ST-O	5.1234	3.5379	1.58550 **	4.183511	4.641157	-0.4576463	4.201389	4.631714	- 0.4303
FO-O	11.019	11.650	-0.63091	7.612637	11.27223	- 5.398 ***	7.645309	12.98463	- 5.333***
FA-O	8.991181	9.21078	-0.21959	12.77562	7.302044	5.473***	12.65564	7.370509	5.2851***

*Notes: PAT is the yearly number of patents filed during the year by the firm. PROD is a dummy variable equal to 1, if the firm has introduced at least a new good/service or significantly improved existing good/service, 0 otherwise. PROC is a dummy variable equal to 1, if the firm has introduced at least a new process in the production/supply procedures, 0 otherwise. C-GEN Percentage of female directors on nomination committee. C-IND Percentage of independent directors on nomination committee. C-SIZE Total number of directors on the nomination committee. FRQ Number of meetings on the nomination committee. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. R&D expenses to total assets ratio. LEV Debt book value to total assets. *p < .05, **p < .01, ***p < .001.*

Moreover, the table reports that the percentage of independent directors in the nomination committee is significantly higher in firms with PROC and PROD innovations. These differences are significant at the 5% level.

We also notice that innovative firms are larger than non-innovative ones, while the firms without innovation are characterized by a significantly high percentage of female and foreign directors on board. These differences are significant at the 1% level. Turning to capital structure shows that foreign investors have a large share of capital in non-innovative firms. Surprisingly, family ownership is large in firms with at least one innovation.

The mean difference tests between firms with and without NCs, are presented in table (7). We notice that firms with nomination committees have large boards and high percentages of female and independent directors: These differences are significant at the 1% level.

Table 7. Mean difference tests between firms with nomination committee and firms without nomination committee.

Variables	NC=1	NC=0	Difference
PAT	22.52994	48.40484	-25.8749 **
H-R&D	78.77817	85.08637	-6.308196
R&D	0.0695	0.0682	0.0013
B-GEN	19.0225	10.68772	8.334786 ***
B-IND	51.68219	37.54472	14.13747 ***
B-FOR	20.3769	20.12026	0.2566342
B-SIZE	12.7352	10.84965	1.885547 ***
TA	79825.07	48623.78	31201.28*
ROA	3.869516	3.159565	0.7099515
LEV	0.4480633	1.111533	-1.779091
IN-O	34.88929	19.87213	15.01716
ST-O	5.211363	1.186409	4.024954***
FO-O	11.8195	8.749286	3.070211**

FA-O	7.803545	14.8509	-7.047352

*Notes: NC is a dummy variable, is equal to 1, if there is a nomination committee, 0 otherwise. PAT is the yearly number of patents filed during the year by the firm. H-R&D The average yearly number of hours spent by scientists and experts in R&D projects. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. R&D expenses to total assets ratio. LEV Debt book value to total assets. *p < .05, **p < .01, ***p < .001.*

Moreover, regarding innovation, the number of patent applications is lower in firms that established a NC. Finally, small firms are more likely to implement NC. Regarding the financial capital structure, we notice that state and foreign ownership are larger when there is NC.

3.4. Models and Results

We estimate PAT using the System Generalized Method of Moments (GMM) developed by Blundell and Bond (1998). This estimation method allows for removing the time-invariant fixed effects that may affect dependent variables and endogeneity problems. For binary variables PROD and PROC, we use the logit model.

We introduce a lag structure into the regression models to account for the time lag between the director's decisions and their effects on innovation (see among others Mairesse and Mohnen, 2005; Østergaard et al., 2011; Balsmeier et al., 2014; and Chen et al., 2016).

In PROD and PROC regressions, we use one year lag (t+1) for the dependent variables concerning explanatory variables. In PAT regression, we use three-year lag (t+3) structure (Choi et al., 2011; Wang et al., 2017 and Cho et al., 2017). We consider the following models:

$$\text{INNOV}_{i,t+j} = \beta_0 + \sum \alpha_i^* \text{ Board committee } - \text{ Characteristics}_{i,t} + \sum \mu_i * \text{ Control Variables}_{i,t} + \mathcal{E}_{i,t} \quad (1)$$

Where $\text{INNOV}_{i,t+j}$ is the measure of innovation of the firm i, at the year t+j, j=1,3. Innovation proxies are PROD, PROC, and PAT.

Estimates are in table (8). They show that the presence of a nomination committee is negatively associated with the number of patent applications. Unlike Harrison (1987) and Gabrielsson and Winlund (2000) who argue that board committees can enhance the firm's innovation potential by getting access to more information and resources, our results show globally, that the presence of NC committees has no significant association with innovation outcomes. Moreover, our findings are consistent with evidence showing that NCs are more likely to first, serve shareholder interests: they will recommend candidates who are likely to prefer short-term profitable projects at the expense of uncertain and long-term profitable activities. Usually, they select directors who are reluctant to adopt transformational leadership that could lead to the introduction of new changes (Ruigrok et al., 2006). Building on the similarity-attraction paradigm viewpoint (Byrne, 1971), we can explain that NC members may tend to recommend candidates to the board who share some demographic and/or experiential characteristics with them (Westphal and Milton, 2000). NC's members are not going to prefer director's candidates who are skillful and have the necessary qualification to increase innovation, they are more likely to select individuals who belong to their networks and have similar academic and professional backgrounds, life experiences and values (Byrne, 1971; Goldberg et al., 2008; Walton et al., 2012; Garcia, 2004; Barragán Díaz et al., 2019). They are more likely to trust and work with those with whom they share the same characteristics (Burger et al., 2004; Jiang et al., 2010; Polman et al., 2013; Hirsch et al., 2020) such as birth-date, name, educational level, race, or age. Therefore, the preferences of NC members seem to influence the board composition, which can marginalize innovation activities. Therefore, we reject H1.

Table 8. Results of our regression models.

Variables	LnPAT (t+3)	PROD (t+1)	PROC (t+1)
NC	-1.199711*	2.121381	1.669641
	(-1.74)	(1.26)	(1.14)
C-GEN	-.001867	-.0038613	.0115015
	(-0.44)	(-0.31)	(0.98)
C-SIZE	.1766026*	.1880479	-.0888143
	(1.84)	(0.83)	(-0.42)
C-IND	.0023271	.0085279	.0095643
	(0.96)	(1.23)	(1.43)
FRQ	.0314219	.168242	.1536607
	(0.48)	(1.44)	(1.38)
MERG	.0415957	1.025919	1.02352
	(0.08)	(1.13)	(1.19)
B-GEN	-.0085441	-.0187166	-.042776**
	(-1.48)	(-1.02)	(-2.45)
B-IND	.004549	.0411974**	.0409286**
	(0.43)	(2.41)	(2.58)
B-FOR	-.0032219	-.048221**	-.037801**
	(-0.45)	(-2.40)	(-2.03)
B-SIZE	-.0714339	.2470207**	.1471723
	(-1.22)	(1.98)	(1.41)
LnR&D	-.0013231	.0246798	.00575
	(-0.25)	(0.83)	(0.31)
LnTA	.1036762	.3108209	.6628864
	(0.25)	(0.39)	(0.86)
ROA	.0263793*	.0760862*	.0701342*
	(1.95)	(1.71)	(1.69)
LEV	-.0124014	-.0448579*	-.0298016
	(-1.16)	(-1.88)	(-1.34)
IN-OW	.0010874	-.0047078	-.0131281
	(0.29)	(-0.40)	(-1.23)
ST-OW	-.0038531	-.0068178	-.0096927
	(-0.29)	(-0.19)	(-0.33)
FA-OW	.0160096	.0365234	.016672
	(1.10)	(1.47)	(0.75)
FO-OW	-.0002256	-.0408542*	-.056340**
	(-0.05)	(-1.78)	(-2.41)
Industry effect	YES	YES	YES
Constant	0.9070	-12.135***	-10.160***
	(0.44)	(-3.48)	(-3.18)
N	876	936	936
N of firms	107	103	103
Wald chi2	68.81	36.92	36.64
P > Chi2	(0.000)	(0.0446)	(0.0475)
Arellano-Bond test for order one AR(1)	4.15 (0.000)		
Arellano-Bond test for order two AR(2)	0.73 (0.465)		
Sargan test (Chi-square,p-value)	164.98 (0.000)		
Hansen test (Chi-square,p-value)	34.10 (0.693)		

Notes: PAT is the yearly number of patents filed during the year by the firm. PROD is a dummy variable equal to 1, if the firm has introduced at least a new good/service or significantly improved existing good/service, 0 otherwise. PROC is a dummy variable equal to 1, if the firm has introduced at least a new process in the production/supply procedures, 0 otherwise. C-

*GEN Percentage of female directors on nomination committee. C-IND Percentage of independent directors on nomination committee. C-SIZE Total number of directors on the nomination committee. FRQ Number of meetings on the nomination committee. MERG is a dummy variable, is equals to 1, if compensation and nomination committees have been merged, and 0 otherwise. NC is a dummy variable, is equal to 1, if there is a nomination committee, 0 otherwise. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. R&D expenses to total assets ratio. LEV Debt book value to total assets. *p < .05, **p < .01, ***p < .001.*

Surprisingly, the presence of independent directors on the board is significantly and positively associated with some innovation proxies (PROD and PROC) while their presence on the NC has no significant association with all innovation proxies. Hence, the hypothesis H2 is rejected. One explanation could be that outside directors most often, are not familiar with the day-to-day business operations.

In addition, our results show that female members on NCs do not have a significant impact on all innovation measures. The presence of female members on NCs does not lead the company to improve or develop new products and/or processes. Therefore, the hypothesis H3 is rejected. One explanation could be, despite the introduction of gender quota law, female directors re not appointed to strategic committees on the board, such as nomination and remuneration committees. In fact, very few women are in committees board positions, particularly in male-dominated companies. Female directors are still prevented from moving up into management and leadership positions and are facing significant barriers (glass ceiling" theory, ILO, 2001). In fact, a low number of female directors characterizes the nomination committees in France, only 41% of women sit on NCs in 2017 (Board Index study by Spencer Stuart, 2018). The complexity of the board selection process (Peterson and Philpot, 2007), in addition to many gender stereotypes, still makes it more difficult for a woman to be nominated on boards as well as on committees (Brière and Rinfret, 2010). This is in line with studies on board committees who show that women directors most often serve on specific committees: they can easily join audit, CSR, and corporate governance committees while they are unlikely to be appointed to the strategic, nominating and compensation committees (Adams and Ferreira, 2009; Bugeja et al., 2016).

Moreover, the results show that the frequency of NC meetings does not have a significant association with innovation proxies. In the same vein, Menon and Williams (1994) conclude that the number of meetings does not provide any evidence about the work accomplishment. Thus, hypothesis H5 is also rejected. Besides, merging the compensation and nomination committees has a non-significant association with all innovation proxies.

Furthermore, we notice that C-SIZE has a positive and significant impact on PAT. Our study highlights that a large nomination committee is prone to have a valuable diversity of perspectives which increases innovation opportunities. Unlike Lin et al. (2009), large committees could suffer interests' conflicts and could lead to unnecessary debate and delay in making decisions. Consequently, it could influence negativity communication and decision-making processes. The C-SIZE coefficient is not significant in PROD and PROC regressions. We, therefore, reject H4. One explanation could be that few firms are able to yearly apply for a large number of patents such as L'Oréal, Valeo, France Telecom, and Renault.

Turning to board characteristics, we notice that the presence of independent directors on the board is positively and significantly associated with PROC and PROD proxies. This is in line with Choi et al. (2012) who highlight that independent directors are more involved in innovation activities. Indeed, they have good knowledge of the business and valuable social network and resources in innovation activities. They are, therefore, more prone to encourage innovative activities that could lead to the implementation of new products and processes.

In addition, Unlike Yuan and Wen (2018) who provide evidence that managerial foreign experience is positively associated with corporate innovation, our findings show that the presence of foreign directors on board is negatively and significantly associated with both proxies PROC and PROD. It shows that directors who have different cultural backgrounds could provide diverse perspectives but not automatically valuable for innovation and solving problems

(Berliant and Fujita, 2011). Even though ethnic diverse directors know global markets and customers' tastes, they may not lead the firm to develop new products sold abroad as they also (Kerr and Lincoln, 2010).

Besides, estimates show a negative association between B-GEN and all innovation measures. It is, however, significant only in the PROC regression. Our result could not confirm the influence of women directors on innovation. This is not consistent with many previous findings (Teruel et al., 2015; and Ruiz-Jiménez et al., 2016) arguing that gender diversity in boards helps to diversify knowledge and improves discussion to generate innovative ideas. In fact, there is some empirical evidence on how women could contribute to broadening the range of new products (Østergaard et al., 2011; Torchia et al., 2011; Díaz-García et al., 2013; and Teruel et al., 2013) and how they could achieve successful innovations (Chen et al., 2018). However, the significant and negative coefficient in PROC regression could confirm the women risk-avoidance behavior: female directors avoid risky investments and financing opportunities as they are labelled more risk averse than men (Croson and Gneezy, 2009). In the same vein, Niederle and Vesterlund (2007) conclude that women are less competitively inclined and less overconfident than men. Consequently, women avoid risky challenging situations and avoid investments with unknown outcomes, such as innovation projects. In NCs, they will select and recommend candidates who are likely to have the same risk preferences and to avoid challenging activities such as innovation.

4. Robustness Checks

4.1. Alternative Measures of Innovation

For robustness tests, we use alternative measures of innovation, specifically innovation efforts such as R&D expenses to total assets ratio, and the average yearly number of hours spent by scientists and experts in R&D projects (H-R&D). We introduce one year lag (t+1) for the dependent variables in model (1) and use System GMM. The estimates are presented in Table (9). Our results highlight the negative influence of NCs on decreasing the number of hours dedicated to R&D activities. Unlike Harrison (1987), committees can enhance the involvement of directors in innovation activities. Our finding is not consistent with Gabrielsson and Winlund (2000) who show that committees can provide advice on how to use the resources required for innovation opportunities which could lead to an increase in shareholders' wealth. Moreover, similar to our previous findings, we show that the size of NCs is positively associated with R&D team structure. It can be concluded that a large number of NC's members is positively associated with innovation effort proxies (R&D ratio and the number of hours spent by experts and scientists on R&D activities). In the two regressions, the C-SIZE coefficients are positive and significant at the 5% level. Turning to committee functioning, we show that the frequency of meetings of NC has a positive and significant association with R&D expenditures proxy. Frequent meetings may have a positive influence on the strategic role of board committees, specifically on how they perform their roles. Frequent meetings help outside directors to interact with inside directors and to be well informed about firm activities. It could stimulate entrepreneurial thinking, particularly of outsiders who could suggest innovative initiatives (Tuggle et al., 2010). Accordingly, when nomination committees meet often, board committees seem to be well informed about the current problems and firm activities such as R&D investments. However, we notice a negative association between the size of the board and all innovation input proxies (Table 9). In line with Linck et al. (2008), large boards could suffer conflicts of interest, the lack of communication and delay in the decision-making process. This environment can inhibit creativity and innovation opportunities (Jensen, 1993).

Table 9. Robustness checks: Alternative measures of innovation.

Variables	LnR&D(t+1)	LnH-R&D(t+1)
NC	.0463338	-.9387079*
	(0.11)	(-1.88)

C-GEN	.0054369	-.0034481
	(1.09)	(-0.69)
C-SIZE	.1371012**	.275406**
	(2.69)	(2.15)
C-IND	-.0016255	.0049515
	(-0.78)	(1.26)
FRQ	.0307712*	-.0285362
	(1.68)	(-0.39)
MERG	-.2465994	-.3027502
	(-0.60)	(-0.70)
B-GEN	-.0082647	-.0029806
	(-1.37)	(-0.38)
B-IND	.0030361	.0055868
	(0.87)	(0.91)
B-FOR	.0017953	-.0076607
	(0.31)	(-1.20)
B-SIZE	-.0796645**	-.095945**
	(-2.19)	(-2.06)
LnR&D		.0040955***
		(3.61)
LnTA	-.6026305	-.1260442
	(-1.64)	(-0.19)
ROA	.011776	.0030424
	(1.28)	(0.16)
LEV	-.0093995	-.0034444
	(-1.52)	(-0.22)
IN-OW	.0028271	-.0032405
	(0.81)	(-0.55)
ST-OW	-.0060722	-.0209754
	(-0.51)	(-1.09)
FA-OW	.0127651	.0194107
	(1.22)	(0.89)
FO-OW	.0073359	-.0067554
	(1.57)	(-0.93)
Industry effect	YES	YES
Constant	2.481465**	2.045291
	(2.21)	(0.76)
N	982	983
N of firms	107	108
Wald chi2	106.08	208.70
P > Chi2	(0.000)	(0.000)
Arellano-Bond test for order one AR(1)	4.89	4.20
	(0.000)	(0.000)
Arellano-Bond test for order two AR(2)	0.86	1.19
	(0.396)	(0.233)
Sargan test (Chi-square,p-value)	359.57	159.28
	(0.000)	(0.000)
Hansen test (Chi-square,p-value)	29.80	42.96
	(0.921)	(0.473)

*Notes: R&D expenses to total assets ratio. H-R&D The average yearly number of hours spent by scientists and experts in R&D projects. C-GEN Percentage of female directors on nomination committee. C-IND Percentage of independent directors on nomination committee. C-SIZE Total number of directors on the nomination committee. FRQ Number of meetings on the nomination committee. MERG is a dummy variable, is equals to 1, if compensation and nomination committees have been merged, and 0 otherwise. NC is a dummy variable, is equal to 1, if there is a nomination committee, 0 otherwise. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. LEV Debt book value to total assets. *p < .05, **p < .01, ***p < .001.*

Also, we notice that large boards are positively and significantly associated with product innovation. This is in line with Zona et al. (2013) who find that large boards could lead to more successful innovations due to the members' multiple resources. However, our finding is not consistent with Linck et al. (2008) who stress that large boards of directors may have more resources and knowledge which contribute to firm performance and agility, however, their benefits are diminished when the communication inside the board becomes difficult (Jensen, 1993), which can inhibit creativity and innovation.

Finally, when we focus on the impact of ownership structure on innovation, we find a significant and negative association between foreign ownership and PROD, PROC proxies. Having a large share of foreign capital seems to decrease the firm's ability to produce products/processes innovations. In fact, foreign ownership could help firms to acquire the resources needed for innovation activities (Chen et al., 2011, Lodh et al., 2014; and Shapiro et al., 2015), however, they seem to avoid investments with unknown outcomes and challenging situations, such as innovation projects.

4.2. Does the Nomination Committee have a Different Influence on Innovative Firms?

In this section, we select firms that have been able to introduce at least one innovation (PROD=1, or PROC=1 or PAT>0) between 2002 and 2016.

Table (10) provides the results of the model (1). It shows that most of the previous findings are robust: there is no significant association between NC's attributes and innovation proxies. However, we notice that the presence of independent directors on NCs is positively and significantly associated with PROC proxy. Our regressions show that independent directors in NCs influence positively the firm's ability to introduce new or improved processes. From a resource-based perspective, outsiders can be seen as providers of access to scarce or strategic resources (Lynall et al., 2003; and Tuggle et al., 2010). Independent members have outside contacts and typically bring a broader range of experience due to their address book, they have a good knowledge of many businesses, and they are more concerned about the firm's internal development (Choi et al., 2012). Therefore, independent directors in nomination committees are likely to have enough knowledge and skills to appoint new members, who have the required qualifications for innovative activities.

Table 10. Does the nomination committee have a different influence on innovative firms?

Variables	LnPAT (t+3)	PROD (t+1)	PROC (t+1)
NC	-1.197538*	2.573358	2.01306
	(-1.68)	(1.52)	(1.36)
C-SIZE	.2146119*	.0729997	-.1675869
	(1.93)	(0.31)	(-0.78)
C-GEN	.0012784	-.0043911	.0111251
	(0.24)	(-0.36)	(0.95)
C-IND	.0049577	.0102582	.0115074*
	(1.10)	(1.45)	(1.67)
FRQ	.0586704	.1672563	.1633076
	(0.80)	(1.37)	(1.42)
MERG	-.1835546	1.037879	1.086875
	(-0.38)	(1.12)	(1.23)
B-GEN	-.0132843	-.0097491	-.0367502**
	(-1.43)	(-0.52)	(-2.07)
B-IND	.00109	.0414434**	.0411943**
	(0.09)	(2.41)	(2.61)
B-FOR	-.0076474	-.0388178*	-.0303507*
	(-0.74)	(-1.86)	(-1.57)
B-SIZE	-.0355709	.2274545*	.1504836

	(-0.47)	(1.79)	(1.41)
LnR&D	-.0022578	.9721277	.03763
	(-0.77)	(0.94)	(0.14)
LnTA	-.453493	-.4770741	-.0253951
	(-0.84)	(-0.54)	(-0.03)
ROA	.0403506**	.066982	.0656739
	(2.10)	(1.37)	(1.45)
LEV	.0041097	-.0393496	-.0209556
	(0.43)	(-1.59)	(-0.91)
IN-OW	.0010677	-.0024353	-.0109693
	(0.21)	(-0.20)	(-1.02)
ST-OW	.0045064	.0135591	-.0009532
	(0.23)	(0.41)	(-0.03)
FA-OW	.006058	.0243987	.0082141
	(0.34)	(0.98)	(0.37)
FO-OW	-.0026479	-.0565889**	-.0663262**
	(-0.31)	(-2.28)	(-2.76)
Industry effect	YES	YES	YES
Constant	2.751138	-7.870461**	-7.081447**
	(1.40)	(-2.13)	(-2.15)
N	661	687	687
N of firms	80	75	75
Wald chi2	68.90	34.31	33.73
P > Chi2	(0.000)	(0.0792)	(0.0895)
Arellano-Bond test for order one AR(1)	-4.28 (0.000)		
Arellano-Bond test for order two AR(2)	-0.87 (0.383)		
Sargan test (Chi-square,p-value)	132.32 (0.000)		
Hansen test (Chi-square,p-value)	36.72 (0.574)		

*Notes: PAT is the yearly number of patents filed during the year by the firm. PROD is a dummy variable equal to 1, if the firm has introduced at least a new good/service or significantly improved existing good/service, 0 otherwise. PROC is a dummy variable equal to 1, if the firm has introduced at least a new process in the production/supply procedures, 0 otherwise. C-GEN Percentage of female directors on nomination committee. C-IND Percentage of independent directors on nomination committee. C-SIZE Total number of directors on the nomination committee. FRQ Number of meetings on the nomination committee. MERG is a dummy variable, is equals to 1, if compensation and nomination committees have been merged, and 0 otherwise. NC is a dummy variable, is equal to 1, if there is a nomination committee, 0 otherwise. B-SIZE Total number of directors on board B-GEN Percentage of female directors on board. B-IND Percentage of independent directors on board. B-FOR Percentage of foreign directors on board. IN-O Institutional investors' share of capital. ST-O State's share of capital. FO-O Foreign investors' share of capital. FA-O Family's share of capital. TA Total assets. ROA Return on asset ratio. LEV Debt book value to total assets. R&D expenses to total assets ratio. LEV Debt book value to total assets. *p < .05, **p < .01, ***p < .001.*

5. Conclusion

It is well argued that innovation ability is significantly influenced by several governance features (Lodh et al., 2014; and Wang et al., 2017). Despite the central role of boards in corporate governance, there is relatively little understanding of how the internal organization of boards, specifically the structure of board committees, could influence innovation. Drawing from the agency and socio-psychological behavioral theories, this paper has examined the effect of structural features of NCs and demographic attributes of their members on different types of innovation. Indeed, our contribution emphasizes that boards should pay attention to the nomination committee features as they could undermine innovation projects, specifically in innovation-sensitive industries.

Our paper highlights that members in nomination committees are more likely to first, serve shareholder interests: they will recommend candidates who are likely to prefer short-term profitable projects at the expense of

uncertain and long-term profitable activities. Moreover, the complexity of the board selection process (Peterson and Philpot, 2006), in addition to many gender stereotypes, still makes it more difficult for a woman to be nominated on boards (Adams et Ferreira, 2009; Bugeja et al., 2016, Brière et Rinfret, 2010). The absence of females in corporate boards as well as in committees has become the focus of legislators and regulators in many countries, especially with women being more risk-averse and adopting a trust-building approach than men as proven in prior research (Daily and Dalton, 2003). Women's talents are still being underutilized at decision-making levels. Our finding is in line with studies on the boards' committees, which show that women directors most often serve on specific committees: they face a second ceiling barrier in boardrooms while they are supposed to achieve high top management positions: the glass cliff (Ryan and Haslam, 2005). For instance, they can easily join audit, CSR, and corporate governance committees while they are unlikely to be appointed to the strategic, nominating, and compensation committees (Adams and Ferreira, 2009). However, through this contribution, we try to show how the presence of females could change the dynamics of the board as well as the board committees, which could influence innovative' activities. We notice that gender diversity in board seems to help firms to diversity knowledge and to improve discussion, which generates new ideas. They can contribute to broadening the range of new products (Østergaard et al., 2011; Torchia et al., 2011; Díaz-García et al., 2013; and Teruel et al., 2013) and introduce more organizational innovation. Hence, based on the advanced results, we can adhere to the improved decision-making process of the "gender quota law" to leadership positions. Third, we provide evidence that specific features of nomination committee could be valuable in innovation projects. For instance, large committees that meet frequently could reduce asymmetric information regarding innovation projects and could to an increase of R&D expenditures. Finally, we underline that heterogeneity of board members could be more influential in innovation projects than heterogeneity of committee members. For instance, outside directors on board, most often, have good knowledge of the business and valuable social network and resources in innovation activities. They are, therefore, more prone to encourage innovative projects that could lead to the implementation of new products and processes. Furthermore, gender diversity seems to decrease innovation that could be explained by the fact women are less competitively-inclined and less overconfident than men. Consequently, women avoid risky challenging situations and avoid investments with unknown outcomes, such as innovation projects. Also, we show that large boards are positively and significantly associated with product innovation. The large boards could lead to more successful innovations due to the members' multiple resources.

Some of the inherent limitations of this study are: First, a dummy variable is used to measure only the existence of nomination committees in the sample firms, hence this variable only captures the mere existence but not the quality of those nomination committees (e.g. CEO involvement). However, the other four nomination committee attributes' measures (C-GEN, C-IND, C-SIZE, FRQ) provide better inside of nomination committee composition and activities. Second, we have used different measures of innovation in our analysis, but have ignored other forms of innovation, such as marketing innovations. Then, we have neglected the market characteristics such as competitiveness, which provide significant incentive to get involved in innovation projects. Finally, this study is conducted in a French context and the results might not be generalizable to other countries.

Our paper opens many future avenues for research: In this perspective, we have mainly focused on the nomination committee, it would be interesting to understand why specific committees, such as the strategy and technology committee are rarely used and how they may impact innovation. Moreover, Future research can analyze the impact of nomination committee existence on innovation by taking CEO involvement. Finally, the influence of the board diversity on innovation could be impacted by national and cultural dimensions, we could further enrich the analysis of our research thanks to international comparisons. These issues are left for future papers.

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

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