Abstract

In this study, we examine the effect of corporate venturing portfolio strategies on different types of firm performance. We analyze how portfolio diversity, venture autonomy and venture relatedness mediate the relationship between the extent to which firms engage in corporate venturing and firm performance, and show how these effects differ in terms of financial and innovation performance. We employ meta-analytic techniques on a sample of 47 primary studies in the field of corporate venturing, in order to synthesize and extend this growing body of literature. Our study advances understanding of the mechanisms by which portfolio strategies shape incumbent firm outcomes related to the extent of corporate venturing, and the strategies that firms may use to improve financial or innovation performance.
THE EXTENT OF CORPORATE VENTURING AND FIRM PERFORMANCE: THE MEDIATING ROLE OF PORTFOLIO STRATEGIES

In this study, we examine the effect of corporate venturing portfolio strategies on different types of firm performance. We analyze how portfolio diversity, venture autonomy and venture relatedness mediate the relationship between the extent to which firms engage in corporate venturing and firm performance, and show how these effects differ in terms of financial and innovation performance. We employ meta-analytic techniques on a sample of 47 primary studies in the field of corporate venturing, in order to synthesize and extend this growing body of literature. Our study advances understanding of the mechanisms by which portfolio strategies shape incumbent firm outcomes related to the extent of corporate venturing, and the strategies that firms may use to improve financial or innovation performance.

Keywords:
Corporate Venturing, Meta-Analysis, Inter-organizational Portfolios
Corporate venturing, the creation of and investment in new business ventures by an established organization (Chesbrough, 2002; Sharma & Chrisman, 1999), allows corporations to tap into emerging markets, take advantage of new market opportunities and renew the firm’s operations (Dushnitsky & Lavie, 2010; Narayanan, Yang & Zahra, 2009; Van de Vrande & Vanhaverbeke, 2013; Van de Vrande, Vanhaverbeke & Duysters, 2011a). A corporate venturing portfolio includes multiple ties with different ventures (Keil, Zahra & Maula, 2016). What is important to the incumbent firm is not the success or failure of a single venture, but rather whether the corporation is able to achieve its goals related to the entire corporate venturing portfolio (Hoffman, 2007). As such, existing research has focused on a number of portfolio strategies that may determine the value a firm derives from its corporate venturing activities (cf. Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014), which may be realized in terms of improved financial and/or innovation performance (Chemmanur, Loutska & Tian, 2014; Chesbrough, 2002; Dushnitsky & Lenox, 2006; Siegel, Siegel & MacMillan, 1988; Wadhwa, Phelps & Kotha, 2016). However, studies on whether or not and how portfolio strategies affect firm performance have yielded conflicting results (cf. Lin & Lee, 2011; Schildt, Maula & Keil, 2005; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014) and prior work suggests that meeting the financial and innovation objectives of corporate venturing may require different approaches to investing (cf. Chesbrough, 2002; Koster, 2018). In light of this, the central question we seek to answer in this paper is: how do corporate venturing portfolio strategies differ in terms of their effects on the financial and innovation performance of the incumbent firm?

The performance implications of corporate venturing have been well-documented in the literature (e.g. Dushnitsky & Lenox, 2005a, 2006; Van de Vrande, Vanhaverbeke & Duysters, 2011b; Wadhwa & Kotha, 2006; Yang, 2012), as has the importance of portfolio strategies in capturing the value of corporate venturing (Keil, Zahra & Maula, 2016; Lin &
Lee, 2011; Schildt, Maula & Keil, 2005; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014). Three portfolio strategies dominate this body of literature: portfolio diversity (cf. Lin & Lee, 2011; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014); venture autonomy (cf. Thornhill & Amit, 2001; Shrader & Simon, 1997; Yang, Nomoto & Kurokawa, 2013) and venture relatedness (cf. Keil, Zahra & Maula, 2016; Keil, Maula, Schildt & Zahra, 2008; Schildt, Maula & Keil, 2005). Here, we study these strategies and their performance effects using meta-analytic techniques. This allows us to address our research question on the basis of an analysis of extensive data and provides us with a more definitive answer to our question than an individual study could (Eden, 2002; Miller & Cardinal, 1994; Van Essen, Otten & Carberry, 2015). We theorize that the extent of corporate venturing, which we define as the absolute or relative degree of resources a firm commits to corporate venturing, affects firms’ levels of portfolio diversity, venture autonomy and venture relatedness, and argue that these portfolio strategies may have conflicting effects on financial and innovation performance. Using a mediation model, we show that portfolio strategies can be a double-edged sword from the standpoint of the incumbent firm.

Our study makes two main contributions to the literature on corporate venturing. First, we highlight the mechanisms by which the extent of corporate venturing affects firm performance (Lin & Lee, 2011; Yang, 2012; Yang, Nomoto & Kurokawa, 2013). As our mediation model shows, the relationship between the extent of corporate venturing and firm performance is more complex than previously thought. While prior research has focused primarily on the direct relationship between portfolio size and performance (Dushnitsky & Lenox, 2005a, 2006; Van de Vrande, Vanhaverbeke & Duysters, 2011b; Wadhwa & Kotha, 2006), we identify different ways in which the extent of corporate venturing affects performance, both directly and indirectly, depending on the firm’s portfolio strategies.
Second, we contribute to work on corporate venturing portfolio strategies (Keil, Zahra & Maula, 2016; Lin & Lee, 2011; Schildt, Maula & Keil, 2005; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014). We theorize the conflicting effects of portfolio strategies and, in doing so, we are among the first to consider financial and innovation outcomes simultaneously (Koster, 2018). Recent studies (Dushnitsky & Lenox, 2006; Rossi et al., 2016) have pointed out that there is still no systematic evidence supporting the claim that corporate venturing creates value for the parent firm. Our findings suggest that this may be due (in part) to the different strategies firms employ when engaging in corporate venturing and that these strategies may lead to varied outcomes for investing firms. This suggests that firms should keep their objectives for corporate venturing in mind when deciding on an accompanying strategy.

BACKGROUND AND HYPOTHESES

Corporate Venturing and Firm Outcomes

The amount of research on the topic of corporate venturing has increased substantially in recent years (e.g. Alvarez-Garrido & Dushnitsky, 2016; Colombo & Shafi, 2016; Gaba & Dokko, 2016; Pahnke, Katila & Eisenhardt, 2015; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014). After a peak during the dot-com bubble of the late 1990s and early 2000s and a rapid decline in the years following the burst of said bubble (Basu, Wadhwa & Kotha, 2016), corporate venturing activities have grown in a record number, with 37.4 billion USD invested in 2017 (Pitchbook & National Venture Capital Association, 2018). Corporate venturing is especially prevalent in high-tech sectors, such as software and pharma & biotech (Pitchbook & National Venture Capital Association, 2018).

Firms that engage in corporate venturing are likely motivated by two key considerations. First, investing in startups may be beneficial for strategic reasons, like helping
the incumbent firm to innovate. Firms may engage in corporate venturing activities in order to acquire new knowledge and capabilities (Fleming, 2001; Rosenkopf & Nerkar, 2001; Vanhaverbeke, Li & Van de Vrande, 2009). There are several ways in which corporate venturing can provide access to external technologies. Being privy to a venture’s knowledge base and allowing for knowledge transfer between the investor and the venture (Dushnitsky & Lenox, 2006; Yang, 2012; Yang, Nomoto & Kurokawa, 2013) is one such method. This leads to the recombination of knowledge across organizational boundaries (Henderson & Cockburn, 1994; Von Hippel, 1988), which may have a positive effect on corporate innovation. Prior to actual investment, the due-diligence process also provides firms with the opportunity to glean information on new technologies (Dushnitsky & Lenox, 2005a). Post-investment, the investing firm may learn by obtaining a board seat and monitoring the venture in this way. Even in the event that a venture fails, the initial investment may open up learning opportunities for the firm in the form of access to new technological insights or providing an indication of market unattractiveness (Dushnitsky & Lenox, 2005a). An example of this type of ‘strategic’ investor is GE Ventures, whose claims to invest “…in ways that will improve the design, manufacturing, delivery, and operation of our products” (Kerr, 2018, p. 3) shed light on the perceived strategic benefits associated with corporate venturing.

Second, firms may invest for the purpose of financial gain. The potential financial benefits derived from corporate venturing are twofold. First, there may be direct financial returns from the investment. Incumbent firms often rely on firsthand knowledge in selecting successful ventures, which may yield a positive IRR. Moreover, firms may have complementary assets that boost the value of their portfolio ventures (Dushnitsky & Lenox, 2006). The corporation may, therefore, benefit from increased venture performance, allowing the investor to reap returns on investment. Furthermore, in addition to direct financial returns, investing firms may benefit indirectly in multiple ways. By investing in corporate venturing,
the firm creates opportunities for growth that may or may not be exploited in the future, thus creating value for the firm. This may allow firms to identify strategic opportunities before their competitors do (Maula, Keil & Zahra, 2013), helping them to gain a competitive edge. Another well-established motive for corporations to engage in corporate venturing is building demand and creating a vibrant ecosystem around their products. A firm may invest in ventures with complementary products and services in order to generate demand for its technologies and boost its revenues (Brandenburger & Nalebuff, 1996; Chesbrough, 2002). For example, one such firm driven by a clear financial motive is healthcare giant Roche, that invests with a “focus on generating financial returns” (Roche, 2018, p. 1). This focus is reflected in Roche’s objectives, including “exits via initial public offerings (IPO) [and] company acquisition” (Roche, p. 2).

However, whether or not firms actually realize these potential benefits remains unclear. Allen & Hevert (2007) find that the majority of CVC programs had an IRR lower than the parent firm’s cost of capital and Titus & Anderson (2016) find only a non-significant relationship between corporate venturing and firm performance. Considering this in light of the body of literature that shows the positive effects of corporate venturing on financial (Dushnitsky & Lenox, 2006; Lin & Lee, 2011) and innovation performance (Anokhin et al., 2011; Dushnitsky & Lenox, 2005a; Van de Vrande, Vanhaverbeke & Duysters, 2011a; Wadhwa & Kotha, 2006; Yang, 2012), recent papers (Dushnitsky & Lenox, 2006; Rossi et al., 2016) maintain that no systematic evidence of corporate venturing creating value for the incumbent firm exists. The lack of consistency seen here in terms of findings suggests that there is something else going on – that there is some mechanism at work that leads some firms to success in corporate venturing, and some to failure.
Corporate Venturing Portfolio Strategies

In line with these findings, a greater extent of corporate venturing may not be directly related to financial and innovation performance (cf. Titus & Anderson, 2016). Instead, a significant stream of literature in the field of corporate venturing has adopted a ‘portfolio’ view of corporate venturing (cf. Keil, Maula, Schildt & Zahra, 2008; Lin & Lee, 2011; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014; Yang, Nomoto & Kurokawa, 2013). Instead of only looking at the total size of the portfolio, this perspective also takes the structure and management of the portfolio into account. As such, this view takes into account that it is not the sum total of individual ventures that determines whether firms achieve a certain outcome, but the configuration of the portfolio that matters.

Recent papers have outlined a number of corporate venturing portfolio strategies and have studied how these affect performance outcomes in relation to corporate venturing. These strategies include portfolio diversity, venture relatedness and venture autonomy. Together they make up the different dimensions of the structure and management of the portfolio. Portfolio diversity refers to the average extent to which ventures in an investor’s corporate venturing portfolio are dissimilar from other ventures within the portfolio, in terms of their industries and technologies. Venture relatedness refers to the extent to which ventures within an investor’s corporate venturing portfolio are similar to the parent firm, in terms of their industries and technologies. Finally, prior studies have also examined venture autonomy, the average level of autonomy enjoyed by portfolio ventures from the parent firm.

While we know that these portfolio strategies have important implications for the parent firm, the findings in this line of research have not always been consistent and have, at times, generated very different results. For example, Yang, Narayanan & De Carolis (2014) find a U-shaped relationship between portfolio diversity and financial performance, as portfolios with low diversity are less costly to manage, while portfolios with high diversity...
may offer risk reduction benefits. In contrast, Wadhwa, Phelps & Kotha (2016) find an inverted U-shaped relationship between portfolio diversity and innovation performance, due to both an increasing degree of novel knowledge obtained and simultaneously increasing difficulties in absorbing and integrating that knowledge. In a similar vein, Schildt, Maula & Keil (2005) find that greater venture relatedness leads to increased exploitative learning, but at the expense of exploratory learning. These findings are remarkable, but not completely surprising. After all, prior research has hinted at the idea that achieving different outcomes of corporate venturing requires different ways of investing (Chesbrough, 2002; Koster, 2018). We therefore need to understand how portfolio strategies may (in different ways) affect financial and innovation performance.

We approach this issue by integrating work on the extent to which firms engage in corporate venturing with literature on corporate venturing portfolio strategies. We argue that the extent to which firms engage in corporate venturing affects their portfolio strategies and that the effects of portfolio strategies on firm performance may differ in terms of financial and innovation performance. In the next section, we outline each of the three main portfolio strategies (portfolio diversity, venture autonomy and venture relatedness) and hypothesize that each of these mediates the relationship between the degree of corporate venturing and firm performance.

**Portfolio Diversity**

**Extent of Corporate Venturing and Portfolio Diversity.** Firms can vary greatly in the degree of diversity in their corporate venture portfolios. For example, on one end of the spectrum is Mastercard’s Start Path program, that “work[s] with a diverse set of companies - from FinTech to Retail to Security to Big Data and beyond”; Mastercard, 2019), while other companies set much more narrow focus areas. For example, ING set up a $300m fund
targeted specifically at FinTech ventures (ING, 2017) – which is only one of the dozen-or-so areas in which MasterCard’s Start Path program is active.

The reason why the degree of diversity can be important, is that it provides an indication of the relative novelty of knowledge that each venture brings to the portfolio (Wadhwa, Phelps & Kotha, 2016). Greater portfolio diversity may, therefore, help a firm to prevent redundancies in its portfolio (Wadhwa, Phelps & Kotha, 2016) that might occur when investing in ventures that are similar to each other. In larger portfolios, the risk of redundancies grows as the number of similar ventures increases, requiring a greater degree of portfolio diversity to offset this. Moreover, portfolio ventures that are similar to each other compete for access to the same (limited) corporate resources (Wadhwa, Phelps & Kotha, 2016). The more similar ventures there are in a portfolio, the more congested the flow of resources will be (Levinthal & Wu, 2010) and the more competition there will be among ventures for these resources. As a result, a larger corporate venturing portfolio tends to increases the need for diversity. We therefore hypothesize that a greater extent of corporate venturing also leads to increased portfolio diversity.

**Portfolio Diversity and Financial Performance.** Portfolio diversity can generate both benefits and costs for the investing firm. Diversity may be an effective tool to reduce unsystematic risk (Markowitz, 1952; Yang, Narayanan & De Carolis, 2014), as a lower concentration of resources may decrease the variability of returns (Rumelt, 1974). However, both the corporate venturing and alliance literatures have also indicated that portfolio diversity can come at a (financial) cost. More diverse portfolios tend to be costlier to manage and monitor due to the need to integrate and evaluate information from a variety of (external) sources (Lee & Kang, 2015; Lin, Chen & Wu, 2006). Moreover, in highly diversified portfolios, managers may find it increasingly difficult to recognize valuable and relevant information (Lin & Lee, 2011; Wadhwa and Kotha 2006) due to the cognitive limitations of
managers (Belderbos, Carree & Lokshin, 2006; Duysters & Lokshin, 2011). This complexity with regard to decision making may lead to inefficient resource allocation and to decreased financial performance as a result (Goerzen & Beamish, 2005; Lee, Kirckpatrick-Husk & Madhaven, 2017). Despite the benefits in terms of risk reduction, we therefore argue that portfolio diversity has an overall negative effect on financial performance. Because we predict that a greater extent of corporate venturing increases portfolio diversity, we put forward the following mediation hypothesis:

\[ H1a. \text{Portfolio diversity mediates the relationship between the extent of corporate venturing and financial performance in such a way that the extent of corporate venturing has a positive effect on portfolio diversity and portfolio diversity has a negative effect on financial performance.} \]

**Portfolio Diversity and Innovation Performance.** However, despite the financial costs, portfolio diversity may also allow firms to obtain new information from ventures that can be used for innovation (Wadhwa, Phelps & Kotha, 2016). In portfolios with low diversity, there is an increased risk of overlap in the knowledge bases of ventures. In such cases, the combined value of ventures may be lower than the sum of individual ventures, as the amount of new knowledge added by each venture decreases. This is also known as the problem of sub-additivity (Lin & Lee, 2011; Vassolo, Anand & Folta, 2004; Vassolo, Ravara & Connor, 2005). Therefore, despite the fact that managers may find the increase in new information difficult to manage, the inflow of non-redundant information from ventures is crucial to innovation. Moreover, diversity may help prevent competitive concerns from emerging between ventures (Dushnitsky & Shaver, 2009), as a result of portfolio ventures sharing similar knowledge domains (Stuart & Podolny, 1996). These competitive concerns may lead
ventures to protect their knowledge in order to prevent within-portfolio spillover to competing ventures (Dushnitsky & Shaver, 2009), in turn leading to a lesser degree of knowledge transfer both among ventures and between venture and corporation (Wadhwa, Phelps & Kotha, 2016). For these reasons, there tends to be a higher degree of knowledge transfer in diverse portfolios. We therefore hypothesize a positive effect of portfolio diversity on innovation performance.

H1b. Portfolio diversity mediates the relationship between the extent of corporate venturing and innovation performance in such a way that the extent of corporate venturing has a positive effect on portfolio diversity and portfolio diversity has a positive effect on innovation performance.

Venture Autonomy

Extent of Corporate Venturing and Venture Autonomy. Corporate venturing, as compared to other external corporate development modes, is often managed by (semi-) autonomous units (Keil, 2004; Keil, Zahra & Maula, 2016; McNally, 1997). Ventures may benefit from a certain degree of autonomy in terms of allowing for growth and development (Keil, 2004). However, a lack of autonomy may also be beneficial, as a close connection between venture and parent may grant the venture access to the corporation’s resources and competences (Thornhill & Amit, 2001). Firms engaging in corporate venturing are therefore faced with the choice between autonomy and coordination (cf. Puranam, Singh & Zollo, 2006).

Over time, investors may develop practices and routines that facilitate knowledge transfer and coordination (Dushnitsky & Lenox, 2006). Corporations may actively form connections between business units and ventures, thereby enabling knowledge transfer and
interaction that may benefit both the parent firm and venture (Dushnitsky & Lenox, 2006).
Firms that engage in a greater extent of corporate venturing can, therefore, also develop the
capabilities needed to actively manage their portfolio. Moreover, many investors regularly
visit and monitor their ventures (Bottazzi, Da Rin & Hellmann, 2004). We expect more
committed investors (i.e. firms that engage in a greater extent of corporate venturing) to be
more likely to actively establish these types of connections because they have a greater
incentive to coordinate and monitor their investment portfolio. Finally, a larger investor may
‘buy’ greater access to the portfolio ventures, as this may endow the corporation with the
bargaining power needed to secure board seats and regular communication with the venture
(Dushnitsky & Lenox, 2006). As such, we hypothesize that firms with a greater extent of
corporate venturing will tend to have a lower degree of venture autonomy (in favor of more
coordination).

**Venture Autonomy and Financial Performance.** The degree to which a venture is
autonomous, underpinned by the choice between autonomy and coordination, has a number of
performance implications. From a financial perspective, there are two main investor-level
advantages to venture autonomy. First, venture autonomy may have a positive effect on the
development and performance of portfolio ventures (Burgelman, 1984; MacMillan, Block &
Narasimha, 1986; Siegel, Siegel & MacMillan, 1988; Sykes & Block, 1989). Ventures need
to maintain flexibility in decision making in order to pursue aggressive growth strategies and
experiment (Block & MacMillan, 1993). Excessive coordination efforts on the part of the
investor hinder timely decision making by ventures (Gompers & Lerner, 2001). Furthermore,
autonomy may help prevent the investing organization’s management from impeding the
development of technologies that may disrupt or compete with technologies inside the
investor’s business units (Birkinshaw, Van Basten Batenburg & Murray, 2002) by separating
ventures from existing organizational domains. Separating new ventures from the mainstream
business may also avert (internal) conflicts relating to corporate venturing management (MacMillan, Block & Narasimha, 1986; Siegel, Siegel & MacMillan, 1988; Sykes & Block, 1989). Therefore, while autonomy reduces the venture’s access to corporate resources, it may also yield benefits. As the venture portfolio flourishes, direct financial returns from corporate venturing will increase.

Second, coordination is generally paired with higher monitoring and administration costs for the parent firm (Wadhwa & Kotha, 2006; Yang, 2012). Monitoring and administration costs include the opportunity costs borne by both the investor and entrepreneurial ventures of writing reports, for example, and other comparable activities that take up time that could be spent on elsewhere (Gompers, 1995). With greater autonomy, the investor is not burdened by these costs, leading to improved financial performance. As such, we predict a positive effect of venture autonomy on investors’ financial performance. This leads to the following hypothesis:

\( H2a. \) Venture autonomy mediates the relationship between the extent of corporate venturing and financial performance in such a way that the extent of corporate venturing has a negative effect on venture autonomy and venture autonomy has a positive effect on financial performance.

**Venture Autonomy and Innovation Performance.** However, while we predict venture autonomy to be beneficial to financial performance, we expect the opposite effect with regard to innovation performance. In order for new knowledge to have an impact on organizational learning and innovation, it must first reach the investing firm (Wadhwa & Kotha, 2006). With high venture autonomy, knowledge flows between investor and venture are limited (Yang, 2012), thus slowing down the exchange of knowledge (Keil, Zahra & Maula, 2016).
Conversely, when ventures operate under closer investor oversight, it is likely that the relationships with existing business units will be stronger (Yang, Nomoto & Kurokawa, 2013). From an innovation standpoint, having closer ties between ventures and corporate business units not only increases knowledge flows, but also ensures that valuable information reaches the business units that are best equipped to handle it (Wadhwa & Kotha, 2006). The efficacy of knowledge exchange is even more important when knowledge is tacit (Kogut & Zander, 1992). Therefore, venture autonomy limits the degree to which the investor may exploit relevant knowledge in the pursuit of innovation. From this flows the following hypothesis:

\[ H2b. \text{Venture autonomy mediates the relationship between the extent of corporate venturing and innovation performance in such a way that the extent of corporate venturing has a negative effect on venture autonomy and venture autonomy has a negative effect on innovation performance.} \]

**Venture Relatedness**

*Extent of Corporate Venturing and Venture Relatedness.* The degree of venture relatedness can either mitigate or exacerbate the costs of having a larger portfolio of ventures. Larger portfolios are likely to suffer from information overflow problems due to information not being fully exploited and learning opportunities being missed (De Leeuw, Lokshin & Duysters, 2014; Koput, 1997; Oerlemans, Knoben & Pretorius, 2013). Moreover, larger portfolios may strain managers’ cognitive capabilities in terms of selecting and monitoring ventures (Wadhwa & Kotha, 2006). When the portfolio of ventures is related to the corporation, the similarity in knowledge bases mitigates these effects by simplifying the integration of knowledge and making the portfolio easier to monitor (Ahuja & Katila, 2001;
Shenkar & Li, 1999). On the other hand, when ventures in the portfolio are less related, knowledge is much more difficult to recognize, assimilate and apply (Cohen & Levinthal, 1990). A larger portfolio of unrelated ventures, therefore, brings with it high costs associated with re-combinatory innovation (Fleming, 2001; Phelps, 2010; Wadhwa, Phelps & Kotha, 2016; Weitzman, 1998). Accordingly, we expect that firms with a greater extent of corporate venturing will tend toward a higher degree of venture relatedness in an effort to keep costs manageable and facilitate learning and knowledge assimilation.

**Venture Relatedness and Financial Performance.** The degree of venture relatedness can have significant implications for the performance outcomes of corporate venturing. From a financial perspective, there are several important benefits to investing in related ventures. First, investing in related ventures creates the opportunity for synergies to emerge between investor and venture (Lin & Lee, 2011). As a related set of investments directly reflects the investor’s strategic focus, investors may exploit resource commonalities and complementarities by sharing critical resources (Lai, Chiu & Liaw, 2010), cross-leveraging business opportunities (Lin & Lee, 2011), and using corporate venturing to complement core business activities (Basu & Wadhwa, 2013). As such, ensuring greater venture relatedness can be an effective way to build an ecosystem through corporate venturing (i.e. the ‘Intel model’) (Brandenburger & Nalebuff, 1996; Chesbrough, 2002; Lin & Lee, 2011). For example, investing in related downstream ventures creates demand for the investor’s products, while investing in related upstream ventures may lower the cost of raw materials (Lin & Lee, 2011).

Second, investing in unrelated ventures can be problematic due to the costs of distant search (Nelson & Winter, 1982). The search for knowledge that is more distant from the investor’s knowledge base is by definition broader in terms of search area (Nelson & Winter, 1982) and tends to involve more risk (Lee, Kim & Jang, 2015). As such, corporate venture investors in search of distant (unrelated) knowledge will need to expend more resources (Keil, 2004; Lee,
Kim & Jang, 2015). In investing in related ventures, the organization instead engages in local search, which is more gradual, less risky and less expensive. We therefore hypothesize a positive relationship between venture relatedness and financial performance. Furthermore, as we argue that corporate venturing has a positive effect on venture relatedness, this leads to the following hypothesis:

\[ H3a. \text{Venture relatedness mediates the relationship between the extent of corporate venturing and financial performance in such a way that the extent of corporate venturing has a positive effect on venture relatedness and venture relatedness has a positive effect on financial performance.} \]

\textit{Venture Relatedness and Innovation Performance.} While venture relatedness is beneficial in terms of the assimilation, identification and interpretation of knowledge (Cohen & Levinthal, 1989, 1990), it is also the case that the novelty value is lower due to the greater overlap between knowledge bases (Schildt, Maula & Keil, 2005). The more closely related partners are, the more similar they will be in terms of business logics and cognitive frameworks. This makes it not only more likely that the firms will have a similar view of how relevant technologies will evolve, but also more likely that they will search for new knowledge in the same places (Schildt, Maula & Keil, 2005). Furthermore, relatedness between the investor and its ventures can actually impede knowledge flows due to misappropriation concerns (Dushnitsky & Shaver, 2009; Katila, Rosenberger & Eisenhardt, 2008). A higher level of relatedness enhances the investor’s ability and increases the incentive to understand and imitate a certain technology (Dushnitsky & Shaver, 2009), creating a need for the venture to protect its resources (Katila, Rosenberger & Eisenhardt, 2008). In situations of higher relatedness, the venture may actually be less likely to transfer knowledge to the
investor, decreasing any potential innovation gains on the part of the investor. Therefore, we hypothesize the following:

\textit{H3b. Venture relatedness mediates the relationship between the extent of corporate venturing and innovation performance in such a way that the extent of corporate venturing has a positive effect on venture relatedness and venture relatedness has a negative effect on innovation performance.}

**METHODOLOGY**

**Sample and Coding**

In our efforts to identify primary studies directly dealing with corporate venturing, we employed three complementary search strategies. First, we read existing reviews of corporate venturing (Basu Wadhwa & Kotha, 2016; Narayanan, Yang & Zahra, 2009). Second, we searched eight electronic paper and working paper databases (Web of Science, ABI/INFORMS, EconLit, Business Source Premier, Proquest, SSRN, ResearchGate, Google Scholar) using search terms such as “Corporate Ventur*”, Internal Corporate Venturing, Corporate Venture Capital, External Corporate Venturing, New Business Creation, CV and CVC. Third, we engaged in snowball sampling, examining the reference lists of identified articles in search of other related studies.

We used the following criteria to determine which studies would be included in the meta-analysis. First, the study’s level of observation had to be at the investing-firm level. Second, the study had to report an effect size for either (1) the relationship between the extent of corporate venturing and investing firm performance or (2) between one of the corporate venturing portfolio strategies and performance or (3) between the extent of corporate venturing and one of the portfolio strategies. Third, we dealt with studies with overlapping
samples using the procedure outlined by Wood (2008). As such, studies with identical data were dropped from the sample. If there were unpublished and published studies reporting the same results, we included the published study. Fourth, primary studies can either include a control group of non-corporate venturing investors or have a sample consisting entirely of investors. Our study examines corporate venturing portfolios, and firms that do have any corporate venturing activities clearly do not have a portfolio. We therefore excluded the effect sizes from these control-group studies on the relationship between corporate venturing, corporate venturing portfolio strategies and performance from our analysis. On the basis of these inclusion criteria, we arrived at a final sample of 47 primary studies, spanning a time period between 1993 and 2018.

**Measurement**

After completing these steps, we read the papers and developed a coding protocol (Lipsey & Wilson, 2001). We include two performance variables as our dependent variables: *financial performance* and *innovation performance*. We measure financial performance on the basis of accounting performance and financial market performance (Richard et al., 2009). This includes, but is not limited to: Tobin’s Q, CAR, EBITDA, IRR, sales growth rate and ROA. We operationalize innovation performance using measures of innovation and strategic benefit to corporate venturing. This variable, therefore, includes measures such as patent count, patent citations, firm renewal, exploratory and exploitative innovation, and scale efficiency gains. We include one variable relating to *the extent of corporate venturing*, including measures such as portfolio size, amount invested, numbers of ventures started or invested in, CVC intensity and CVC experience (number of ventures or investments over the past years). We include three corporate venturing portfolio strategies: *portfolio diversity*, *venture autonomy* and *venture relatedness*. Portfolio diversity includes measures such as (reverse-
coded) industry overlap between ventures, industry diversity of ventures and technological diversity of ventures. Venture autonomy is measured on the basis of, for example, operations independence of ventures, (reverse-coded) relationships with business units, (reverse-coded) knowledge flows between parent and venture and investing through a separate CVC unit. Finally, venture relatedness is measured in accordance with, for example, technological relatedness between parent and venture, product relatedness, market relatedness, and industry relatedness. We include four control variables: ‘firm size and age’, ‘R&D’, ‘environmental uncertainty’ and ‘environmental munificence’. We coded all variables in a way that is consistent with our definitions of the constructs, independent of the name given to these variables in the primary studies that we coded. Table 1 provides a more extensive overview of the relevant variables and the measurements used in the primary studies we included in our study.

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HOMA procedure

In order to create the meta-analytic correlation table required for using MASEM, we applied HOMA (Hedges & Olkin, 1985). HOMA calculates meta-analytic mean correlations and confidence intervals, using effect sizes from primary studies as its input. We used Pearson’s product-moment correlation ($r$) effect sizes, as these are suitable for generating the correlation matrix for our MASEM. In line with current conventions in macro research (e.g. Carney et al., 2011; Combs et al., 2011; Drees & Heugens, 2013), we use random-effects HOMA. Random-effects HOMA, as opposed to fixed-effects, accounts for heterogeneity in the effect size distribution and is better suited to making inferences beyond the observed studies (Hedges & Vevea, 1998).
When we encountered a study that reported multiple measurements of the same construct, we included all relevant effect sizes. Monte Carlo simulations show that including all relevant measures improves the parameter significance testing and estimation accuracy as compared to using only a single value per study (Bijmolt & Pieters, 2001). Furthermore, in calculating the meta-analytic mean effects, it is necessary to account for differences in the precision of effect sizes due to heterogeneity in sample sizes. We therefore weigh each effect size by its inverse variance weight \( w \), the inverse of its squared standard error (Hedges & Olkin, 1985). Based on this \( w \), we are also able to calculate the standard error and confidence interval of the mean effect.

**MASEM procedure**

We apply Meta-Analytic Structural Equation Modeling (MASEM: Bergh et al., 2016; Shaw & Ertug, 2017) to test our hypotheses. MASEM consists of two steps. First, we created a meta-analytic correlation matrix based on our \( r \)-based random-effects HOMA (see Table 2), calculating interrelationships between all the variables in our model. Second, we use this correlation matrix as input for our SEM. Different primary studies may capture different parts of our model, meaning that not all relationships in the model need to be included in every individual primary study (Carney et al., 2011; Viswesvaran & Ones, 1995). In order to account for differences in sample sizes in different parts of the model, we calculate the harmonic mean (\( N = 5010 \)). The harmonic mean is less sensitive to outliers and is, thus, more conservative than the arithmetic mean (Geyskens, Steenkamp & Kumar, 2006).

Finally, we recognize that the portfolio strategies included in our model may be interrelated. For example, a highly related portfolio of ventures may be less autonomous, as a related investor would be able to provide complementary resources to its ventures (Thornhill & Amit, 2001), potentially producing closer linkages and less autonomy. While this
interrelatedness is not the main focus of our study, we account for it in our analyses by allowing for covariance between the error terms of portfolio diversity, venture autonomy and venture relatedness in our model. The MASEM path model is depicted in Appendix A.

RESULTS

Table 3 shows the results of the MASEM analysis. First, we find that the extent of corporate venturing is positively associated with portfolio diversity ($\beta = 0.367$, $p = 0.000$) and portfolio diversity is negatively related to financial performance ($\beta = -0.084$, $p = 0.000$), in line with Hypothesis 1a. Moreover, in line with Hypothesis 1b, we find that portfolio diversity is positively related to innovation performance ($\beta = -0.140$, $p = 0.000$). We formally test for mediation using a Sobel test and find test statistics of $z = -5.49$ ($p = 0.000$) and $z = -8.61$ ($p = 0.000$), respectively. As such, we find strong support for Hypotheses 1a and 1b, with portfolio diversity mediating the relationships between the extent of corporate venturing and financial performance, as well as innovation performance.

Second, we find a weak negative relationship between the extent of corporate venturing and venture autonomy ($\beta = -0.030$, $p = 0.034$). This indicates that firms that engage in higher levels of corporate venturing, indeed, tend to be more closely linked to their ventures. We also find a negative association between venture autonomy and innovation performance, as predicted in Hypothesis 2b ($\beta = -0.103$, $p = 0.000$), as well as a small and non-significant positive effect of autonomy on financial performance ($\beta = 0.007$, $p = 0.629$). We ran a Sobel test for mediation and find a mediation effect with a Sobel test statistic of $z = 2.06$ ($p = 0.040$) between corporate venturing, venture autonomy and innovation performance. Therefore, a greater extent of corporate venturing decreases the level of venture autonomy, while autonomy negatively affects innovation performance. However, it does not affect the financial
performance of investing firms through autonomy \((z = 0.49, p = 0.626)\). Thus, we find support for Hypothesis 2b, but our findings fail to support Hypothesis 2a.

Third, we find a positive relationship between the extent of corporate venturing and venture relatedness \((\beta = 0.033, p = 0.020)\). This means that a greater degree of corporate venturing tends to lead to a more related portfolio. Moreover, we find strong support for the conflicting effect of venture relatedness on financial performance \((\beta = 0.123, p = 0.000)\) and innovation performance \((\beta = -0.129, p = 0.000)\). We tested for mediation and found a Sobel test statistic of \(z = 2.28 (p = 0.02)\) and \(z = -2.29 (p = 0.02)\). Therefore, we may conclude that venture relatedness mediates the relationship between the extent of corporate venturing and financial and innovation performance, but in very different ways. This lends support to Hypotheses 3a and 3b.

Finally, we find that the direct effect of the extent of corporate venturing on firm performance does not seem to be as important as the strategies, as it has a small, but non-significant positive direct effect on financial performance \((\beta = 0.002, p = 0.879)\) and a small negative direct effect on innovation performance \((\beta = -0.036, p = 0.013)\). However, it should be noted that the indirect effects of portfolio strategies compensate for this negative direct effect. The total effect on innovation performance is \(\beta = 0.014 (p = 0.328)\) because the indirect effects of the degree of corporate venturing on innovation performance are positive.

While we have treated financial and innovation performance as entirely different outcomes in this analysis, we performed an additional test to check whether the financial benefits of corporate venturing may accrue through increased innovation rather than directly through the mechanisms stated in this paper (see Table 4 for the full model). When we add a relationship between innovation and financial performance, we find a strong positive effect \((\beta\))
Moreover, the fit statistics improve significantly (Model 1: $\chi^2 = 258.19$, CFI = 0.910, RMSEA = 0.061; Model 2: $\chi^2 = 119.25$, CFI = 0.958, RMSEA = 0.042). However, adding this relationship does not meaningfully change any of our primary results. The effect of autonomy on financial performance is actually strengthened slightly ($\beta = 0.024$, $p = 0.083$), but this effect is compensated for by the negative indirect effect of decreased innovation performance. We may therefore conclude that although innovation may indeed lead to financial gain, it appears justified to treat financial and innovation performance as two essentially different outcomes of corporate venturing.
we draw specific attention to the direction of these effects. While portfolio diversity positively affects innovation performance, due to an increase in non-redundant information from ventures, we also find that it negatively affects financial performance due to the costliness of managing such diversity. In a similar vein, while venture relatedness positively affects financial performance as a result of increased synergies between firm and ventures, it may also harm innovation performance through a decrease in new-to-the-firm information.

Moreover, while research has often considered the direct relationship between portfolio size and firm performance (Dushnitsky & Lenox, 2005a, 2006; Van de Vrande, Vanhaverbeke & Duysters, 2011b; Wadhwa & Kotha, 2006), we find that the extent to which firms engage in corporate venturing also has an effect on their portfolio strategies. The extent of corporate venturing has a positive effect on the level of diversity and relatedness, and a negative effect on the level of autonomy. Naturally, investing firms still have the freedom to choose their own strategies, relatively unrestricted by factors such as their portfolio size. However, we do show that these strategies are affected, to some degree, by the extent of corporate venturing, either because certain strategies are more attractive in larger or smaller portfolios or because the degree to which firms engage in corporate venturing is a reflection of their commitment to corporate venturing (which may, for example, translate to more thoroughly coordinated portfolios). Therefore, in addition to the direct effect of the extent of corporate venturing on performance, we also draw attention to this indirect effect by way of the portfolio strategies. This highlights the complexity of the phenomenon of corporate venturing, and shows that we need to consider the different pathways through which the extent to which firms engage in corporate venturing can have an effect on their performance. In doing so, we speak to literature studying the mechanisms by which corporate venturing creates value for the investing firm (cf. Lin & Lee, 2011; Yang, 2012; Yang, Nomoto & Kurokawa, 2013).
Our study also has certain implications for research on corporate venturing portfolio strategies (Keil, Zahra & Maula, 2016; Lin & Lee, 2011; Schildt, Maula & Keil, 2005; Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014). Because of potentially conflicting effects of portfolio strategies on different performance measures, it is not enough to consider only a single performance dimension when looking at the outcome of a portfolio strategy. Considering the conflicting effects, we should view the performance effects of portfolio strategies as being driven by separate mechanisms, rather than as a single coherent phenomenon. This also implies that portfolio strategies should depend on an investor’s motivation to achieve financial outcomes, innovation outcomes, or both. A financially focused portfolio should, therefore, be relatively less diverse and more related, while an innovation-focused portfolio should be relatively more diverse and less autonomous and related. In doing so, we advance work on portfolio strategies, both by synthesizing existing work and uncovering the notion of corporate venturing portfolio strategies as a double-edged sword.

Finally, prior work has raised the question of whether or not corporate venturing has an effect on firm performance (Dushnitsky & Lenox, 2006; Rossi et al., 2016). In response, we put forward that the use of different portfolio strategies by firms may (partially) explain the divergent findings in the literature. Our conflicting findings with regard to portfolio strategies suggest that it may be difficult to maximize both financial and innovation outcomes through corporate venturing. Should firms, therefore, aim to balance financial and innovation outcomes? Or should they focus on only one of the two? And how should they aim to do so? In this regard, perhaps, our research raises as many questions as it answers. All in all, our findings suggest that we have yet to fully understand how investors may best capture the potential benefits of corporate venturing.
Limitations and Directions for Future Research

Our work serves to further understanding of the different mechanisms involved in corporate venturing and corporate venturing portfolio strategies. However, it is only a first step in understanding these mechanisms. We recommend that future research further explore three main areas.

First, the methods we employed in our study enabled us to consider the simultaneous effect of portfolio strategies on financial and innovation performance. However, we were limited in our ability to test for potential curvilinear effects (cf. Wadhwa, Phelps & Kotha, 2016; Yang, Narayanan & De Carolis, 2014) between portfolio strategies and performance. In line with prior research, we would expect there to be certain subtleties in configuring a portfolio that need to be taken into account; for example, while we generally find a negative direct effect of venture relatedness on innovation, we do not wish to suggest, of course, that investors should take this to the extreme of investing in completely unrelated ventures at all times in order to improve innovation outcomes. While previous studies have looked at individual relationships between portfolio strategies and a single performance outcome, future research should look at ways of configuring a portfolio in a way that might balance different performance outcomes.

Second, due to the complex nature of corporate venturing, it is likely that there is not one single configuration of portfolio strategies that will be most successful. Instead, a study employing a method such as Qualitative Comparative Analysis (QCA: Ragin, 1987), based on the principle of equifinality, might uncover multiple pathways to successful venturing, depending on the desired outcome. As such, we see great potential in a study of a portfolio from a configurational perspective, one that highlights different strategies in combination with firm or context-specific factors that might lead to corporate venturing success.
Third, portfolio strategies may complement or substitute each other – lower autonomy might be more beneficial to related ventures with complementary resources (Thornhill & Amit, 2001). In our model, we were unable to test for interactions between strategies and little work has been done, thus far, on how different portfolio strategies might interact with each other to create value for the firm. We see this as an excellent avenue for future research.
REFERENCESa


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a Studies marked with an asterisk were included in the MASEM.


* Jessri, M., & Garrett, R.P. Internal corporate venture planning autonomy and performance. 2015 USASBE, Tampa, FL.


### Table 1: Description of Variables

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>PROXIES USED IN PRIMARY STUDIES</th>
<th>EXEMPLARY REFERENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation Performance</td>
<td>We proxy innovative performance using measures of innovation and other related strategic benefits, such as strategic renewal.</td>
<td>Patent count; patent applications; patent citations; exploratory patents; exploitative patents; firm renewal; strategic performance; scale efficiency gains.</td>
<td>Anokhin et al., 2011; Dushnitsky &amp; Lenox, 2005a; Wadhwa &amp; Kotha, 2006; Wadhwa, Phelps &amp; Kotha, 2016; Yang, 2012; Yang, Narayanan &amp; Zahra, 2009.</td>
</tr>
<tr>
<td>Extent of Corporate Venturing</td>
<td>We measure the extent of corporate venturing using proxies such as portfolio size in number of investments or dollars invested, as well as other measures indicating the investor’s degree of commitment to corporate venturing.</td>
<td>Number of corporate venturing investments; dollar amount of corporate venturing investments; CVC Intensity; CVC Experience; number of years the investor has been active; number of employees in CVC unit; number of emerging, enabling, passive, and unclassified investments; number of internal corporate ventures started.</td>
<td>Allen &amp; Hevert, 2007; Anokhin et al., 2011; Dushnitsky &amp; Lenox, 2005a; Garrett &amp; Covin, 2015; Titus &amp; Anderson, 2016; Wadhwa &amp; Kotha, 2006; Wadhwa, Phelps &amp; Kotha, 2016; Yang, Narayanan &amp; De Carolis, 2014; Yang, 2012.</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>A firm's R&amp;D expenses or R&amp;D intensity may complement and/or substitute corporate venturing efforts.</td>
<td>R&amp;D Expenditures; R&amp;D Intensity.</td>
<td>Anokhin, Wincent &amp; Oghazi, 2016; Dushnitsky &amp; Lenox, 2005b; Kashthirangan &amp; Robeson, 2008; Kim, Gopal &amp; Hoberg, 2016.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Measures</td>
<td>References</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Environmental Munificence</td>
<td>Environmental Munificence refers to the scarcity or abundance of resources within a certain environment (Castrogiovanni, 1991). We include this variable to control for differences within both financial and innovation-related resources in an environment; therefore, we include both measures of industry growth, as well as opportunities for innovation such as industry innovativeness.</td>
<td>Industry growth; Returns on NASDAQ; Industry Tobin’s Q; industry growth opportunities; industry patent citations; industry patent count; industry patent stock.</td>
<td>Anokhin et al., 2011; Gaba &amp; Dokko, 2016; Dushnitsky &amp; Lenox, 2005b; Lin &amp; Lee, 2011; Yang, Narayanan &amp; De Carolis, 2014.</td>
</tr>
<tr>
<td>Portfolio Diversity</td>
<td>Portfolio diversity refers to the average extent to which ventures in the investor’s portfolio are different from each other in terms of technologies and/or industries.</td>
<td>Industry diversity; technological diversity; investment overlap; investment dispersion; CVC experience diversity.</td>
<td>Belderbos, Jacob &amp; Lokshin, 2018; Dokko &amp; Gaba, 2012; Lee &amp; Kang, 2015; Lee, Park &amp; Kang, 2018; Lin &amp; Lee, 2011; Wadhwa, Phelps &amp; Kotha, 2016; Yang, Narayanan &amp; De Carolis, 2014; Yang, Narayanan &amp; Zahra, 2009.</td>
</tr>
<tr>
<td>Venture Autonomy</td>
<td>Venture autonomy refers to the average degree of autonomy and (lack of) linkages between an investor and its venture. This includes e.g. investing through a subsidiary rather than investing directly, as well as other measures of venture (in)dependence from the parent firm.</td>
<td>Separate CVC Unit (subsidiary); operations independence; planning autonomy; relationship with business units; relationship with TMT; financing decisions by parent; involvement by parent firm; knowledge flows to venture; autonomy.</td>
<td>Benson &amp; Ziedonis, 2009; Covin et al., 2016; Garrett &amp; Covin, 2015; Hill &amp; Birkmshaw, 2014; Kasthurirangan &amp; Robeson, 2008; Lee, Kim &amp; Jang, 2015; Wadhwa &amp; Basu, 2013; Wadhwa &amp; Kotha, 2006; Yang, 2012; Yang, Nomoto &amp; Kurokawa, 2013.</td>
</tr>
<tr>
<td>Venture Relatedness</td>
<td>Venture relatedness refers to the average extent to which ventures in the investor’s portfolio are similar (or different) to the investor in terms of technologies and industries.</td>
<td>Venture technological relatedness; product relatedness; market relatedness; interindustry investment; industry relatedness; technological distance; industry overlap.</td>
<td>Dushnitsky &amp; Lenox, 2005a; Johnson, 2005; Lee, Kim &amp; Jang, 2015; Lin &amp; Lee, 2011; Tong &amp; Li, 2011; Wadhwa &amp; Basu, 2013; Wadhwa &amp; Kotha, 2006; Yang, 2012; Yang, Narayanan &amp; De Carolis, 2014.</td>
</tr>
</tbody>
</table>
Table 2: Meta-Analytic Correlation Table

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Financial Performance</td>
<td>2639 (14)</td>
<td>6855 (25)</td>
<td>27800 (16)</td>
<td>14445 (10)</td>
<td>5769 (8)</td>
<td>28799 (18)</td>
<td>3987 (7)</td>
<td>1585 (7)</td>
<td>5914 (8)</td>
<td></td>
</tr>
<tr>
<td>2. Innovation Performance</td>
<td>0.181 (0.001)</td>
<td></td>
<td>12478 (39)</td>
<td>90962 (59)</td>
<td>81846 (28)</td>
<td>7926 (6)</td>
<td>69457 (6)</td>
<td>4184 (7)</td>
<td>4559 (26)</td>
<td>61893 (8)</td>
</tr>
<tr>
<td>3. Extent of Corporate Venturing</td>
<td>0.018 (0.383)</td>
<td>0.073 (0.000)</td>
<td></td>
<td>29565 (59)</td>
<td>20404 (38)</td>
<td>5211 (9)</td>
<td>6036 (12)</td>
<td>11060 (16)</td>
<td>8316 (43)</td>
<td>36560 (15)</td>
</tr>
<tr>
<td>4. Firm Size and Age</td>
<td>0.108 (0.156)</td>
<td>0.183 (0.000)</td>
<td>0.227 (0.000)</td>
<td></td>
<td>75360 (38)</td>
<td>11684 (10)</td>
<td>75288 (24)</td>
<td>8457 (13)</td>
<td>5367 (23)</td>
<td>37707 (15)</td>
</tr>
<tr>
<td>5. R&amp;D</td>
<td>0.105 (0.020)</td>
<td>0.127 (0.022)</td>
<td>0.104 (0.005)</td>
<td>0.052 (0.374)</td>
<td></td>
<td>13208 (10)</td>
<td>69756 (18)</td>
<td>6154 (9)</td>
<td>2042 (9)</td>
<td>37652 (10)</td>
</tr>
<tr>
<td>6. Environmental Uncertainty</td>
<td>0.034 (0.106)</td>
<td>0.018 (0.519)</td>
<td>-0.029 (0.701)</td>
<td>-0.002 (0.968)</td>
<td></td>
<td>0.066 (0.264)</td>
<td>13146 (10)</td>
<td>1776 (4)</td>
<td>651 (6)</td>
<td>5584 (8)</td>
</tr>
<tr>
<td>7. Environmental Munificence</td>
<td>0.140 (0.008)</td>
<td>0.205 (0.000)</td>
<td>0.074 (0.066)</td>
<td>0.019 (0.493)</td>
<td>0.160 (0.000)</td>
<td>0.028 (0.511)</td>
<td></td>
<td>4483 (9)</td>
<td>1364 (3)</td>
<td>41061 (12)</td>
</tr>
<tr>
<td>8. Portfolio Diversity</td>
<td>-0.056 (0.398)</td>
<td>0.144 (0.017)</td>
<td>0.367 (0.000)</td>
<td>0.155 (0.001)</td>
<td>0.026 (0.608)</td>
<td>0.015 (0.748)</td>
<td>0.051 (0.366)</td>
<td></td>
<td>2302 (4)</td>
<td>3772 (9)</td>
</tr>
<tr>
<td>9. Venture Autonomy</td>
<td>-0.025 (0.315)</td>
<td>-0.063 (0.138)</td>
<td>-0.030 (0.301)</td>
<td>0.038 (0.429)</td>
<td>-0.067 (0.293)</td>
<td>-0.089 (0.121)</td>
<td>-0.008 (0.889)</td>
<td>-0.008 (0.005)</td>
<td></td>
<td>2224 (17)</td>
</tr>
<tr>
<td>10. Venture Relatedness</td>
<td>0.125 (0.000)</td>
<td>-0.121 (0.000)</td>
<td>0.033 (0.583)</td>
<td>-0.025 (0.811)</td>
<td>0.030 (0.480)</td>
<td>-0.008 (0.808)</td>
<td>0.018 (0.576)</td>
<td>-0.013 (0.813)</td>
<td>-0.087 (0.141)</td>
<td></td>
</tr>
</tbody>
</table>

*a Cells below the diagonal contain the mean meta-analytic correlations and corresponding p-values. Cells above the diagonal contain the total number of observations N and number of samples (k).*
Table 3: MASEM Results$^a$

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Corporate Venturing</th>
<th>Portfolio Diversity</th>
<th>Venture Autonomy</th>
<th>Venture Relatedness</th>
<th>Financial Performance</th>
<th>Innovation Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Size and Age</td>
<td>0.222** (16.21)</td>
<td></td>
<td></td>
<td></td>
<td>0.117** (8.25)</td>
<td>0.162** (11.85)</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>0.086** (6.20)</td>
<td></td>
<td></td>
<td></td>
<td>0.075** (5.36)</td>
<td>0.086** (6.38)</td>
</tr>
<tr>
<td>Environmental Uncertainty</td>
<td>-0.036** (-2.61)</td>
<td></td>
<td></td>
<td></td>
<td>0.029* (2.09)</td>
<td>-0.006 (-0.45)</td>
</tr>
<tr>
<td>Environmental Munificence</td>
<td>0.057** (4.11)</td>
<td></td>
<td></td>
<td></td>
<td>0.127** (9.10)</td>
<td>0.186** (13.78)</td>
</tr>
<tr>
<td>Extent of Corporate Venturing</td>
<td></td>
<td>0.367** (27.90)</td>
<td>-0.030* (-2.12)</td>
<td>0.033* (2.33)</td>
<td>0.002 (0.15)</td>
<td>-0.036* (-2.48)</td>
</tr>
<tr>
<td>Portfolio Diversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.084** (-5.53)</td>
<td>0.140** (9.49)</td>
</tr>
<tr>
<td>Venture Autonomy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.007 (0.48)</td>
<td>-0.103** (-7.46)</td>
</tr>
<tr>
<td>Venture Relatedness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.123** (8.92)</td>
<td>-0.129** (-9.67)</td>
</tr>
</tbody>
</table>

$^a$ Harmonic Mean N = 5010; t-values shown in parentheses.

* p < 0.05
** p < 0.01
Table 4: Robustness Test MASEM Results$^a$
Relationship between Innovation and Financial Performance included.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Corporate Venturing</th>
<th>Portfolio Diversity</th>
<th>Venture Autonomy</th>
<th>Venture Relatedness</th>
<th>Financial Performance</th>
<th>Innovation Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Size and Age</td>
<td>0.222** (16.21)</td>
<td></td>
<td></td>
<td></td>
<td>0.117** (8.27)</td>
<td>0.162** (11.85)</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>0.086** (6.20)</td>
<td></td>
<td></td>
<td></td>
<td>0.075** (5.38)</td>
<td>0.086** (6.38)</td>
</tr>
<tr>
<td>Environmental Uncertainty</td>
<td>-0.036** (-2.61)</td>
<td></td>
<td></td>
<td></td>
<td>0.029* (2.09)</td>
<td>-0.006 (-0.45)</td>
</tr>
<tr>
<td>Environmental Munificence</td>
<td>0.057** (4.11)</td>
<td></td>
<td></td>
<td></td>
<td>0.127** (9.12)</td>
<td>0.186** (12.78)</td>
</tr>
<tr>
<td>Extent of Corporate Venturing</td>
<td>0.367** (27.90)</td>
<td>-0.03* (-2.12)</td>
<td>0.033* (2.33)</td>
<td>0.009 (0.57)</td>
<td>-0.036* (-2.48)</td>
<td></td>
</tr>
<tr>
<td>Portfolio Diversity</td>
<td></td>
<td>-0.108** (-7.13)</td>
<td></td>
<td></td>
<td>0.140** (9.49)</td>
<td></td>
</tr>
<tr>
<td>Venture Autonomy</td>
<td></td>
<td>0.024† (1.73)</td>
<td></td>
<td></td>
<td>-0.103** (-7.46)</td>
<td></td>
</tr>
<tr>
<td>Venture Relatedness</td>
<td></td>
<td></td>
<td>0.145** (10.57)</td>
<td></td>
<td>-0.129** (-9.67)</td>
<td></td>
</tr>
<tr>
<td>Innovation Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.171** (11.87)</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ Harmonic Mean N = 5010; t-values shown in parentheses.
† p < 0.1
* p < 0.05
** p < 0.01
Appendix A: MASEM Path Diagram