The Contribution of Board Experience to Opportunity Development in High-tech Ventures

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PREPRINT

This article has been peer-reviewed and accepted for publication in Small Business Economics. For the published version, please visit https://doi.org/10.1007/s11187-021-00460-1

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ABSTRACT

This study investigates the board of directors' contribution to opportunity development in high-tech ventures. Based on the dynamic managerial capabilities perspective, we argue that more experienced boards will contribute more to opportunity development. Furthermore, building on the attention-based view, we argue that this effect will be moderated by structural and situational factors that affect board members' attention to the venture's opportunity development process. Using hand-collected data on 179 high-tech ventures in Belgium, we find that board experience has a stronger relationship with the board's contribution to opportunity development when board size decreases, when board tenure increases and when the venture underperforms. These findings offer a contribution to the literature on opportunity development in new ventures and to research on the boards of directors' role in new ventures. They also have important implications for entrepreneurs who are trying to develop opportunities and their stakeholders.

Keywords: Opportunity Development, Board of Directors, High-tech Ventures, Dynamic Managerial Capabilities Perspective, Attention-Based View

1. INTRODUCTION

The development of entrepreneurial opportunities is at the heart of new venture creation (Shane and Venkataraman, 2000). Opportunity development entails both the sensing or identification of

opportunities and the seizing or exploitation of these opportunities (Choi, Lévesque, and Shepherd 2008; Davidsson, 2004; Shane & Venkataraman, 2000; Shane, 2003; Vogel 2017) and is especially relevant for high-tech ventures (HTVs). As they often operate in rapidly changing markets where existing capabilities quickly become obsolete, HTVs need to constantly explore and exploit new opportunities (Sirmon, Hitt and Ireland, 2007). Yet, many HTVs struggle to successfully develop new technologies, products, and markets (Andries, Debackere and Van Looy, 2013). This is partly because their founders' experience and knowledge limit the range of potential opportunities they identify (Gruber, MacMillan, and Thompson, 2013). Furthermore, given their newness and smallness, they often lack the necessary resources to successfully exploit the opportunities that they do identify (Knockaert, Bjornali and Erikson, 2015).

An emerging research field is looking at the role of ventures' interactions with external parties as a solution to this problem. In order to sense a larger set of potential opportunities, entrepreneurs may need to broaden their search scope to include new information (March, 1991) and interact and collaborate with external parties (Gruber et al., 2013; Maguire, Hardy and Lawrence, 2004). In addition, many studies highlight the importance of external actors (e.g. customers, investors or regulators) in providing entrepreneurs with the resources and legitimacy that are needed for opportunity seizing (Dimov, 2007, 2011; Hallen and Eisenhardt, 2012). Overall, it is generally accepted that HTVs need to involve external actors in the opportunity development process in order to obtain valuable information and feedback and acquire resources (Snihur, Reiche, and Quintane, 2017).

An external party that may be particularly relevant in this respect, but whose role for the opportunity development process of HTVs has remained understudied (see calls by Åberg et al., 2019; Filatotchev and Wright, 2005; Zahra, Filatotchev and Wright, 2009;), is the board of

directors (hereafter the board). The literature indicates that HTVs' boards typically engage in two types of roles: the monitoring and the service role (Knockaert et al., 2015; Zahra and Pearce, 1989). While the monitoring role focuses on evaluating the company and controlling the top management team (TMT) to protect shareholders' interest, the service role involves building legitimacy and networks as well as counseling and advising the TMT (Knockaert and Ucbasaran, 2013; Zahra and Pearce, 1989). Several studies on established firms suggest that during its engagement in the service role, an experienced board could be instrumental for thinking about new opportunities and exploiting them (Forbes and Millikin, 1999; Tuggle, Schnatterly, and Johnson, 2010a). In a sample of medium-sized and large publicly traded and private joint stock companies, Åberg and Torchia (2019) observe a positive relationship between the human capital of the board and the board members' cognitive capabilities, that underpin the process of sensing and seizing opportunities. Zahra et al. (2009), and more recently, Garg and Furr (2017) suggest that also in the specific context of ventures, boards may contribute substantially to opportunity development, but empirical evidence is missing.

In fact, research indicates that board members may not always mobilize their experience to the benefit of the firm (Diestre, Rajagopalan, and Dutta, 2015; Garg and Eisenhardt, 2017; Garg, Li and Shaw, 2019). Especially in ventures, board members face major time and attention constraints (Garg and Eisenhardt, 2017; Garg and Furr, 2017), which may be affected by board structure, characteristics of individual directors, and group dynamics of the board (Garg and Furr, 2017). Specifically, we still have a rather limited understanding of the factors that lead external actors, such as board members, to engage in opportunity development (Snihur et al., 2017). The current study therefore aims at improving our understanding of the role of the board for opportunity development in HTVs by investigating *whether and under which conditions the board's*

experience affects its contribution to HTVs' opportunity development.

We use a dynamic managerial capabilities perspective to argue that board members draw on their prior experience with firm and industry conditions to help HTVs in developing opportunities. In particular, we hypothesize that there is a positive relationship between board experience and the board's contribution to opportunity development. Building on the attention-based view of the firm, we then propose structural (i.e. board size and tenure) and situational (i.e. firm aggressiveness and performance) boundary conditions for this relationship. We use hand-collected, cross-sectional data on 179 HTVs in Belgium to test our conceptual framework.

Our research has a number of theoretical implications. First, we contribute to the entrepreneurship literature. Specifically, as we explore whether ventures can utilize and leverage the boards' experience in the opportunity development process, we answer the call in the opportunity literature to investigate external actors' impact in the development of entrepreneurial opportunities (Gruber et al., 2013; Dimov, 2007, 2011; Snihur et al., 2017). As such, our paper complements the work by Snihur and co-authors (2017), who conceptually explain how ventures can leverage external actors in the opportunity development process. As far as we know, our study is the first to measure the extent to and the conditions under which the board contributes to opportunity development in HTVs. Second, we contribute to the corporate governance literature. Specifically, we respond to a plea in this literature to investigate not only the monitoring and service role, but to also consider board roles that are more tailored to specific firm needs (Åberg et al., 2019) and to provide insights in board functioning in other contexts than large public firms (Garg, 2013; Garg and Furr, 2017; Johnson, Schnatterly and Hill, 2013). Furthermore, we make a theoretical contribution to corporate governance literature on venture boards, as we apply a multi-theoretical approach (see calls by Åberg et al., 2019; Garg and Furr, 2017) where we point to the attention-based view as an

important complement to the dynamic managerial capabilities perspective and leave the traditional theories such as agency and resource dependence (Åberg et al., 2019; Garg and Furr, 2017; Li et al., 2020). In particular, this multi-theoretical approach allows us to show that whereas the resources and capabilities of board members can potentially contribute to opportunity development in HTVs, their actual contribution is in fact contingent on structural and situational factors. As such, we move the focus from purely "who" is governing to "when" they do it (Garg and Furr, 2017; Li, Terjesen and Umans, 2020). Our results also have important managerial applications for entrepreneurs in pursuit of new opportunities and for the stakeholders that support them.

In what follows, we first present our theoretical framework, followed by our methodology. We then continue with the results and conclude with the discussion section, in which we advance limitations and directions for further research.

2. THEORY AND HYPOTHESES

Since Shane and Venkataraman's (2000) work, entrepreneurship research has focused on how opportunities are detected and acted upon (Davidsson, 2015; Davidsson and Honig, 2003). While there is much discussion on what opportunities are (Davidsson, 2015), many researchers contend that we could move the field forward by focusing on the opportunity development process (Garud and Giuliani, 2013; McMullen and Dimov, 2013). In this study, we focus on the board's contribution to opportunity development, a process which, according to the literature consists of two phases or aspects, namely (1) sensing or identifying opportunities and (2) seizing or exploiting these opportunities through the development of valuable business models (Choi, et al., 2008; Davidsson, 2004; Shane, 2003; Shane & Venkataraman, 2000; Vogel, 2017).

It is well accepted that founders' human capital, and in particular founders' experience, is

fundamental for the sensing (Corbett, 2007; Westhead, Ucbasaran and Wright, 2005) and seizing of opportunities (Davidsson and Honig, 2013; Shane and Khurana, 2003). At the same time, entrepreneurs' experience can also limit the range of potential opportunities they see, as it creates a knowledge corridor that prevents them from identifying and developing opportunities in other areas (Furr, Cavarretta, and Garg, 2012; Gruber et al., 2013). As a result, even experienced founding teams may need to complement their own knowledge with that of external actors (Gruber et al., 2013; March, 1991; Snihur et al., 2017). Studies have pointed to the role of different actors in the opportunity development process, such as customers, investors, regulators, and mentors (Dimov, 2007, 2011; Hallen and Eisenhardt, 2012; Ozgen and Baron, 2007).

In their 2009 study, Zahra and co-authors advanced the board as a crucial actor that can assist HTVs in this opportunity development process. Next to the monitoring and service role (Knockaert et al., 2015; Zahra and Pearce, 1989), they proposed a more entrepreneurial role where "boards guide and motivate managers to accumulate needed resources, effectively configure and bundle them, and leverage their use to create a competitive advantage […] building capabilities that allow the firm to explore and exploit opportunities" (Zahra et al., 2009: 249). They suggest that a board's experience can complement and expand that of the TMT (Zahra et al., 2009). Similarly, Garg and Furr (2017: p.339) highlighted that boards could play an important role in the opportunity development process, as they could correct the TMT when "struggling with potential cognitive traps that bias search" for opportunities. In what follows, we use the dynamic managerial capabilities perspective to develop hypotheses on the role of board experience for opportunity development in HTVs. Furthermore, we follow suggestions by Li et al. (2020) and identify contingency factors affecting this role using the attention-based view.

2.1. Board Experience and Contribution to Opportunity Development

The development of new opportunities is at the heart of the dynamic capabilities perspective (Teece, Pisano and Shuen, 1997). This perspective was introduced as an enhancement of the resource based view (Barney, 1991), as the latter was regarded as a rather static theory, unable to explain the competitive advantage of firms in rapidly changing environments (Eisenhardt and Martin, 2000). Teece and co-authors (1997: p.516) defined dynamic capabilities as "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments". Later on, Teece (2007) specified the sensing and seizing of opportunities and the reconfiguration of the firm's existing resource base as the core components of this ability.

Over the years, the dynamic capabilities perspective has been studied at the firm level (Teece, 2007; Teece et al., 1997). However, Adner and Helfat (2003) introduced the concept of dynamic managerial capabilities, introducing the role of managers and extending the dynamic capabilities perspective to the individual or team level (Augier and Teece, 2009; Helfat and Martin, 2014; Helfat and Peteraf, 2015). The authors further advanced managers' human capital as one of the core resources underlying dynamic managerial capabilities (Adner and Helfat, 2003; Helfat and Martin, 2014). Human capital, as conceptualized by Becker (1964), is defined as experience, expertise, knowledge, reputation and skills. This means that managers draw on their experience and expertise to develop opportunities and reconfigure the firm's resource base accordingly (Helfat and Martin, 2014). Castianas and Helfat's (2001) extend this view by reasoning that not only the members of the top management team, but also the members of the board have an important managerial role to play. In fact, Åberg and Shen (2020) and Åberg and Torchia (2019) observe, for a sample of medium- and large-sized firms, that the human capital of the board and its chairman are important drivers of dynamic managerial capabilities and strategic change.

As the boards of HTVs are expected to make decisions in rapidly changing environments with

major resource challenges (Garg, 2013; Garg and Furr, 2017), we argue that the dynamic managerial capabilities perspective is also extremely relevant in this context. In particular, board members' experience − one of the most important components of board members' human capital (Certo, 2003; Kor and Sundaramurthy, 2009; Tian et al., 2011) − can be expected to contribute to the development of opportunities by HTVs. Board members who have prior experience with firm or industry conditions will be better able to understand the current challenges (e.g. Åberg and Torchia, 2019; Åberg and Shen, 2020), and they will build on this experience to help the HTV in developing opportunities (Helfat and Martin, 2014; Åberg and Torchia, 2019). We therefore hypothesize the following:

Hypothesis 1: There is a positive relationship between board experience and the board's contribution to opportunity development.

2.2. Board Attention

Recent research indicates that, although board members may have relevant experience, they are not always motivated to use this experience to the firm's benefit (Diestre et al., 2015; Garg and Eisenhardt, 2017; Garg et al., 2019; Hillman et al., 2008). In fact, they have to allocate their attention to multiple tasks that underlie different roles (Garg and Eisenhardt, 2017). Garg and Furr (2017: p.337) highlighted that especially in venture boards, directors face major time and attention constraints, and that these attention constraints may "depend, inter alia, on board structure, characteristics of individual directors and social and group dynamics on the board". According to the attention-based view (ABV) of the firm, decision-makers cannot and will not pay equal attention to all the tasks they are expected to perform. Rediscovering the work of Simon (1947), the ABV defines firm behavior as "both a cognitive and a structural process, as decision making in organizations is the result of both the limited attentional capacity of humans and the structural

influences of organizations on an individual's attention" (Ocasio, 1997: 188). Explicitly linking individual information processing behavior with organizational structure, the ABV builds on three related premises. First, the premise of focused attention states that "what decision makers do depend on what issues and answers they focus their attention on" (Ocasio, 1997: 188). The second premise is that of situated attention, or the idea that "the issues and answers decision makers focus upon, and what they do, depend on their situation. Individual decision makers vary their focus of attention depending on the characteristics of the situation in which they find themselves" (Yu, Engleman and Van de Ven, 2005: 1505). Examples of situational factors assessed in corporate governance literature are firm performance (Tuggle, Sirmon, Reutzel and Bierman, 2010b) and environmental munificence (Titus and Anderson, 2016). Third, the particular situation decision makers find themselves in, and how they attend to it, depends on structural distribution of attention. In other words, decision makers' attention to selected issues and answers depends on which structures exists within the firm. Structural factors include the firm's rules, resources and social relationships (Ocasio, 1997), examples being top management team size (Knockaert et al., 2015) and operational structure (Titus and Anderson, 2016). In sum, building on the ABV, we argue that board members' experience will only strengthen the opportunity development process to the extent that they actually pay attention to this process, which is contingent on situational and structural factors. Particularly, we will advance board size and tenure as structural contingencies, and firm performance and aggressiveness as situational contingencies.

2.2.1. Structural factors.

The first structural factor we investigate is board size. In their review on venture boards, Garg and Furr (2017) highlighted board size as in important structural factor that needs further research. A recent review by Li and co-authors (2020) indicated that, although the board size in ventures tends

to be smaller than in established firms, board size does matter and its effects are different from those in large, established firms (Cowling, 2003; Eisenberg, et al., 1998; Gordon et al., 2012). While literature on large, established firms identified agency problems and increased problems of communication and coordination as board size increases (Eisenberg et al., 1998; Forbes and Milliken, 1999), agency problems are less likely in ventures, in which little separation of ownership and control exists (Eisenberg et al., 1998; Garg and Eisenhardt, 2017; Garg and Furr, 2017). However, group dynamics, communication and coordination problems are likely to also occur in smaller boards (Eisenberg et al. 1998; Garg and Furr, 2017).

We argue that board size, as a structural factor, will moderate the relationship between board experience and the board's contribution to opportunity development, as it will affect the attention board members pay to opportunity development. As boards become larger, they are more likely to experience coordination problems, and their decision-making effectiveness is likely to decrease (Forbes and Milliken, 1999). Given these coordination problems, board members will be less likely to focus their attention on the opportunity development process, as in such circumstances it is difficult for them to leverage their experience effectively (Forbes and Milliken, 1999). Moreover, directors in larger boards may feel less motivated to leverage their experience and focus on the opportunity development process, given the rather limited impact of their contribution and the possibility of "social loafing" ("a dysfunctional dynamic through which group members exert less effort when working in larger groups") (Zona, Zattoni and Minichilli, 2013: p.303). Following the potential coordination problems, the diminished motivation and the potential for social loafing, we argue that members in larger boards are less likely to focus their attention on opportunity development. We offer the following hypothesis:

Hypothesis 2a: Board size weakens the positive relationship between board experience and the board's contribution to opportunity development.

We advance board tenure as a second important structural factor that impacts board members' attention allocation towards opportunity development. As such, we follow Garg and Furr (2017) who refute that board participants are always fully prepared for their board roles, and who urge researchers to consider the role of learning for improving board effectiveness (Garg and Furr, 2017). Particularly, we introduce board tenure as an important structural factor that explains boards' learning, as they build up experience over time (Johnson et al., 2013). Building on the ABV, we expect that board tenure will strengthen the relationship between board experience and the board's contribution to opportunity development. This is because board tenure affects the socialization and familiarity with one another (Kor and Sundaramurthy, 2009), group cohesiveness and interaction (Forbes and Milliken, 1999), and the firm-specific human capital of the board members (Kor and Sundaramurthy, 2009; Vandenbroucke, Knockaert, and Ucbasaran, 2016). Particularly salient to these studies is the notion that, over time, board members become more aware of firm-specific needs. Understanding the venture better, allows board members to better interpret venture-related information and to direct their attention to make more valuable contributions (Vandenbroucke et al., 2016), amongst others to opportunity development. We propose that:

Hypothesis 2b: Board tenure strengthens the positive relationship between board experience and the board's contribution to opportunity development.

2.2.2. Situational factors

A first important situational element is firm performance (Tuggle et al., 2010b), and in particular, how actual firm performance relates to performance aspiration levels (Audia and Greve, 2006). In

line with Tuggle et al. (2010b), who however conducted their study in the context of large, established firms, we expect that firms' underperformance relative to aspirations will operate as a master switch (Greve, 2003). When performance is low, firms start searching for new opportunities (cfr. Angus, 2019; and Cyert and March, 1963, and March and Simon, 1958, on 'problemistic search'), as the development of new opportunities is considered one of the most prominent avenues for restoring firm performance (Burgelman, 2005; Cyert and March, 1963; March and Simon, 1958). It can be expected that such underperformance will not only trigger the attention of the firm's managers/founders, but also that of its board members. This is because firm underperformance may have both negative reputational and financial consequences for board members (Fama and Jensen, 1983; Srinivasan, and Richardson, 2005), which they will be wanting to undo. We contend that this may even be more the case in ventures than in large established firms, as ventures' board members tend to have higher ownership alignment and stronger financial incentives (Eisenberg et al., 1998; Garg and Furr, 2017), which implies that they will be even more motivated to help restoring firm performance. So, we expect that, as board members of ventures are mostly busy people and have to choose which activities to allocate their attention and time to (Garg and Furr, 2017), they are more likely to allocate their attention to opportunity development in situations of firm underperformance.. Therefore, we hypothesize that:

Hypothesis 3a: Firm underperformance strengthens the positive relationship between board experience and the board's contribution to opportunity development.

By contrast, if the venture is already taking the necessary actions to develop entrepreneurial opportunities, board members may feel that their contribution to opportunity development is less needed and may therefore direct their attention away from the opportunity development process. Based on competitive dynamics research, Chen, Lin and Michel (2010: 1413) defined action

aggressiveness or firm aggressiveness as "a firm's tendency to initiate actions and the firm's agility in doing so". A firm has high levels of aggressiveness if it can more rapidly take a large number of actions than its competitors. We argue that, when the firm is more aggressive, it is more likely to take appropriate actions for opportunity development. Indeed, as already indicated by Schumpeter (1950), a firm is more likely to develop business opportunities and secure its first mover advantage if it acts frequently and speedily in the marketplace. We argue that, in the situation of high firm aggressiveness, board members will to a lesser extent attend to the opportunity development process, as the venture is already performing well in terms of opportunity development. This is because board members are mainly motivated to exert influence on the firm's actions when needed (Boivie, Graffin and Pollock, 2012; Knockaert et al, 2015; Withers, Hillman and Cannella, 2012). Indeed, the ability to have influence has been shown to be one of the intrinsic motivating factors for serving on a board, as it enhances the board member's sense of competence (Boivie, Graffin and Pollock, 2012). As a result, we expect board members' attention to be diverted away from opportunity development when firm aggressiveness is high. Consequently, we hypothesize:

Hypothesis 3b: Firm aggressiveness weakens the positive relationship between board experience and the board's contribution to opportunity development.

Figure A graphically presents our hypotheses.

3. DATA AND METHODS

3.1. Sample

Our study is based on a hand-collected dataset of independent HTVs in Belgium. Belgium is an export-driven economy, with relatively high R&D intensity, some venture capital funds that invest

in HTVs, a predominantly controlled ownership structure and a significant presence of small (both private and public) firms (Allen and Overy, 2012; Knockaert and Ucbasaran, 2013). The structure of Belgian boards is based on a one-tier model, in which both executive and non-executive board members form the board. The two-tier model, in which there is an executive board and a supervisory board, is rarely preferred. The country context hence provides us with a sample that is relatively homogeneous in terms of corporate governance.

We use pooled cross-sectional data. More specifically, we collected our data in two survey waves, one in 2016 and one in 2018, based on the same selection criteria. Specifically, we selected ventures that were maximum 10 years old and operated in high-tech sectors, based on their official industry codes (Burgel, Fier and Licht, 2004). Furthermore, only independent ventures, having no single external shareholder holding a majority stake, were selected. After consulting the official public database Bel-First, we identified 896 active HTVs that fit the above criteria for the first wave and 820 for the second wave. Ventures that responded to the first wave, were not included in the sample for the second wave. We contacted the companies by telephone, asking the CEOs to cooperate in an online survey and requesting their e-mail address. The online surveys were launched in February 2016 and 2018 respectively.

In line with the majority of studies on venture boards (Li et al., 2020) we relied on survey data, as these allow to capture actual board behavior (Åberg and Torchia, 2019). In line with other studies on venture boards (e.g. Knockaert et al, 2015; Zahra, Neubaum and Huse, 2000), we target the CEO as respondent. As Forbes, Korsgaard and Sapienza (2009) explain, CEOs have extensive, first-hand knowledge about the behavior of their venture's board (members) and are able to answer specific questions regarding their recent behaviors. This mitigates the risk that their view of board processes differ systematically from the view of the board members themselves.

After two rounds of reminders via email and two rounds of telephone calls to the CEOs, 255 HTVs filled in the survey, implying a 14.9% response rate. Due to missing responses for some core variables, the final dataset was reduced to 179 ventures. Of these 179 ventures, 88 had installed a board.

3.2. Measures

3.2.1. Dependent variable

We constructed a scale to measure the board's *Contribution to opportunity development*. We build on case studies by Mezger (2014), who identified four different activities underlying opportunity sensing and seizing, namely (1) translating technological possibilities to new business model ideas, (2) recognizing alternative business model configurations at competitors and across industry boundaries, (3) focusing our innovation activities on the entire business model configuration, and (4) systematically advancing business models through (re)combination of technology, market, and business model knowledge. For each of these four activities, we asked respondents to indicate on a scale from 1 (to a low degree) to 7 (to a high degree) whether the board engaged in them. We thereby followed the operationalization of similar scales on board contribution in the venture boards literature (e.g. Knockaert and Ucbasaran, 2013).

We conducted both an exploratory and confirmatory factor analysis to assess the measurement model's fit. The exploratory factor analysis revealed that the four items load on a single factor. Next, we proceeded to a confirmatory factor analysis. The confirmatory factor model showed an excellent fit (RMSEA=0.000, CFI=1.000, TLI=1.028, Chi-square=0.370 with $p>0.100$ and df=2). Therefore, the scores on the four items were averaged to construct the board's *Contribution to opportunity development* ($\alpha = 0.87$, Mean=3.96).

We further investigated the internal consistency and construct validity of the scale. Our analyses, which can be consulted in online supplementary materials to this paper, indicate that the dependent variable is well captured by the underlying items, is distinct from other constructs such as service role involvement, and that the scale is therefore highly reliable.

3.2.2. Independent and moderator variables

Our independent variable is *Board experience*. Based on Cantner, Goethner and Stuetzer (2010) we asked respondents to indicate on a seven-point Likert scale ranging from 1 (to a low degree) to 7 (to a high degree) whether their board members have experience in the following domains: (1) management, (2) marketing, sales and promotion, (3) accounting, controlling and financing, (4) engineering and R&D, (5) production and (6) personnel. A confirmatory factor analysis with all items loading on one latent variable showed that the factor loadings of two items, namely (4) engineering and R&D and (5) production, did not meet the minimum .5 threshold (Hair et al., 2010). Therefore, we removed these two items from our analyses and averaged the scores of the remaining four items ($\alpha = 0.76$, Mean = 5.50).

Board size. Respondents were asked how many members the board has (Mean= 4.89).

Board tenure. Similar to Vandenbroucke et al. (2016), we define board tenure as the total number of years that all members have been on the board. For example, when three members sit in the board, their total board tenure after the first year is three, after the second year six, etc. (Mean =17.56).

Firm underperformance. Based on Fredriksen and Klofsten (1999) we asked the CEO to compare the current firm size, both in terms of sales and full time equivalents (FTEs), to what was foreseen in the initial business plan. Responses were recorded using a seven-point Likert scale, ranging

from 1 to 7 (the initial business plan had foreseen a much lower level to a much higher level of sales/FTEs respectively). The scores on these two items were averaged. (α = 0.73, Mean = 3.98).

Firm aggressiveness. Following Chen et al. (2010) we measured aggressiveness as (a) the relative number and (b) speed of actions a firm takes, in comparison to the firm's direct competitors, on following types of competitive moves: (1) market expansion, (2) new product introduction and (3) new service offering. In line with Chen et al. (2010), this resulted in a six-item, seven-point Likert scale ranging from 1 (far fewer or far slower than direct competitors) to 7 (far more or far faster than direct competitors). However, the initial confirmatory factor model with one latent variable showed substantial misspecification. Investigation of modification indices suggested to remove item 4 and 5, relating to the speed of new product introduction and new service offering. The scores of the remaining four items were averaged (α = 0.79, Mean = 4.60).

3.2.3. Control variables

In addition to our hypothesized predictors, other variables are likely to affect the board's contribution to opportunity development. First, we control for the *Percentage of shares held by outsiders.* Outsiders are defined as directors who are neither members of the TMT nor relatives of the team members (Zahra, Neubaum and Naldi, 2007). As their financial interests may affect their motivations and subsequent attention to, amongst others, opportunity identification, we control for the percentage of shares held by outside members. The average share held by outsiders is 28.39%. Next, we control for *CEO Growth intention*, as CEO preferences can affect board effectiveness (Gabrielsson, 2007; Fiegener, 2005; Ranft and O'Neill, 2001). Following Knockaert et al. (2015b), we measured this growth intention as the average of a two-item seven-point lickert scale (α = 0.78, Mean=4.58), considering growth in sales and employees. Furthermore, we also included the top

management team's experience *(TMT experience)*, as this experience may affect board's engagement in the opportunity development process, in line with findings related to other board roles (e.g. Knockaert and Ucbasaran, 2013). TMT experience was assessed in the same manner as *Board experience*. In line with this variable and based on a confirmatory analysis, items 4 and 5 were also removed and the remaining items were averaged (α = 0.80, Mean = 4.86). In line with Knockaert et al. (2015), we further include a dummy variable capturing whether or not the company raised *External equity financing*, such as venture capital, business angel funding, etc. Two thirds of the ventures in our sample who have a board, had obtained external financing. In line with Vandenbroucke et al. (2016) we also control for *Firm age* (Mean=5.01) and *Firm industry*. We included a categorical variable, indicating whether the venture is part of (1) manufacturing, wholesale/retail, or construction sector (serving as the reference category), (2) software sector, (3) ICT services and (4) other services. Lastly, we included the variable *Identifier* (wave1/wave2=value of 0/1). Descriptive statistics of the subsample, namely 88 ventures who have a board, are presented in Table 1. The means described above are also calculated for this subsample.

3.3. Common Method Variance

Common method variance can be a concern whenever a cross-sectional design with self-report measures by a single respondent is applied. Therefore, we took into account several techniques both before and after the data collection to reduce concerns about common method bias. Before the data collection, we assured confidentiality (Podsakoff, et al., 2003) and pretested the items for their unambiguity with 27 'intelligent non-experts' (Tourangeau, Rips, and Rasinski, 2000). After the data collection, we conducted a Harman post-hoc one-factor test (Podsakoff et al., 2003) to confirm that a single factor does not account for all of the variance in the data. Three factors with

eigenvalues greater than one emerged, with the first factor explaining only 44.27% of the variance. Furthermore, following Stevens, Moray and Bruneel (2015) we conducted a confirmatory factor analysis as a more sophisticated version of the Harman post-hoc one-factor test. The model in which all variables were allowed to load on a single factor presented poor fit (RMSEA=0.186, CFI=0.384, TLI=0.289, Chi-square=419.44 with $p<0.000$ and df=104). The results of these tests allowed us to conclude common method bias is not a major problem in our data.

3.4. Statistical Method and Model Specification

Since our sample consists of ventures with and without a board, deleting the ventures without a board would likely result in selection bias. Therefore, we use Heckman's selection model (Heckman, 1979). In the first stage, the selection equation stage, a probit regression is used to estimate the likelihood of having a *Board*. Similar to other selection models applied in board research (Knockaert and Ucbasaran, 2013), we regress the dummy variable on, amongst others, industry dummies, as can be seen in Table 2. Whether selection effects actually are an issue in our models, is reflected in the Wald chi square statistics in Table 3. Based upon the results of the first-stage regression, we calculate the inverse Mill's ratio (λ_i) for each observation and include this in the regression of the second stage. This allows us to model the *Contribution to opportunity development* conditionally on having a *Board*. The F-statistics in Table 3 provide an indication of model fit for this second stage regression including the Mill's ratio. The control variables in the second stage regression are identical to the ones from the first stage, apart from the variables *Legal form* and *Firm size*. These variables are our exclusion restriction variables. Legal form is used as, in Belgium, only the limited liability companies (value of 1 and 0 otherwise) are legally required to have a board. Next, we expect that firm size, measured as the natural log of the number of full

time equivalents, will impact whether an organization has a board or not, but not whether the board contributes to the opportunity development process (Vandenbroucke et al., 2017).

4. RESULTS

4.1. Main Results

In Table 1 we provide the descriptive statistics of the subsample, namely 88 ventures who have a board. The correlations of the independent variables are all below 0.55. Variance inflation factors ranged from 1.37 to 2.24, suggesting multicollinearity is not an issue.

-- Insert Table 1 about here –

The results of the selection model (step 1) are presented in Table 2. In line with studies in corporate governance (e.g. Vandenbroucke et al., 2017), Table 2 reveals that larger ventures (in terms of employees), limited liability companies, as well as ventures with external equity financing and of which the CEO exhibits stronger growth intentions are more likely to have a board.

-- Insert Table 2 about here –

Table 3 represents the results of the regression model. In Model 0 we only include the control variables. In Model 1, we add the independent variable to investigate the direct effect of board experience. In Model 2, we add the structural factors to investigate their interaction effects, while in Model 3 we only add the situational factors. Finally, all interaction terms are added in in Model 4. To calculate these interaction terms, we used mean centered observations of the independent and moderator variables; a standard practice in multiple regression analysis (Kutner et al., 2005). Adding the direct effect (Model 1) to Model 0 improves the model. In Model 1, we find a

statistically significant positive relation between *Board experience* and *Contribution to opportunity development* (B=0.282, p<.05). We hence find **support for Hypothesis 1**.

Finally, Model 4 presents the full model including all interaction terms. We find that both structural elements significantly moderate the relationship between *Board experience* and *Contribution to opportunity development*. *Board size* negatively moderates this relationship (B=-0.182, p<.01), **supporting Hypothesis 2a**. *Board tenure* positively moderates the relationship (B=0.023, p<.10), **supporting Hypothesis 2b**. As for situational factors, we find a significant, positive moderating effect of *Firm underperformance* (B=0.176, p<.10), but no significant moderating effect of *Firm aggressiveness*. As such, our findings **support Hypothesis 3a**, but **do not support Hypothesis 3b**.

-- Insert Table 3 about here –

4.2. Robustness check: marginal effects

Although the interaction effects are statistically significant for *Board size*, *Board tenure* and *Firm underperformance*, we perform a marginal effect analysis of these moderator variables on the relationship between *Board experience* and *Contribution to opportunity development.* This is needed to correctly interpret our findings for hypotheses H2a, H2b and H3a, as the interaction terms' estimated coefficients do not equal the true interaction effects in nonlinear relationships (Hoetker, 2007; Zelner, 2009). Moreover, the marginal effect analysis reveals for what values of the moderating variables the interaction is truly significant (Brambor, Clark and Golder, 2006). The negative coefficient for the interaction between *Board experience* and *Board size* suggests that the leveraging of the board's experience in the opportunity development process weakens when *Board size* increases. Plotting the interaction effect in Figure 2 with a range of values between +/- 1 standard deviation of *Board experience* and *Board size* confirms this hypothesis.

Calculating the average marginal effect of *Board experience* on *Contribution to opportunity development* across different board sizes further verifies our hypothesis. Particularly, in Figure 3, significant interaction effects fall in any area where the upper and lower bounds of the confidence interval band (90% CIs) are above (or below) the zero line.

-- Insert Figure 2 and 3 about here –

Further, we found initial support for Hypothesis 2b, in the sense that we found a positive significant interaction effect of *Board experience* and *Board tenure* on our dependent variable. In Figure 4, we again plot this interaction effect. The figure corroborates our support for H2b. Figure 5 plots the average marginal effect and shows a positive interaction effect when the level of *Board tenure* passes a value just below the mean. Hence, a minimum level of *Board tenure* is needed in order to strengthen the relationship between *Board experience* and *Contribution to opportunity development*.

-- Insert Figure 4 and 5 about here –

Finally, Figure 6 plots the interaction effect of *Board experience* and *Firm underperformance* (also mean-centered; see above) on *Contribution to opportunity development*. Again the hypothesis is confirmed in the sense that higher levels of *Firm underperformance* lead to a more positive relationship between *Board experience* and our dependent variable. Calculating the average marginal effect further supports Hypothesis 3a, as we observe a positive marginal effect. Figure 7 clearly indicates that this effect is significant once *Firm underperformance* reaches a level just below the mean. This means that a minimum level of *Firm underperformance* is needed in order for the board to leverage their experience and contribute to opportunity development.

-- Insert Figure 6 and 7 about here –

5. DISCUSSIONS AND IMPLICATIONS

The goal of our study was to better understand the board's contribution in the opportunity development process. Our first question was whether boards leverage their experience into the opportunity development process. Secondly, we researched under which contingencies they are more or less motivated to do so. Our findings reveal that HTVs can indeed benefit from the board's experience in the opportunity development process. However, they also suggest that this will particularly be the case if certain structural and situation factors influence board members' attention towards this process. Concerning the structural factors, we found that board experience has a stronger impact on the contribution to opportunity development when boards are smaller and board tenure increases. Regarding the situational factors, we conclude that boards are more likely to leverage their experience into the opportunity development process when the venture underperforms.

Our research has a number of theoretical and practical implications. First, it contributes to the entrepreneurship literature which has called for the investigation of external actors' impact in the opportunity development process (Dimov, 2007, 2011; Gruber et al., 2013; Snihur et al., 2017). While these studies have suggested that external actors can play a role in the opportunity development process, our study specifically points to the contribution of the board as one of these external actors, as well as the factors that lead to its engagement in developing opportunities (see the call by Snihur et al., 2017). In particular, boards can potentially be used as alternative information sources to help mitigating the uncertainty surrounding HTVs and the complexity of the opportunity development process. But we also show that the HTV's ability to actually leverage the board's experience in the opportunity development process is limited by situational and

structural factors, an issue that has been largely overlooked in the conceptual literature on this topic. Our findings imply that future studies of the opportunity development, and literature on ventures in general, should move beyond the dominant focus on founders' human capital, and take a much broader view that includes the input of external actors. The board members clearly form an important knowledge source in this respect. When engaging in this endeavour, future studies should consider presenting a nuanced view on the role of external actors, taking into account structural and situational characteristics that enable or hinder them to make an actual contribution. Second, our research is relevant to the corporate governance literature which has called for leaving the beaten paths of the monitoring and service role, and for considering roles which are more tailored to the specific needs of the firms under investigation (Åberg et al., 2019), especially in other contexts than large public firms (Garg, 2013; Garg and Furr, 2017; Johnson et al., 2013). More specifically, we demonstrate the relevance of the board's opportunity development role for HTVs. Furthermore, as research on venture boards has acknowledged that, although experience might be available, board members are not always motivated to use it to the benefits of the venture (Diestre et al., 2015; Garg and Eisenhardt, 2017; Garg et al., 2019), we point out under which contingencies the board's experience actually contributes to the opportunity development process. By doing so, we answer the call in the venture board literature to explore the constraints ventures face when leveraging board experience as a valuable strategic resource (Diestre et al., 2015; Garg and Furr, 2017) and move the focus from purely "who" is governing to "when" they do it (Garg and Furr, 2017; Li et al., 2020). Finally, we make a theoretical contribution in the field of venture boards, as we are the first to integrate the dynamic managerial capabilities perspective with the attention-based view, as such pointing to their complementarity in understanding board functioning. While the dynamic managerial capabilities perspective allows us to understand the

contribution that experienced boards can *potentially* make to HTVs' opportunity development, the attention-based view improves our understanding of the precise conditions under which board members will *actually* leverage their experience to the benefit of the venture. Our approach answers the call to apply a multi-theoretical approach by combining out-of-the-box theories and leaving the traditional theories like agency and resource dependence (Åberg et al., 2019; Garg and Furr, 2017). Furthermore, our study is the first to apply this set of theories to a novel context, namely that of opportunity development in HTVs. As such, we test the boundaries of existing theories by applying these to novel contexts, which is a theoretical contribution in itself (Zahra and Newey, 2009). We hope our research will motivate researchers to further use the combination of the dynamic capabilities perspective and the attention-based view in order to understand board processes.

Our results also have important managerial applications. While it is generally accepted that TMT experience is fundamental in developing opportunities (e.g. Davidsson and Honig, 2013), HTVs need to be aware that their own experience could also hinder them in the range of opportunities they see. We explicate that bringing in board's experience could be a fruitful way of getting new information and a broader perspective. Specifically, our research explains how ventures could direct the board's attention toward the opportunity development process. This is particularly the case when boards are smaller and have a longer tenure. Furthermore, experienced boards could especially contribute to opportunity development when the venture underperforms.

Our study also has some limitations which lead to future research directions. First, it is cross-sectional in nature. Future research could embrace a longitudinal design to understand how the boards' contribution to the opportunity development process changes over time. Second, although our theoretical model is built on the notion that structural and situational factors influence the

attentional focus of the board, we do not directly measure attentional focus. Although our approach is in line with prior research in the attention based view (Titus and Anderson, 2018; Tuggle et al., 2010b), we agree with Titus and Anderson (2018) that measuring decision makers' attentional focus could be a fruitful opportunity for future research. Third, other factors could directly or indirectly affect the board's contribution to opportunity development. Specifically, we point to diversity as variety and diversity as separation (Harrison and Klein, 2007) as potentially interesting factors. Whereas the first would study the impact of a multiplicity of perspectives and experiences, the latter would investigate the impact of hypothetical dividing lines, or faultlines, in board functioning (Lau and Murnighan, 1998; Van Peteghem et al., 2018). Finally, while we consciously focused on a particular external actor, the board as a monolith, future research could study the impact of different board compositions and the relationships between certain types of directors (see calls by Garg and Furr, 2017; Li et al., 2020) and the impact of other external actors, such as intermediaries (e.g. incubators and science parks) on the opportunity development process.

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Table 1: Summary Statistics and Correlation Matrix (n=88)

		Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Contribution to opportunity development	3.963	1.329	1	7	1															
2	Board experience	5.502	1.056	1	7	0.173	1														
3	Board size	4.886	2.053	2	12	-0.187	0.059	1													
4	Board tenure	17.557	14.032	1	66	-0.008	-0.021	0.351***	1												
5	Firm underperformance	3.983	1.435	1	7	0.098	0.281**	0.033	0.102	1											
6	Firm aggressiveness	4.597	1.231	1	7	0.177	0.379***	-0.041	-0.219*	0.211	1										
7	Percentage of shares held by outsiders (ln)	28.398	33.265	0	100	-0.191	0.178	0.379***	-0.016	-0.195	-0.094	1									
8	CEO Growth intention	4.580	1.683	1	7	0.049	0.204	-0.004	-0.278**	-0.126	0.158	0.126	1								
9	TMT experience	4.858	1.135	1	7	0.104	0.415***	0.107	0.076	0.095	0.231*	0.068	0.147	1							
10	External equity financing	0.659	0.477	0	1	-0.265*	0.242*	0.371***	0.044	0.008	0.037	0.493***	0.077	0.122	1						
11	Firm age	5.011	3.034	1	12	-0.106	-0.000	-0.081	0.428***	0.144	-0.089	0.032	-0.243*	-0.138	0.098	1					
12	Manufact/wholesale/retail/construct.	0.216	0.414	0	1	0.046	0.032	-0.106	-0.053	0.151	0.026	-0.066	-0.083	-0.185	0.086	0.053	1				

13	Software	0.239	0.429	0	1	-0.151	-0.065	-0.047	-0.223*	-0.115	-0.104	0.082	0.252*	0.130	0.178	-0.117	-0.294**	1	
14	ICT services	0.261	0.442	0	1	0.124	0.017	-0.119	0.119	-0.007	0.133	-0.182	-0.021	-0.028	-0.282**	0.161	-0.312**	-0.333**	1
15	Other services	0.284	0.454	0	1	-0.021	0.016	0.257*	0.143	-0.037	-0.055	0.159	-0.143	0.074	0.028	-0.094	-0.331**	-0.353***	-0.375***
16	Identifier	0.443	0.450	0	1	0.038	-0.008	0.016	-0.350***	0.067	-0.014	-0.038	0.163	0.153	-0.034	-0.542***	-0.190	0.145	0.094

*p<.05; **p<.01, ***p<.001; n=88

Table 2: Results of the Heckman two-step selection model: selection model (step 1)

Selection equation	
Board (0/1)	**Unstandardized coefficients**
CEO Growth intention	0.136* (0.073)
TMT experience	-0.044 (0.103)
External equity financing	0.893*** (0.280)
Firm age	0.013 (0.047)
Software	0.125 (0.369)
ICT services	0.443 (0.335)
Other services	0.450 (0.346)
Identifier	0.289 (0.292)
Legal form	1.110*** (0.280)
Firm size (ln)	0.398*** (0.131)
Constant	-2.348*** (0.637)

Standard errors in brackets, *p<.10; **p<.05; ***p<.01; n=179

Table 3: Results of the Heckman two-step selection model: regression model (step 2)

Contribution to Opportunity Development	Model 0	Model 1	Model 2	Model 3	Model 4
Board experience (H1)		0.282** (0.144)	0.332** (0.142)	0.319** (0.162)	0.359** (0.157)
Board size			-0.139* (0.080)		-0.141* (0.079)
Board tenure			0.009 (0.012)		0.012 (0.012)
Firm underperformance				0.011 (0.102)	-0.009 (0.099)
Firm aggressiveness				0.108 (0.119)	0.149 (0.118)
Board experience * Board size (H2a)			-0.177*** (0.068)		-0.182***(0.067)
Board experience * Board tenure (H2b)			0.024** (0.013)		0.023* (0.012)
Board experience * Firm underperformance (H3a)				0.186* (0.095)	0.176* (0.090)
Board experience * Firm aggressiveness (H3b)				-0.151 (0.104)	-0.137 (0.099)
Percentage of shares held by outsiders (ln)	-0.055 (0.081)	-0.066 (0.080)	-0.029 (0.080)	-0.063 (0.081)	-0.024 (0.082)
CEO Growth intention	0.093 (0.097)	0.072 (0.096)	0.095 (0.096)	0.053 (0.096)	0.078 (0.094)
TMT experience	0.204 (0.128)	0.106 (0.136)	0.085 (0.136)	0.053 (0.135)	0.026 (0.136)
External equity financing	-0.365 (0.444)	-0.412 (0.438)	-0.286 (0.440)	-0.450 (0.433)	-0.350 (0.436)
Firm age	-0.029 (0.057)	-0.028 (0.057)	-0.014 (0.061)	-0.011 (0.058)	0.006 (0.062)
Software	-0.568 (0.415)	-0.407 (0.418)	-0.325 (0.407)	-0.070 (0.438)	-0.006 (0.424)
ICT services	-0.025 (0.419)	-0.004 (0.412)	0.007 (0.413)	0.058 (0.413)	0.014 (0.415)
Other services	-0.193 (0.401)	-0.116 (0.397)	-0.043 (0.396)	0.095 (0.401)	0.135 (0.398)
Identifier	-0.064 (0.333)	-0.030 (0.329)	0.225 (0.345)	-0.002 (0.333)	0.309 (0.355)
constant	3.104** (1.206)	3.590*** (1.211)	3.142** (1.234)	3.667*** (1.192)	3.242***(1.206)
Number of observations	179	179	179	179	179
Number of censored observations	91	91	91	91	91
Number of uncensored observations	88	88	88	88	88
Mills ratio	0.375	0.483	0.694	0.499	0.702
Wald chi square	9.82	13.97	24.83**	19.48	31.69**
F statistic	2.31	3.91**	2.93***	2.58**	2.63***

Standard errors in brackets, *p<.10; **p<.05; ***p<.01; n=88

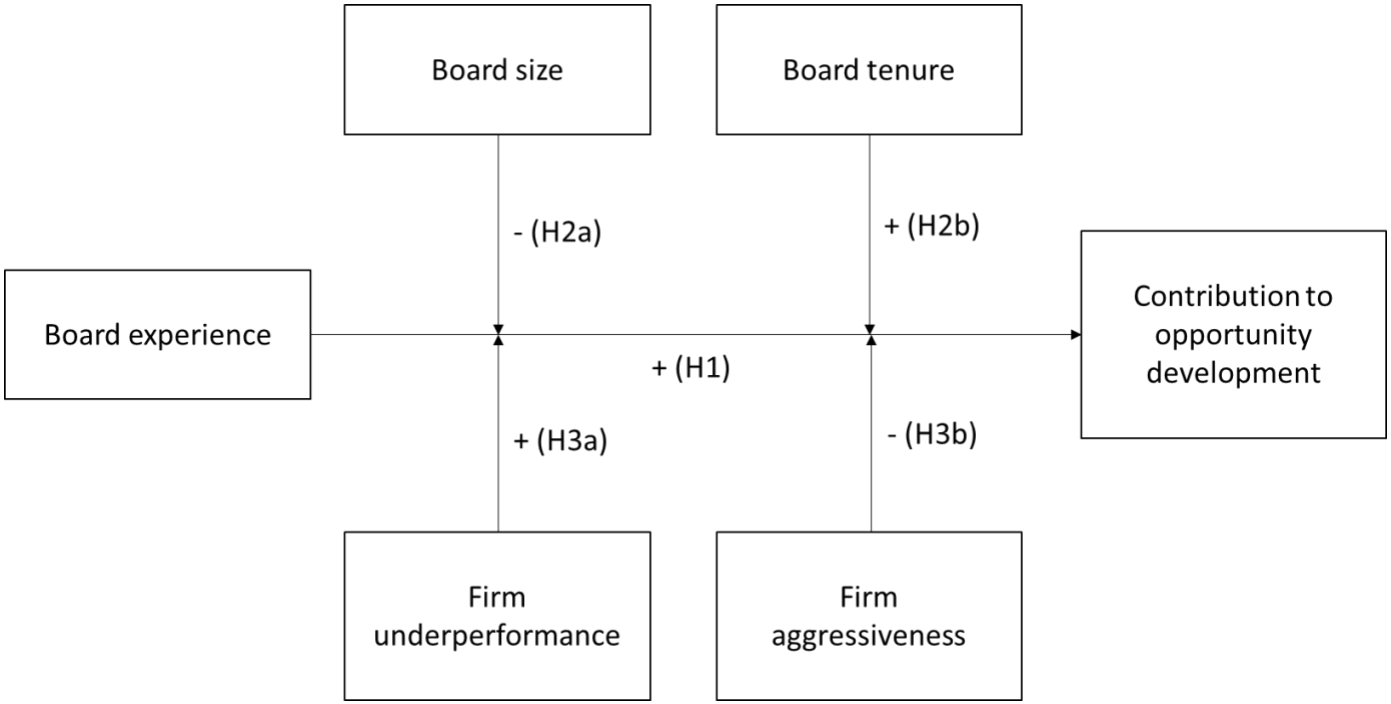

Figure 1: Conceptual framework

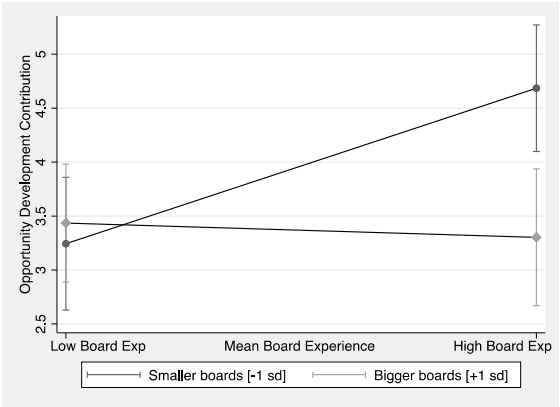

Figure 2: Interaction of Board Experience and Board Size on Contribution to Opportunity Development (90% CIs)

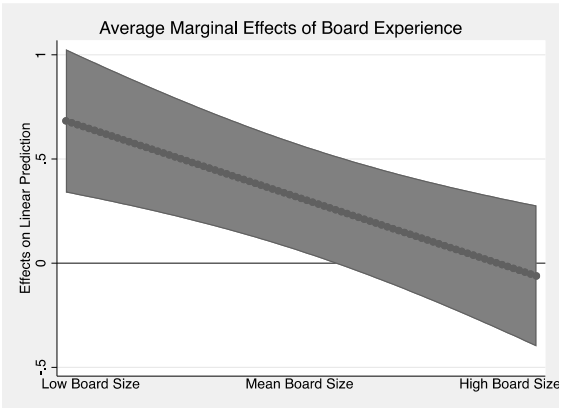

Figure 3: Average Marginal Effect of Board Experience on Contribution to Opportunity Development Across Different Levels of Board Size

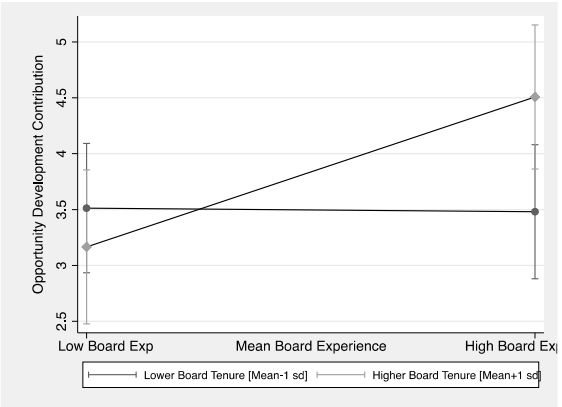

Figure 4: Interaction of Board Experience and Board Tenure on Contribution to Opportunity Development (90% CIs)

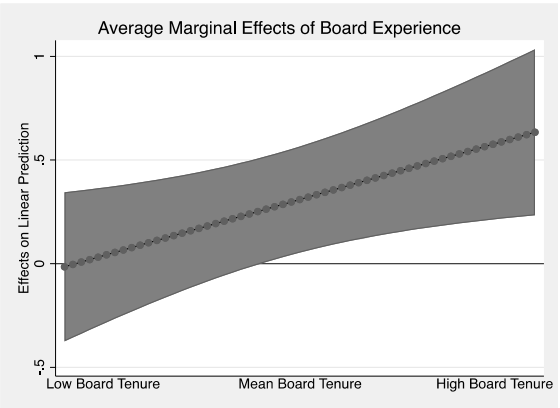

Figure 5: Average Marginal Effect of Board Experience on Contribution to Opportunity Development Across Different Levels of Board Tenure

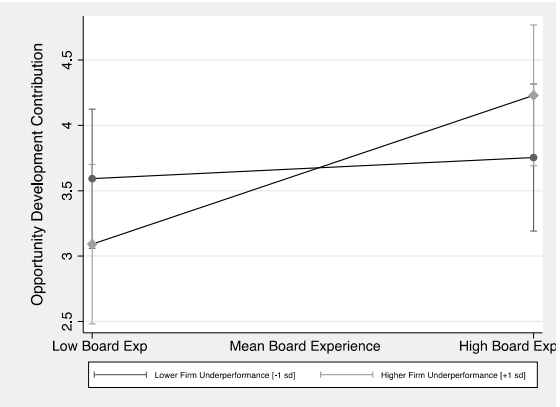

Figure 6: Interaction of Board Experience and Firm Underperformance on Contribution to Opportunity Development (90% CIs)

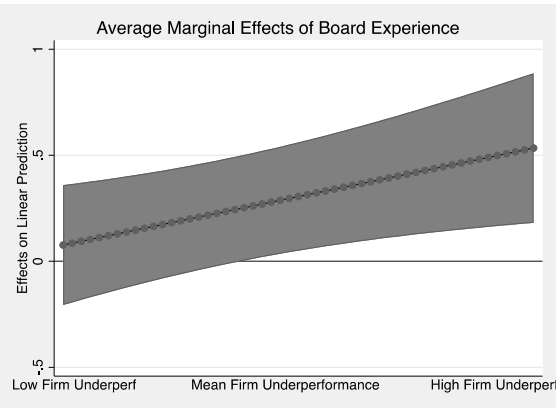

Figure 7: Average Marginal Effect of Board Experience on Contribution to Opportunity Development Across Different Levels of Firm Underperformanc