

Board control and innovation in small and medium-sized companies

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Abstract

This paper investigates how the board of directors affects product and process innovation in small and medium-sized enterprises (SMEs) through their control role. Researchers so far mainly relied on agency theory. However, we argue that the agency theory assumptions apply less in SMEs and therefore develop new theory for explaining this relationship. We draw on the recent theoretical view of stability and change as a duality (Farjoun, 2010), as we argue that control by the board of directors is needed for innovation because this directs focus in the right direction, reduces uncertainty and provides a consistent frame wherein the innovation can take place. Statistical analysis on a sample of 150 Belgian SMEs revealed that board involvement in control is positively related to process innovation, but not related to product innovation. Overall, the present study adds to a better understanding of how boards contribute to firm value creation.

Keywords

board of directors - small- and medium-sized enterprises - board control - innovation

Introduction

How do boards of directors affect product and process innovation in small and medium-sized enterprises (SMEs) through their control role? Innovation is increasingly important for firm performance and long-term survival, since the current economy is characterized by dynamic markets, continuous technological developments and various other complexities that pose substantial challenges to firms today. As the competition is intense, firms need to be able to adapt to rapid changing customer needs and find efficient ways to enhance productivity. They need to continually pursue new products and services to meet the growing external market demands and to be able to develop new and more efficient production processes to help

increase internal productivity. Hence, product and process innovation are crucial for long-term wealth creation in firms today. In comparison to larger firms, SMEs generally have fewer resources due to size constraints (Chen & Hambrick, 1995). Therefore, in order to compensate this, flexibility and innovation are even more important (Wolff & Pett, 2006).

A growing number of researchers is studying the role the board of directors plays in stimulating innovation (e.g., Gabrielsson, 2007; Brunninge, Nordqvist, & Wiklund, 2007). Most of this research uses an agency theory lens, arguing that an active board of directors encourages innovation as the board can counter manager's reluctance to take risks and encourage him/her to pursue more long-term oriented strategies like innovation activities (Jones & Butler, 1992). While this argument might apply in large publicly-owned firms, where ownership and management is separated and CEOs thus need to be controlled in order to offset their self-interested short-term focused behaviour (Zahra, 1996), this is usually not the case in SMEs. In these firms, CEOs are often the firm owners and therefore are expected to act more in line with the organization's best interest and thus support needed innovation efforts. Hence, following this agency logic, there seems to be no need for board control to stimulate innovation in SMEs. What is more, SMEs are often characterized by fewer hierarchical levels and a more informal structure, two features that are often viewed as important facilitators of innovation in the change and innovation literature (e.g., Damanpour, 1991; Beer & Nohria, 2000). Control is in the change literature often considered to thwart innovation because it reduces intrinsic motivation and creativity (e.g., Amabile, 1998; Damanpour, 1991; Tushman & O'Reilly, 1997).

However, we argue that control is not an inhibitor, but rather a facilitator of innovation in SMEs. We rely on recent theoretical developments (Farjoun, 2010) that conceptualize

stability and change as a duality. Stability and change are not mutually exclusive, but rather mutually enabling. Stable mechanisms like control enable change and innovation. Control facilitates design and invention, because it channels search in the right direction. Control provides focus towards organizational goals and identifies problems that can become triggers for change (Simons, 1995). Control is needed to reduce uncertainty and regularize the innovation. Control provides the CEO with the necessary feelings of psychological safety (Edmondson, 1999; Edmondson, Bohmer, & Pisano, 2001) and it provides a consistent frame wherein the innovation can take place (Ghoshal & Bartlett, 1994). As SMEs often lack formal planning systems or performance reviews, the board of directors can be expected to perform this innovation enabling control role. In this paper, we therefore investigate the relationship between board involvement in control and innovation in SMEs.

By doing this, we contribute to the literature in two ways. First, we develop new theory as we look beyond the traditional agency theory in explaining the role the board of directors plays in innovation (van Ees, Gabrielsson, & Huse, 2009). Research on boards of directors has been dominated by agency theory perspectives, with a focus on aligning the interests of firm owners and (self-serving) managers. However, recently many scholars (e.g., Hambrick, Werder, & Zajac, 2008; Huse, 2005; Minichilli, Zattoni, & Zona, 2009; van Ees, et al., 2009) call for alternative theories to better understand all the complexities of the broader role the board plays in ensuring that organizational efforts are effectively and efficiently directed towards organizational goals. Given our focus on the role the board plays in innovation, we rely on the new theoretical view of change and stability as a duality (Farjoun, 2010), arguing that board control enables innovation in SMEs because this provides needed certainty, legitimacy, structure and focus. Secondly, we contribute to the empirical research on board governance and innovation, as we empirically test the relationship between board

involvement in control and product and process innovation in SMEs. For our analysis, we rely on actual board task behaviour rather than board demographics (e.g., size, CEO duality). This is in line with recent developments in the corporate governance literature (e.g., Zona & Zattoni, 2007; Gabrielsson, 2007), where various scholars claim that the classic board demography approach is not able to capture the actual board processes leading to board effectiveness, which would explain the conflicting results found in previous empirical research on corporate governance.

The rest of the paper proceeds as follows. The next section presents a literature review, where we first discuss the literature on innovation and present the recent theoretical view of stability and change as a duality and second, discuss the role the board of directors plays in stimulating innovation and develop our hypotheses. Then follows the method section, which includes a description of the sample and the measures used in the study. This is followed by a presentation of the data analyses and results. In a concluding section the results and their implications for theory and practice are discussed.

Theory and hypotheses

Innovation

As the importance of innovation in today's economy is commonly recognized, the study of innovation has become one of the most important topics within organizational sciences. Innovation is a very broad concept that encompasses different forms. Therefore, Wolfe (1994) states that for accumulating knowledge in the field, it is important that researchers clearly specify the type of the innovation and the type of organization that they focus on. Concerning innovation type, the most commonly used typology concerns product and process innovation (e.g., Abernathy & Utterback, 1978; Damanpour, 1991; Damanpour &

Gopalakrishnan, 2001). We view product innovation as new products or services that the firm introduced to the market. Product innovation thus has an external market focus and is primarily customer-driven. Process innovation on the other hand, entails new production-related technologies developed by the firm, like work and information flow mechanisms. Process innovation has an internal focus and is primarily efficiency driven (Zahra, et al., 2000; Damanpour & Gopalakrishnan, 2001). Product as well as process innovation are important for competitiveness and wealth creation in SMEs (Garcia & Calantone, 2002). Product innovations help firms in gaining advantage over competitors in the market, as they can reach new customers and markets. Process innovations improve the firm's productivity and efficiency (Wolff & Pett, 2006).

Since the importance of innovation for long-term value creation is clear, it is important to gain insight into the antecedents of successful innovation. A recurring theme in the literature on change and innovation has been the importance of an organic organizational structure, characterized by, for example, decentralized decision-making and horizontal communication lines (Damanpour, 1991; Hage, 1999). Organic organizations are traditionally contrasted to mechanistic structures, which are characterized by more control, formalization, centralization and rigidity (Burns & Stalker, 1961). The former are thought to be required for dynamic and non-routine tasks, like innovation, whereas the latter are more suited for specialized routine tasks in stable environments. In other words, organic structures are thought to support change; Mechanistic structures support stability. Several scholars take it a step further and state that stable mechanisms like control actually hinder innovation, as they induce rigidity and decrease intrinsic motivation (e.g., Amabile, 1998). However, according to Farjoun (2010), the organizational forms and practices that support change and the ones that support stability are not necessarily incompatible and therefore stability and change can be

seen as a duality. Farjoun (2010) argues that stability promoting mechanisms like habits, routines and control can also enable change and innovation. Controls first of all channel search in the right direction. They help focus attention so that new ideas are in line with the organization's goals, they help define the limits wherein creativity is allowed (Simons, 1995). Through control, new customer needs and (efficiency) problems are more easily detected, which then can become triggers for product or process innovation. Second, controls reduce uncertainty. Innovation often creates feelings of uncertainty and therefore it is important to encourage psychological safety, which has been defined as the belief that one is safe for risk-taking and capable of changing (Edmondson, 1999; Schein & Bennis, 1965). The CEO's psychological safety can be enhanced when he/she is not the only one keeping an eye on everything that is going on in the business, so that problems will be easily detected and for this control is needed. Third, controls create a consistent framework wherein the innovation can take place (Ghoshal & Bartlett, 1994). The process that leads up to the introduction of a new product to the market or the implementation of a new production process, requires not only brainstorming by creative minds and fast responsiveness. It also requires clear goal setting to know what the company needs to attain with the innovation. It requires a stable frame so that the necessary steps to implement the innovation can be taken in an effective and efficient manner and that results can be evaluated. This is in line with Ghoshal and Bartlett (1994), who state that change and innovation requires an organizational context of trust and support on the one hand, but also stretch and discipline on the other hand. Trust and support are soft elements associated with the so-called organic structures, whereas stretch and discipline are hard, 'mechanistic' elements like clear performance standards, fast feedback and thus control. Overall, we conclude that control can be an important facilitator of innovation. The question remains how SMEs may enact control so that it facilitates innovation rather than obstruct it.

Board of directors and innovation

In comparison to large firms, SMEs experience size constraints and as a result have fewer resources, which they need to compensate through their flexibility and innovativeness (Qian & Li, 2003; Wolff & Pett, 2006). They are expected to be more flexible, as SMEs are often characterized by less hierarchy, a more informal structure and more horizontal communication lines, which have been positively related to innovation as characteristics of a more organic structure (e.g., Damanpour, 1991). However, one of the resource shortages of SMEs is the fact that they have less legitimacy and can rely less on formalized systems for acquiring information, control and decision-making (Chen & Hambrick, 1995; Perren, Berry, & Partridge, 1998). Therefore, as we argued above, SMEs are in need for control that helps them focus, reduce uncertainty and that builds legitimacy and structure, without creating the rigidity and inertia often related with formal control.

Research shows that in SMEs control is mainly the task of the board of directors (e.g., Bammens, Voordeckers, & Van Gils, 2008). There is a growing amount of research on the role the board of directors plays in change and innovation efforts (Baysinger & Hoskisson, 1990; Baysinger, Kosnik, & Turk, 1991; Zahra, 1996; Zahra, Neubaum, & Huse, 2000; Golden & Zajac, 2001; Westphal & Frederickson, 2001; Brunninge, Nordqvist, & Wiklund, 2007; Gabrielsson, 2007; Wu, 2008; Gabrielsson & Politis, 2009; Zhang & Rajagopalan, 2010). Most of this research has been done from an agency theory perspective. From this perspective, managers are thought to be self-interested and risk-averse. Therefore, they focus more on short-term goals that receive immediate rewards, rather than uncertain long-term innovation projects. The board of directors is then needed to counter this reluctance towards innovation, ensuring that long-term value creation is supported (Zahra, 1996). While this might be true in large publicly-owned organizations (although we believe that this is only part

of the story), this reasoning applies less in SMEs. In these firms, ownership and management are often not separated. Managers who are also owners of the firm are expected to act in line with the more long-term organizational goals and thus support innovation for creating firm value. So the agency logic of aligning the interests of more long-term focused owners and more short-term focused managers doesn't apply. However, from our theoretical focus of change and stability as a duality, we argue that, although these CEOs are expected to act in the firm's best interest, they still need a feeling of psychological safety before engaging in risky innovation projects. They still need a certain degree of formal planning and focus so that the innovation efforts are taken in a focused and efficient manner (Gabrielsson & Politis, 2009). We posit that this is exactly what the control role of the board of directors entails to support innovation in SMEs, above and beyond the agency logic.

While the interest for board tasks like advice and networking is growing, the most fundamental role of the board remains control (e.g., Fiegener, 2005). Board control entails a wide array of tasks ranging from monitoring budgets, quality of products and other internal company affairs over monitoring financial performance and value creation for external stakeholders, to monitoring and evaluating strategic decisions. When the board of directors closely monitors and steers internal and external organizational behaviour, it will become easier for the firm to introduce new products/services or to implement new production processes, because the board then helps to provide the necessary guidelines and structure for transforming the innovative idea into a marketable product/service or into a functioning production process (Farjoun, 2010). Problems that occur during the innovation process are also more rapidly detected and adjusted and the results of the innovation can be evaluated. The board also helps to keep the goals of the firm in mind and thus to channel the search for new ideas in the right direction. What is more, when the CEO feels that he/she is not the only

one keeping an eye on everything that is going on in the business, he/she feels more secure to support new innovative ideas. This way the board thus performs the control tasks that are needed to enable innovation according to the view of change and stability as a duality (Farjoun, 2010), without stifling the CEO as more rigid control systems are often inclined to do. These control tasks that enable innovation thus concern more than merely countering a more short-term focus, as posited by agency theorists.

Hence, we hypothesize the following:

H1 There is a positive association between board involvement in control and product innovation.

H2 There is a positive association between board involvement in control and process innovation.

Method

Sample

To test the hypotheses of the study, we used data from a mail survey that was part of a large-scale European research project concerning the value creating board (Huse, 2009). The questionnaires were sent out to CEOs from Belgian small and medium-sized firms in 2004. Firms were selected based on three criteria. The first criteria was that it concerned firms with 5 to 250 employees. Secondly, only firms from the manufacturing industry were selected (industry code NACE Section D; 16-36). And lastly, all firms had an independent ownership structure, meaning that the firm owner is not affiliated to a larger group. The Belfirst database was used to compose the sample frame. From this database, 2000 firms were randomly selected. We received 150 completed questionnaires, giving a total response rate of 8 percent.

Potential response bias was evaluated by analyzing late and early respondents. Because it was not possible to collect data on the whole population, a direct non-respondent analysis couldn't be executed. However, Kanuk and Berenson (1975) noted that late respondents are expected to be more similar to non-respondents than early respondents. Using late respondents as a surrogate for non-respondents, a t-test was conducted to identify possible differences between the early respondents and the late respondents. Results indicate that no significant differences exist between the two groups on any of the variables.

Measures

Dependent Variables

To measure product and process innovation, we used the scales developed by Zahra and colleagues (2000). The scales consist of 5 items related to product innovation and 4 items related to process innovation. The CEO was asked to rate the firm's emphasis on the innovation components on a 5-point Likert scale. We subjected the survey items to principal component factor analysis with varimax rotation. The reversed coded question related to process innovation was left out, as it could not consistently be related to one of the factors in the analysis. As expected, with the remaining 8 items, we found two significant factors: product and process innovation. The Cronbach's alpha (α) for product innovation is .90 and the factor explains 44% of the variance. The process innovation scale has a Cronbach's alpha of .81 and the factor explains 29% of the variance. The results of the factor analysis for the innovation measures can be found in the appendix.

Independent Variables

The measures for the board control task were based on the control roles from Huse (2005). The CEO was asked to rate on a five-point Likert scale the degree to which the board

of directors is active in three distinct control tasks. First of all, behavioural control has an internal focus and concerns monitoring the CEO's and other top managers' behaviour (Huse, 2005). More specifically, it entails monitoring budgets, quality of products and other internal company affairs. The behavioural control task was measured using 8 items ($\alpha = .93$). The second board role concerns output control. Output control has an external focus and consists of monitoring the firm's financial performance and value creation for external stakeholders. The output control task was measured using 3 items ($\alpha = .76$). Finally, the strategic control task has a strategic focus and concerns evaluating and monitoring strategic decision-making. The strategic control task was measured using 2 items ($\alpha = .85$). The 13 survey items can be found in the appendix.

Control Variables

The controls used in our analyses are firm level as well as board level controls. On the firm level, we used size, age and sector. *Firm size* is often used as a control variable in studies on innovation, as many scholars have found that size matters in innovation (e.g., Acs & Preston, 1997; Vaona & Pianta, 2008). Size was measured by the logarithmic function of the number of full-time-equivalents that are employed by the firm. We also included *firm age* as a statistical control variable, as research shows that age makes a difference in innovativeness. Younger firms are often expected to be more innovative (e.g., Acs & Preston, 1997; Zahra, et al., 2000). Age was measured as the number of years since the founding of the firm. The fact that firms are involved in high-technology manufacturing may influence their need for innovation. Therefore, respondents were asked to indicate whether they perceived their company as a *high-tech company* or not.

On the board level we used two control variables. First, because various studies indicated that CEO power influences board involvement (Fiegener, Brown, Dreux, & Dennis, 2000), *CEO duality* was included as a dichotomous variable indicating whether the CEO also served as board chair or not. Second, *board size* can be expected to influence the way the board performs and was therefore included as a statistical control variable. Board size was measured as the number of directors on the board.

Results

For our hypotheses testing, multiple regression analyses were used. Before we ran these analyses, we checked whether common method bias presented a problem in this study using Harman's one-factor test (Podsakoff & Organ, 1986). The test revealed multiple factors (board control, innovation, firm age, firm/board size, ceo duality and sector), which indicates that common method bias didn't pose a problem in this study. Table 1 shows the means, standard deviations and bivariate correlations for the variables used in the regression analyses.

*** Insert Table 1 about here ***

To make sure that multicollinearity didn't present a problem, we calculated the Variance Inflation Factors (VIF) for the explanatory variables used in the regression analyses and found that they all had low VIF values (all lower than 1.21). This indicates that there were no problems of multicollinearity in the data. The results of the multiple regression analyses are presented in Table 2. We tested four models with product innovation as the dependent variable and four models with process innovation as the dependent variable. First, we included only the control variables for product and process innovation separately. We found that neither the product innovation model nor the process innovation model were significant.

Only the positive effect of firm size on process innovation appeared to be statistically significant. Next, because our first hypothesis was that there is a positive association between board involvement in control and product innovation, we included behavioural control, output control and strategic control respectively¹ as the independent variable and product innovation as the dependent variable in the analyses. There was no association between the three board control roles and product innovation, which is contrary to hypothesis 1. Third, our second hypothesis was that there is a positive association between board involvement in control and process innovation. To test this, we repeated the analyses with process innovation as the dependent variable. The relationships between behavioural control, output control and strategic control respectively and process innovation were, in line with hypothesis 2, positive and significant. Hence, we found evidence that board involvement in control positively affects process innovation, but not product innovation.

*** Insert Table 2 about here ***

Robustness tests

To test the robustness of our model, two additional analyses were performed. First, we repeated our regression analyses with a different measure of the three control roles, namely using the control task scales developed by Minichilli, Zattoni and Zona (2009). Behavioural control was measured as the mean of three items asking the CEO on a five-point Likert scale to what degree the board was involved in three tasks related to behavioural control ($\alpha = .76$). Output control was measured in the same manner using three items ($\alpha = .82$) and strategic control was measured using one item. Again, the associations between the control tasks and process innovation were positive and significant. No significant relationships were found

¹ We decided not to enter the three board control roles simultaneously in the regression analyses, because the three control tasks are highly correlated and this would lead to multicollinearity problems.

between the three control tasks and product innovation. So using two different scales of the same board control construct for our hypotheses testing, we found similar results, which is a strong indicator of the robustness of our results.

Second, as discussed above, several scholars (e.g., Zahra, 1996; Gabrielsson, 2007) explain the relationship between board control and innovation from an agency theory lens, arguing that board control is needed to mitigate the short-term oriented focus of CEOs. While this might be true for large corporations, we argued that this is not the right explanation for the relationships that we found in SMEs, where ownership and management are often not separated. CEOs who are also firm owners have enough incentive to focus on more long-term oriented goals like innovation. However, contrary to agency predictions, we argued that board control is still needed in firms that are owner-managed and thus that the relationships between board control and process innovation remain significant in these firms. To test this alternative agency theory explanation, we repeated our regression analyses with process innovation as the dependent variable for two mutually exclusive groups: the group of owner-managed firms and the group of outside-managed firms. We define an outside-manager as a CEO who is a paid employee with no equity in the firm and an owner-manager as a CEO who owns a certain percentage of the firm's equity (Ang, Cole, & Lin, 2000). Owner-managed firm as well as outside-managed firm were dummy variables (coded 0 or 1). Specifically, we tested the following regression model (for the three types of board control separately):

$$\text{Process innovation} = \alpha + \beta_1 (\text{owner-managed} \times \text{board control}) + \beta_2 (\text{outside-managed} \times \text{board control}) + \zeta X$$

where ζX is the vector of control variables. According to the agency theory explanation, only β_2 should be significant. According to our view of change and stability as a duality, β_1 and β_2 should be significant. We found that β_1 and β_2 were positive and significant. The relationships

between the control tasks and process innovation thus remain significant for the group of owner-managed firms, which is in support of our argument of change and stability as a duality and rules out the agency theory explanation.

Discussion and conclusion

The purpose of this study was to examine the role of the board of directors in stimulating product and process innovation in SMEs. The relationship between board governance and change initiatives has mostly been studied from an agency theory lens (e.g., Zahra, 1996; Gabrielsson, 2007). We however, believe that the agency logic applies less in SMEs, where ownership and management is largely combined and therefore developed new theoretical insights based on the viewpoint of change and stability as a duality (Farjoun, 2010). Recently there is growing an awareness in the change literature that innovation is not only supported by concepts like openness and creativity, but also by a considerable amount of control, as this provides needed focus, certainty and structure. Based on these ideas, we formulated two hypotheses, relating to the relationship between board involvement in control and product innovation and process innovation respectively. Statistical analysis on a sample of 150 Belgian firms yielded support for the hypothesis related to process innovation, but no support for the hypothesis related to product innovation. The board's involvement in behavioural control, output control and strategic control is positively related to a firm's emphasis on process innovation, but not related to a firm's emphasis on product innovation. This finding is in line with Gabrielsson and Politis (2009), who also found positive relationships between board control and process innovation, but no relationship with product innovation. This indicates that, although researchers often are inclined to study product and process innovation together, for example in the form of R&D strategy (e.g., Baysinger, et al., 1991), both are in fact supported by different mechanisms. While the board's involvement in

control enables process innovation, this is not the case for product innovation. A possible explanation for this finding is that product innovation requires more the collaboration with other stakeholders instead of the board of directors, like customers and technical specialists. Process innovation on the other hand is often a more large-scale and long-term project (Damanpour & Gopalakrishnan, 2001), which requires more supervision during the process.

We contribute to the literature in two ways. First, we developed new theory for explaining the relationship between board roles and innovation, beyond the traditional agency theory. We presented a theory based on the argument of change and stability as a duality (Farjoun, 2010), arguing that control enables innovation because it provides focus, certainty and a consistent frame wherein the innovation can take place. Second, we contribute to the empirical research on board governance. In line with Gabrielsson (2007) and Gabrielsson and Politis (2009), we found that actual board involvement in control facilitates innovation in SMEs. Contrary to these previous studies on board control and innovation, we thus moved beyond agency theory in explaining these relationship, presenting our new theoretical argument.

This paper also has important practical implications. As there often exists a large overlap between ownership and management in SMEs, the potential agency problem is less prevalent in these firms (Forbes & Milliken, 1999). Accordingly, the monitoring role is considered to be less important than other board roles such as the service role (Long, Dulewicz, & Gay 2005; Van den Heuvel, Van Gils, & Voordeckers, 2006). However, our results suggest that, rather than being a solution for agency problems, active board monitoring plays a significant role in stimulating process innovation in SMEs through the active monitoring of internal and external firm behaviour or of strategic decision-making. Therefore,

entrepreneurs should be aware that a controlling board may be a valuable resource when trying to walk the path of successful innovation because board control provides focus, certainty and structure.

Our study is not without limitations. First, because we used a cross-sectional design, we cannot infer causal relationships. Future (longitudinal) studies that measure different aspects of the innovation process (e.g., the different phases of the process or the outcomes of the innovation) could give more insight in this. Second, we relied on a single respondent, namely the CEO, which means that we measured the CEO's perception of board control and innovation. Other board members might have a different perspective on things which might also be valuable, as the study concerns board role performance, which is less objective than demographics like size and membership. Therefore in the future, it may be interesting to study multiple respondents in every firm.

In conclusion, our research highlighted that board involvement in control facilitates (process) innovation in SMEs and provided a new theoretical explanation based on the idea that stability and thus control is needed for innovation to make sure that new ideas can be effectively and efficiently implemented. The present study is therefore an important step in research on the relation between board roles and firm value creation.

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Appendix A: Factor analysis of innovation measures

	Product innovation	Process innovation
First in industry to introduce new products on market	0,81	0,28
Creating radically new products for sale in new markets	0,76	0,36
Creating radically new products for sale in firm's existing markets	0,88	0,23
Commercializing new products	0,85	0,16
Investing heavily in cutting edge product-oriented R&D	0,68	0,38
Investing heavily in cutting edge process technology-oriented R&D	0,49	0,6
Being first in industry to develop and introduce radically new technologies	0,28	0,86
Pioneering the creation of new process technologies	0,18	0,9
Eigenvalue	3,54	2,33
% Variance explained	44,31	29,14

Extraction method: Principal Component Analysis
Rotation method: Varimax with Kaiser Normalization

Appendix B: Control measures

Behavioural control

The board of directors is involved in the monitoring and adjusting of...

- Cost budgets
- Sales budgets
- Firm liquidity
- Investments
- The contribution and behaviour of the CEO
- The quality of the products
- Human resources
- Health, work environment and safety

Output control

The board of directors is involved in the monitoring and adjusting of...

- Affairs related to the environment and pollution
- Shareholder's profits
- Corporate social responsibility

Strategic control

- The board of directors actively makes long-term strategic decisions.
- The board of directors is active in monitoring/evaluating strategic decisions.

Table 1 Descriptives and correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Product innovation	0,00	1,00	1									
2. Process innovation	0,00	1,00	0,00	1								
3. Behavioural control	3,66	1,01	0,03	0,18**	1							
4. Output control	3,44	1,02	0,01	0,19**	0,83***	1						
5. Strategic control	3,69	1,13	0,11	0,23***	0,77***	0,66***	1					
6. Firm size	3,45	0,80	0,03	0,16*	-0,11	-0,01	0,05	1				
7. Firm age	36,49	28,08	-,08	0,08	0,1	0,1	0,17*	0,09	1			
8. High-tech	0,29	0,46	0,1	0,08	-0,18**	-0,19**	-0,13	0,12	-0,03	1		
9. CEO duality	0,62	0,49	0,01	0,07	0,1	0,06	-0,01	-0,28***	-0,03	0,14	1	
10. Board size	3,69	1,55	0,04	0,05	-0,03	0,00	0,06	0,28***	0,00	-0,04	-0,18**	1

*, **, *** significant at the 10%, 5% and 1% level, respectively

Table 2 Regression results

Variable	Product innovation	Process innovation	Product innovation	Process innovation	Product innovation	Process innovation	Product innovation	Process innovation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Control variables								
Firm size	-0,02	0,19*	-0,01	0,20*	-0,01	0,17	-0,01	,17*
Firm age	-0,12	0,1	-0,14	0,12	-0,12	0,07	-0,14	0,06
High-tech	0,12	0,08	0,14	0,09	0,14	0,12	0,14	0,11
CEO duality	-0,05	0,15	-0,06	0,16	-0,06	0,14	-0,06	0,16
Board size	0,06	0,03	0,08	0,02	0,07	0,02	0,06	0,02
Independent variables								
Behavioural control			0,08	,19*				
Output control					0,05	,21**		
Strategic control							0,13	,24**
F	0,8	1,58	0,79	2,17*	0,7	2,13*	0,95	2,41**
R ² adj.	-0,01	0,03	-0,01	0,06	-0,02	0,06	0	0,07

*, **, *** significant at the 10%, 5% and 1% level, respectively

The table reports standardized coefficients.