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Entrepreneurial Passion and Product Innovation Intensity in New Ventures: Mediating Effects of Exploration and Exploitation Activities

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In this paper, we examine the differential effects of entrepreneurial passion (EP) on product innovation intensity (PII) through the mediating mechanisms of exploration and exploitation activities. Using time-lagged data from 260 new ventures from Ghana, we examine the direct relationships between the three domains of EP (i.e. inventing, developing and founding) and a new venture's PII. Further, we test the indirect relationships between the three domains of EP and PII through the mediating mechanisms of a new venture's exploration and exploitation activities. The empirical results provide a fine-grained understanding of the relationship between EP, exploration and exploitation activities and PII. Implications for research and practice are also discussed.

If passion drives you, let reason hold the reins
– Benjamin Franklin

Introduction

Entrepreneurial passion (EP) has received significant scholarly attention over the last decade (for a review, see Newman *et al.*, 2021). EP is defined as ‘consciously accessible intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful and salient to the self-identity of the entrepreneur’ (Cardon *et al.*, 2009: 517). The EP literature argues that the intense positive feelings individuals experience towards venture activities are important and central to their self-identity, and this motivates them to remain engaged with these ac-

tivities (Cardon *et al.*, 2009, 2013). Instructively, researchers have conceptualized and operationalized EP into three distinctive domains – *passion for inventing*, *passion for founding* and *passion for developing* – and have suggested that each passion domain motivates individuals’ attention and effort towards particular types of venture activities. For example, entrepreneurs with a founder role identity tend to have passion for activities such as assembling resources to pursue new opportunities and launching new ventures. In contrast, entrepreneurs with an inventor role identity display passion for activities such as exploring new technologies and prototyping, and those with a developer role identity have passion for activities related to venture growth and expansion (for a detailed discussion of the three EP domains, see Cardon *et al.*, 2013: 376–377). Findings from the prior

literature indicate that EP affects entrepreneurial behaviours (Murnieks, Mosakowski and Cardon, 2014) and outcomes such as new venture survival (Stenholm and Renko, 2016), venture growth (Drnovsek, Cardon and Patel, 2016), radical innovation (Strese *et al.*, 2018) and small and medium-sized enterprises' (SMEs') performance (Adomako and Ahsan, 2022).

Although this body of research suggests that EP drives entrepreneurial action and affects venture outcomes (Cardon and Kirk, 2015; Hatak *et al.*, 2021; Murnieks, Mosakowski and Cardon, 2014), there is scant empirical evidence supporting this relationship. This is a critical shortcoming, as entrepreneurial action is necessary for successful venture launch and growth (Mathias and Williams, 2018; McKelvie, Brattström and Wennberg, 2017; McMullen and Shepherd, 2006; Townsend *et al.*, 2018). In particular, researchers argue that two distinct types of entrepreneurial action – exploration activities and exploitation activities – are important for survival and growth of entrepreneurial ventures (Goel and Jones III, 2016; Mueller, Volery and von Siemens, 2012; Volery, Mueller and von Siemens, 2015). In a seminal paper, March (1991) argues that exploration is generally associated with activities such as experimentation, search in new domains and innovation, whereas exploitation involves activities such as refinement, efficiency and implementation. Exploration activities enable firms to develop new products, enter new markets and create new opportunities, whereas exploitation activities enable firms to enhance existing products, refine processes and continue capitalizing on prevailing opportunities (Atuahene-Gima, Slater and Olson, 2005; Masango and Lassalle, 2020; Sirén, Kohtamäki and Kuckertz, 2012; Tang, Zhang and Peng, 2021; Zhang and White, 2016). As EP synchronizes founders' cognition and action (Cardon, Glauser and Murnieks, 2017; Cardon *et al.*, 2009), it is important to ascertain whether the three EP domains could differentially affect exploration and exploitation activities (Adomako and Ahsan, 2022; Cardon, Post and Forster, 2017). For example, entrepreneurs with a passion for inventing are motivated to pursue activities such as experimentation and prototyping, as these activities are meaningful to their identity and they experience a higher degree of positive feelings when performing them. Indeed, Hatak *et al.* (2021: 1697) state that '[w]hen entrepreneurs are passionate about an

entrepreneurial activity, they cannot help but to think about and engage in that activity'.

To gain deeper insights on how EP affects entrepreneurial action and outcomes, we examine the relationships between EP, exploration–exploitation activities and firm outcomes. Specifically, we examine the direct and indirect effects (through exploration and exploitation activities) of founders' passion for inventing, developing and founding on new ventures' product innovation intensity (PII). We suggest that the three EP domains differentially direct founders' cognition and action towards exploration and exploitation activities. We consciously focus on all three EP domains to ensure that we appropriately capture the activities that are important and central to the self-identity of the entrepreneur (Cardon *et al.*, 2009, 2013).¹ Moreover, in the context of new ventures, founders have not only recently engaged in activities related to EP for founding and inventing to start and launch their ventures, but are also likely to engage in exploration and exploitation activities to innovate and grow their ventures (Mueller, Volery and von Siemens, 2012; Rothaermel and Deeds, 2004). In this study, we focus on the new ventures' PII outcome, as it depicts founders' subjective assessment of new products developed and launched by their venture relative to industry peers (Boso, Cadogan and Story, 2013). The ability to develop and commercialize new products enhances the likelihood of ventures' survival and growth. We use time-lagged data from 260 new ventures from Ghana to validate our theoretical model.

Our study makes three important contributions to the EP literature. The first is the focus on better understanding the effects of founders' passion on PII. Given the importance of new product development and commercialization for new

¹It is important to stress that the conceptualization (Cardon *et al.*, 2009: 517) and operationalization (Cardon *et al.*, 2013: 375–377) of EP focuses on individuals' affect and self-identity. Researchers have frequently equated EP with venture stages, and that has led to an erroneous assumption that the three EP domains occur sequentially. This is particularly alarming as it assumes that entrepreneurs' identity develops and fades according to venture stage. The three entrepreneurial passion domains (inventing, founding and developing) exist independently of venture stage, and they are either a good fit or a misfit with a particular venture stage (Boone, Andries and Clarysse, 2020).

venture survival and growth (Schumpeter, 1949; Soto-Simeone, Sirén and Antretter, 2020; Zimmerman and Zeitz, 2002), our study has implications for both research and practice, as it elucidates how the three EP domains differentially affect PII. Our findings indicate that certain EP domains can have an unfavourable effect on venture outcomes, thus counterbalancing the extant EP literature that has predominantly emphasized the positive side of EP as well as advising entrepreneurs against pursuing EP-fuelled activities that do not fit the needs of the organization. Specifically, our study cautions against assuming that founders' EP is related to a specific venture stage and emphasizes the importance of examining both the positive and negative effects of EP domains on firm outcomes. Indeed, our findings indicate that EP for founding is not positively related to PII, whereas both EP for inventing and EP for founding are positively associated with PII. The second contribution is the mechanisms through which EP domains impact PII, specifically new ventures' exploration and exploitation activities. While exploration and exploitation activities have received attention in the entrepreneurship literature (Kammerlander *et al.*, 2015; Voss and Voss, 2013), our understanding of the individual-level factors driving these activities is very limited. We find that certain EP domains are congruent (incongruent) with exploration and exploitation activities, which enables (hinders) pursuit of these activities and consequently PII. Finally, our study adds to the generalizability of the EP literature by examining the effect of EP on new ventures' outcome in an emerging economy, Ghana. There are significant contextual differences between entrepreneurship in developed countries (e.g. Canada, Germany, UK, USA) and emerging countries like Ghana due to differences in support available to entrepreneurs, as well as the maturity of the entrepreneurial ecosystem (Ahsan, Adomako and Mole, 2021).

In the next section, we briefly review the identity-based passion literature and emphasize the importance of examining the differential effects of the three EP domains. We then introduce our research model to theoretically ground the study and develop our hypotheses. In the third and fourth sections we describe the research methodology and our findings, respectively. We conclude the study with a discussion on implications for research and practice and future research opportunities.

Theoretical background and hypotheses

Entrepreneurial passion: Founders' identity activation and attention

Two distinct conceptualizations of passion have dominated the EP literature over the last decade (Murnieks, Cardon and Haynie, 2020; Murnieks, Mosakowski and Cardon, 2014) – the dualistic model of passion (Vallerand *et al.*, 2003) and the identity-based model of passion (Cardon *et al.*, 2009). Scholars have noted that the passion model advanced by Cardon *et al.* (2009, 2013) is specific to roles associated with the entrepreneurial process, as it focuses on understanding how entrepreneurs' passion for different activities impacts their cognitions and behaviours. Conversely, the framework suggested by Vallerand *et al.* (2003) is more general and focuses on examining how obsessive and harmonious passion towards an 'entrepreneur identity' influences firm outcomes (Murnieks, Cardon and Haynie, 2020; Sirén, Patel and Wincent, 2016). In this study, we adopt Cardon *et al.*'s (2009) conceptualization of passion, as we are interested in investigating how founders' passion for certain entrepreneurial activities associated with their self-identity (e.g. founder identity, developer identity) influences new venture activities and outcomes.

Cardon *et al.* (2009) emphasize that passion evokes intense positive feelings when founders engage in activities that are meaningful and salient to their self-identity. For example, founders with EP for developing experience positive emotions when they engage in venture development activities, as these activities are meaningful and salient to their self-identity. Further, it has been suggested that the activities a founder engages in are dependent on the EP domain that is activated (Cardon *et al.*, 2009, 2013; Drnovsek, Cardon and Patel, 2016; Mueller, Wolfe and Syed, 2017). This is consistent with the attention-based literature, which suggests that founders' attention is connected with a specific object which leads them to give preference to certain activities over others (Srivastava, Sahaym and Allison, 2020). The attention-based literature has primarily focused on stimuli originating from the organizational environment (Cho and Hambrick, 2006; Kammerlander and Ganter, 2015). However, it is reasonable to assume that founders' attention is also driven by EP. Indeed,

Cardon *et al.* (2009) suggest that individuals are more likely to regulate their attention and motivation based on their passion. That is, EP leads to ‘cognitive and behavioural engagement in activities in a manner that is characteristic of intense positive emotions’ (Cardon *et al.*, 2009: 518). For instance, passion for founding triggers founders’ attention and effort towards venture creation activities. Simply put, entrepreneurs are attracted to activities that they are passionate about and are motivated to pursue (Cardon and Kirk, 2015; Hatak *et al.*, 2021; Murnieks, Mosakowski and Cardon, 2014; Stenholm and Renko, 2016).

While founders engage in the strategic actions that are consistent with their identities (Fauchart and Gruber, 2011), the effectiveness of firm activities and corresponding outcomes is dependent on the attention given to a particular domain (Eggers and Kaplan, 2009). Recent research emphasizes the importance of fit between passion and activities necessary for the venture stage (Boone, Andries and Clarysse, 2020). In particular, these researchers state that the activated EP must manifest into activities that are required for the venture stage as it could lead to external validation and potentially reduce relationship conflict within the venture, which positively affects performance. This is critical, as EP-fuelled actions taken by founders may or may not correspond to the exploration and exploitation activities needed to innovate and grow their ventures. Furthermore, pursuing action based on a particular passion domain (e.g. passion for founding) can take entrepreneurs’ attention away from other activities that might be more relevant for the venture strategy. Indeed, researchers argue that the attention of key decision-makers is bounded, and it is difficult for them to pay attention to multiple activities simultaneously (Srivastava, Sahaym and Allison, 2020). The attention given to a particular activity reduces the attention that founders can allocate to other activities (Stevens *et al.*, 2015).² As founders can employ their agency to influence new venture activities (Zheng, Ahsan and DeNoble, 2020), it is likely

²This is similar to scholars having passion for a particular research domain. Scholars pay more attention to a research domain that they are passionate about rather than expending time and effort on research domains that do not evoke their passion. Another familiar analogy is educators’ passion for the three activities of teaching, research and service. Attention on one type of activity takes attention (and time) away from other activities.

that their EP will influence the new venture activities and outcomes. To deepen our understanding of this relationship, we develop a theoretical model (Figure 1) to examine how entrepreneurs’ passion for inventing, founding and developing affects exploration and exploitation activities, and consequently venture outcomes. In the next section, we elucidate how the three EP domains differentially affect entrepreneurs’ attention towards exploration and exploitation activities.

Founder’s passion and its effects on new venture exploration and exploitation activities

In their seminal paper, Cardon *et al.* (2009) identified three distinct EP domains: inventing (includes activities such as prototyping and exploring new opportunities), founding (involves activities such as starting ventures and assembling resources) and developing identity (consists of capability-building activities that enable venture growth and expansion). These EP domains are based on the entrepreneurial process and are consistent with the actions that entrepreneurs take to start and operate their new ventures (Cardon *et al.*, 2009; Mueller, Volery and von Siemens, 2012). In particular, after launching their ventures, founders engage in both exploration and exploitation activities (Volery, Mueller and von Siemens, 2015).

Exploration activities generate knowledge of new market opportunities and include activities such as researching new technologies and developing products for new markets, while exploitation activities enhance firms’ current knowledge to better capitalize on the existing opportunities; these activities involve actions such as lowering cost and improving existing products (Mueller, Volery and von Siemens, 2012; Sirén, Kohtamäki and Kuckertz, 2012; Volery, Mueller and von Siemens, 2015). Although exploration and exploitation activities are distinct from each other, they are complementary and over time reinforce each other, leading to positive firm outcomes (Parida, Lahti and Wincent, 2016; Raisch *et al.*, 2009), including firm innovation (Benner and Tushman, 2003; Greve, 2007).

Recent research indicates that the characteristics of key decision-makers affect firms’ exploration and exploitation activities. For instance, findings indicate that CEOs’ regulatory focus affects exploration and exploitation activities in small firms (Kammerlander *et al.*, 2015: 585). While this

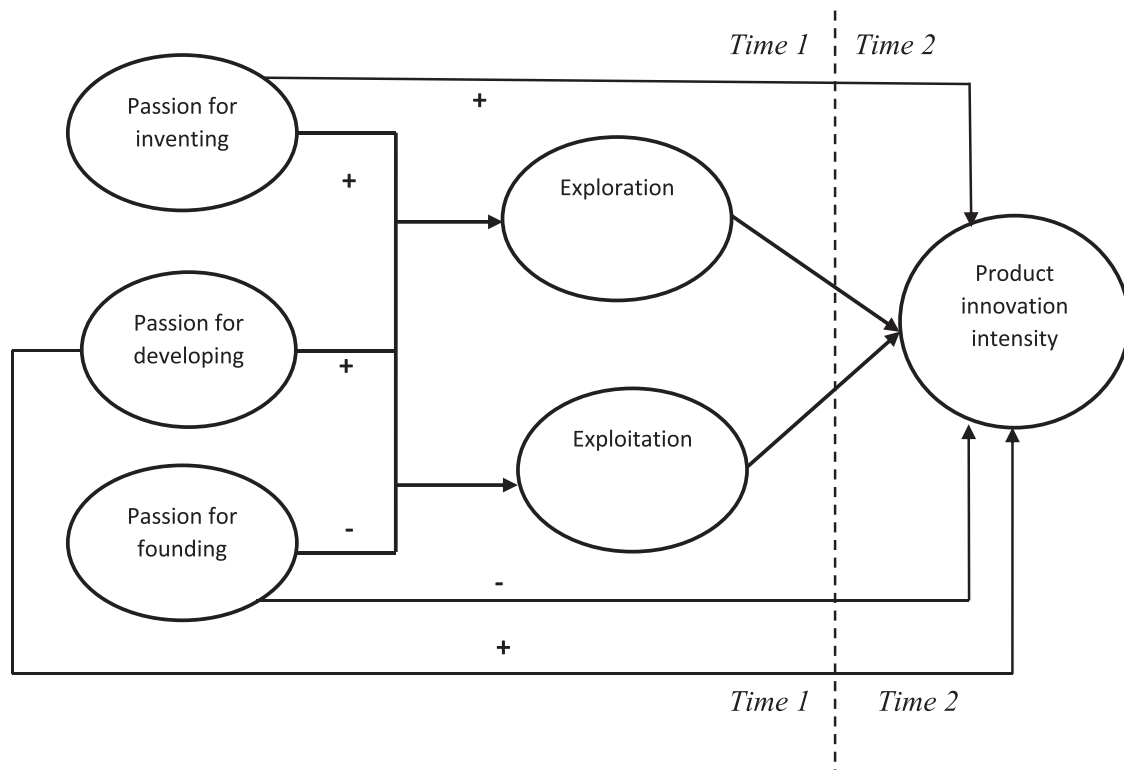


Figure 1. Direct and indirect effects model for new ventures' product innovation intensity

research provides interesting insights, it assumes that founders are motivated to perform the activities and are fully engaged in them. We argue that founders' passion will not only drive their attention and effort towards particular activities (Cardon *et al.*, 2009), but also lead to the reallocation of firms' financial and human resources to pursue these activities. As founders experience intense positive feelings when engaging in activities that are meaningful and salient to their self-identity, they take the necessary action to pursue these activities (Drnovsek, Cardon and Patel, 2016; Mueller, Wolfe and Syed, 2017; Stenholm and Renko, 2016). In other words, the type of passion activated motivates founders' engagement and commitment towards particular activities, including devoting the necessary resources to accomplish these activities. This leads to heterogeneity in a new venture's exploration and exploitation activities, and consequently PII. For instance, founders with a passion for founding might start working on other venture ideas because they experience intense positive feelings when engaging in new venture creation activities, and these activ-

ities are important to their identity (e.g. habitual entrepreneurs). This could shift founders' attention and effort, as well as ventures' resources, away from focal venture activities. In contrast, founders with a passion for inventing and developing will likely take actions that are consistent with exploration and exploitation activities. Next, we expand on the above discussion and develop our theoretical arguments for each of the relationships outlined in Figure 1.

Direct effects of passion on product innovation intensity

We hypothesize that the three distinct EP domains – passion for inventing, passion for developing and passion for founding – will have a differential effect on PII. Indeed, prior findings indicate that founders' attention to relevant information and environmental stimuli influences firm innovation outcomes (Li *et al.*, 2013; Yadav, Prabhu and Chandy, 2007). Founders who have a high passion for inventing experience a higher degree of positive feelings when engaging in activities such

as new product development, as these activities are meaningful to their self-identity. Specifically, founders with a passion for inventing 'will be particularly driven towards engagement in creative pursuit' (Cardon *et al.*, 2009: 520). Engaging in creative activities such as experimentation and prototyping results in the development of new products and improvements to existing products (Liedtka, 2015; Thomke, 2002). Furthermore, researchers argue that entrepreneurs 'experiencing passion for inventing may actively seek out new opportunities, enjoy coming up with new product or service ideas, and relish inventing new solutions to important needs and problems' (Cardon *et al.*, 2013: 376). This suggests that founders' passion for inventing will lead them to engage in creative activities, which has a positive effect on new venture PII.

While founders with a passion for developing may also engage in creative problem solving, the focal interest and attention of these founders are on navigating the uncertainty of the market and growing their new venture (Cardon *et al.*, 2009). Founders who have a high passion for developing are motivated to nurture and grow their ventures. They experience a higher degree of positive feelings when engaging in activities such as refining business processes, as these activities are meaningful to their self-identity, and thus they invest a significant amount of attention and resources in developing their venture's human and organizational capital (Cardon *et al.*, 2013). This improves firms' routines and capabilities (e.g. marketing, operations) and can help them introduce new products to the market (Zhang and Wu, 2017). Furthermore, these routines and capabilities developed by firms can have a positive impact on firms' innovation (Jelinek and Schoonhoven, 1990; Lund Vinding, 2006; Subramaniam and Youndt, 2005). Thus, we expect that founders' passion for developing will have a positive effect on new venture PII.

In contrast, founders with a high passion for founding relish the process of launching a new venture and/or exploring new entrepreneurial opportunities. That is, they experience intense positive feelings when they engage in or think about activities associated with starting new ventures (Cardon *et al.*, 2009, 2013). However, new entrepreneurial opportunities are risky, and the process of starting a new venture is strewn with hurdles and failures (Brush, Greene and Hart, 2001; Fisher *et al.*, 2017; Singh, Corner and Pavlovich, 2015; Zott and Huy, 2007). Founders need to invest significant at-

tention and effort to evaluate new entrepreneurial opportunities and overcome the challenges encountered during new venture creation. As these activities involve a significant cognitive resource commitment, they draw founders' attention away from the invention and development activities of the venture. This might also lead to a reallocation of firms' financial and human resources towards the new entrepreneurial opportunity, which further reduces the already limited resources new ventures have for pursuing innovation activities. This can particularly affect new ventures in developing countries due to the lack of human capital and a supporting entrepreneurial ecosystem (Ahsan, Adomako and Mole, 2021; Hanushek, 2013). While founders who are motivated to start new businesses (e.g. habitual entrepreneurs) can recruit qualified individuals to manage their venture and focus their attention on exploring other entrepreneurial opportunities, recruiting individuals who can independently manage new ventures in the absence of the founders is challenging in developing countries. Furthermore, founders' attention towards activities that are driven by passion for founding reduces employee commitment and increases relationship conflict within ventures (Boone, Andries and Clarysse, 2020; Breugst *et al.*, 2012), which could adversely affect venture outcomes. This leads us to suggest that passion for founding has a negative effect on new venture PII. Thus, we hypothesize:

H1a: Founders' passion for inventing is positively related to a new venture's PII.

H1b: Founders' passion for developing is positively related to a new venture's PII.

H1c: Founders' passion for founding is negatively related to a new venture's PII.

Mediating effects of new venture exploration and exploitation activities

We further argue that the relationship between founders' EP and a new venture's PII is mediated by the venture's exploration and exploitation activities. While it might be challenging for founders to perform activities that are not in correspondence with their EP, the capacity to perform these activities is dependent on founders' ability to regulate between activities associated with their EP and activities necessary to execute exploration and exploitation activities.

Mediating effect of exploration. Founders associate positive feelings with certain specific activities and are motivated to maintain their self-identity (Cardon *et al.*, 2009); this could differentially affect firm activities and innovation outcomes. Founders with a high passion for inventing enjoy performing activities such as new product development, as these activities reinforce their self-identity. These founders are likely to devote a significant amount of firm resources towards experimentation and prototyping, consistent with exploration activities. Indeed, Cardon *et al.* (2013: 376) suggest that certain founders 'search for innovative ideas deeper and more frequently than others', and such activities could enhance a venture's innovativeness. This is consistent with previous research indicating that exploration which involves the search for novel technologies, among other activities, positively influences firm innovation (Benner and Tushman, 2003; March, 1991; McGrath, 2001). Furthermore, activities associated with passion for inventing are important for new venture development. This lowers the relationship conflict within the venture (Boone, Andries and Clarysse, 2020) and increases employee commitment (Breugst *et al.*, 2012). In other words, employees perceive founders' passion for inventing as a commitment to the success of the focal venture, and this increases their commitment towards the organization. Committed employees are aligned with the needs of the organization, which benefits the organization in executing its strategies (Kumar and Pansari, 2015; Meyer, Becker and Vandenberghe, 2004). For instance, committed employees are likely to engage deeply with the innovation activities that the founder is motivated to pursue (Eisenberger, Fasolo and Davis-LaMastro, 1990), which could lead to better execution of exploration activities and consequently enhance innovation outcomes.

Complementarily, founders with a passion for developing experience positive feelings when engaging in activities that enable venture growth and identify strongly with such activities (Cardon *et al.*, 2009). These development activities complement exploration activities and contribute to firms' innovation outcomes in two distinct ways. First, founders with a high passion for developing are motivated to continue expanding and growing their venture. To achieve this objective, founders must be willing to engage in exploration activities, including R&D (Rothaermel and Deeds, 2004).

Second, the activities that founders with a high passion for developing engage in (e.g. developing human capital) could lead to the development of routines and capabilities that facilitate innovation (Benner and Tushman, 2003; Jelinek and Schoonhoven, 1990). This enables the new ventures to achieve growth and ensures bureaucratic stability (Cardon *et al.*, 2009). Indeed, Greve (2007) finds that the development of routines enables firms to engage in exploration activities and be more innovative than other firms. For example, routines like a design thinking and customer discovery process could help firms iteratively develop new products. Founders are also less likely to encounter resistance from employees, as developing activities are consistent with the venture development stage (Boone, Andries and Clarysse, 2020). This increase in employee commitment enhances the execution of new venture exploration activities and improves innovation outcomes (Eisenberger, Fasolo and Davis-LaMastro, 1990; Meyer, Becker and Vandenberghe, 2004).

In contrast, a high passion for founding motivates founders to engage in new venture creation activities, as they experience an intense positive feeling when they engage in activities that are meaningful to their founder identity. The activities associated with starting a new venture divert founders' attention away from the focal firm and do not align with focal firms' exploration activities. In other words, while activities associated with EP for founding are relevant during the early stages of the venture development (Boone, Andries and Clarysse, 2020), the need for these activities reduces as the venture develops. Persisting with activities fuelled by EP for founding will lead to a mismatch between activities performed and exploration activities. Such a misalignment between founders' passion and the necessary activities will also lead to a decrease in employee commitment (Breugst *et al.*, 2012), which could adversely affect the execution of the focal firms' strategies. Furthermore, the challenges and resource requirements associated with venture creation activities (Brush, Greene and Hart, 2001; Zott and Huy, 2007) could significantly reduce the attention and resources available to properly execute exploration activities in the focal venture, and consequently decrease innovation outcomes. As exploring and entering new technological domains and/or market segments requires significant managerial attention and organizational resources, pursuing activities to

start a new business diverts valuable attention and resources from the focal venture and reduces the likelihood of making new products.

In sum, we argue that EP for inventing and developing has a positive relationship with the new venture exploration activities, and this has a positive effect on PII, whereas EP for founding is negatively associated with new venture exploration activities, and this adversely affects PII. Thus, we state:

H2a: The relationship between founders' passion for inventing and a new venture's PII is mediated by its exploration activities, such that high passion for inventing has a positive effect on exploration activities, which enhances PII.

H2b: The relationship between founders' passion for developing and a new venture's PII is mediated by its exploration activities, such that high passion for developing has a positive effect on exploration activities, which enhances PII.

H2c: The relationship between founders' passion for founding and a new venture's PII is mediated by its exploration activities, such that high passion for founding has a negative effect on exploration activities, which diminishes PII.

Mediating effect of exploitation. Adopting a similar logic to our previous set of hypotheses (H2a–c), we argue that the ability of firms to execute exploitation activities is enabled or constrained by the type of EP that is activated. A high level of passion for developing motivates founders to engage in the process of nurturing and growing their firms, as they experience intense positive feelings when engaging in such activities and strongly identify with the developer role. Founders with a passion for developing undertake various activities that develop the ventures' capabilities and promote venture growth, and these activities share a natural alignment with exploitation activities. Although exploitation activities are primarily related to refining and enhancing existing knowledge and technologies, they can lead to new products for existing customers and have a positive impact on firm innovation (Andriopoulos and Lewis, 2009; Benner and Tushman, 2003).

While activities motivated by a high passion for inventing are relatively less aligned with exploitation activities (compared to activities driven by passion for developing), these activities complement exploitation activities. Founders with a high

level of passion for inventing identify strongly with activities associated with inventing new products and solving customer problems. To successfully bring new products to market, firms need to execute exploitation activities (Benner and Tushman, 2003; Rothaermel and Deeds, 2004). The routines and capabilities that the firms develop to enhance the quality of their existing products and lower costs could also allow them to successfully introduce new products to market. We argue that founders with a high level of passion for inventing will be able to regulate their attention and effort towards exploitation activities, as successful commercialization of innovation reinforces their inventor identity. This is consistent with the literature, which emphasizes the mutually reinforcing relationship between exploration and exploitation activities (Parida, Lahti and Wincent, 2016; Raisch et al., 2009) and highlights the ability of founders to demonstrate adaptability and alignment at the same time (Kammerlander et al., 2015). Indeed, prior research suggests that individuals who possess high levels of leadership-based contextual ambidexterity are able to engage in both exploration and exploitation activities (Gibson and Birkinshaw, 2004). Furthermore, the activities associated with EP for inventing and developing are consistent with the venture development stage, and this could enhance the execution of these activities due to lower relationship conflict within the venture (Boone, Andries and Clarysse, 2020) and increased employee commitment (Breugst et al., 2012).

Similar to our arguments related to exploration activities, we claim that the activities associated with EP for founding are incompatible with the activities required to execute exploitation activity. While activities associated with EP for founding are important during the early stages of venture development (Boone, Andries and Clarysse, 2020), their importance reduces as the new venture develops. In other words, EP for founding drives founders' attention and firm resources away from focal venture activities. Further, EP for founding has a negative effect on employee commitment and team bonding (Boone, Andries and Clarysse, 2020; Breugst et al., 2012), which can adversely affect the implementation of exploitation activities. Based on the above arguments, we suggest that passion for developing and inventing has a positive relationship with new venture exploitation activities, and this positively affects PII. In contrast, passion

for founding is negatively related to new venture exploitation activities, and this adversely affects PII. Thus, we hypothesize:

H3a: The relationship between founders' passion for inventing and a new venture's PII is mediated by its exploitation activities, such that passion for inventing has a positive effect on exploitation activities, which enhances PII.

H3b: The relationship between founders' passion for developing and a new venture's PII is mediated by its exploitation activities, such that passion for developing has a positive effect on exploitation activities, which enhances PII.

H3c: The relationship between founders' passion for founding and a new venture's PII is mediated by its exploitation activities, such that passion for founding has a negative effect on exploitation activities, which diminishes PII.

Research method

Sample and data collection

We developed our sampling frame of new ventures from the Ghana Business Directory's databases (Acquaah, 2007). Our selected sample met the following requirements: (1) firms aged between 3 and 8 years of business existence to appropriately capture new venture activities and innovation outcome (McDougall and Oviatt, 1996; McGee, Dowling and Megginson, 1995); (2) independent firms with complete contact information of the founder; (3) manufacturers of physical products; and (4) firms located in the eight regional capitals and selected small towns classified by the Ghana Statistical Service as major manufacturing regions (Ghana Standard Service, 2000).

We collected our data in two rounds with a 12-month time lag (T1 and T2). Using the above sampling criteria, we selected and contacted 800 new ventures by telephone to request participation. We were unable to reach the founders of 166 new ventures, despite repeated attempts, and 258 founders declined to participate in the study, citing company policy. We then hand-delivered the questionnaire to 376 founders to capture data on passion, exploration and exploitation measures (T1). After discounting missing values (20 responses), we obtained 356 usable responses, representing a response rate of 44.50% (out of the 800 new ventures that we contacted).

In T2, we contacted the founders again approximately 12 months after T1 to gather information on PII (i.e. our dependent variable). After two rounds of reminders, we obtained 289 responses. Several firms were excluded due to missing or inconsistent data, resulting in 29 responses being dropped. Thus, we used 260 complete, matched responses from T1 and T2, representing a 32.25% effective response rate (i.e. $[260/800] \times 100$). The average participating firm had been in business for approximately 5 years and employed 22 full-time employees, with average annual sales of USD 615,139. The firms exhibited annual sales growth and employee growth rates of 2.29% and 1.92%, respectively.

To investigate the possibility of non-response bias influencing our findings, we compared respondents and non-respondents on such variables as firm age, firm size and gender (Rogelberg and Stanton, 2007). Pearson's chi-square test for categorical variables showed no substantial differences between these two groups of respondents (Armstrong and Overton, 1977; Greenwood and Nikulin, 1996).

Measure of constructs

In line with the literature, we used a seven-point multi-item measure to capture all the constructs. The items that were used to measure the constructs are shown in Table 1.

Product innovation intensity. We conceptualized a new venture's PII as the ability of a new venture to launch new products into the market relative to its key competitors. We utilized three items to assess the new venture's PII (Boso, Cadogan and Story, 2013). In contrast to a simple count of the number of new products, this subjective measure allows us to compare a new venture's performance relative to its competitors. Firms that outperform competitors are more likely to survive and grow. Additionally, founders make strategic decisions based on their perceptions (Choi and Shepherd, 2004). Our perceptual measure also allows for comparison across industries, which might not be possible when using objective data due to contextual differences (Boyd, Dess and Rasheed, 1993).

New venture's exploration-exploitation activities. We followed the approach used by prior studies (Lubatkin *et al.*, 2006; Sirén, Kohtamäki and Kuckertz, 2012) to capture exploration and

Table 1. Constructs, measurement items and reliability and validity tests

Item description	Factor loadings
Passion for inventing: $\alpha = 0.82$; CR = 0.81; AVE = 0.67	
IPF ₁ – It is exciting to figure out new ways to solve unmet market needs that can be commercialized.	0.70
IPF ₂ – Searching for new ideas for products/services to offer is enjoyable to me.	0.70
IPF ₃ – I am motivated to figure out how to make existing products/services better.	0.81
IPF ₄ – Scanning the environment for new opportunities really excites me.	0.73
IC ₁ – Inventing new solutions to problems is an important part of who I am.	–
Passion for developing: $\alpha = 0.86$; CR = 0.86; AVE = 0.67	
IPF ₁ – I really like finding the right people to market my product/service to.	0.79
IPF ₂ – Assembling the right people to work for my business is exciting.	0.86
IPF ₃ – Pushing my employees and myself to make our company better motivates me.	0.79
IC ₁ – Nurturing and growing companies are important parts of who I am.	–
Passion for founding: $\alpha = 0.85$; CR = 0.84; AVE = 0.65	
IPF ₁ – Establishing a new company excites me.	0.78
IPF ₂ – Owning my own company energizes me.	0.85
IPF ₃ – Nurturing a new business through its emerging success is enjoyable.	0.75
IC ₁ – Being the founder of a business is an important part of who I am.	–
Exploration: $\alpha = 0.91$; CR = 0.91; AVE = 0.61	
The firm looks for novel technological ideas by thinking ‘outside the box’.	0.80
The firm bases its success on its ability to explore new technologies.	0.82
The firm creates products or services that are innovative to the firm.	0.81
The firm looks for creative ways to satisfy its customers’ needs.	0.71
The firm aggressively ventures into new market segments.	0.79
The firm actively targets new customer groups.	0.78
Exploitation: $\alpha = 0.94$; CR = 0.93; AVE = 0.69	
The firm commits to improve quality and lower cost.	0.89
The firm continuously improves the reliability of its products and services.	0.74
The firm increases the levels of automation in its operations.	0.73
The firm constantly surveys existing customers’ satisfaction.	0.86
The firm fine-tunes what it offers to keep its current customers satisfied.	0.89
The firm penetrates more deeply into its existing customer base.	0.88
Product innovation intensity: $\alpha = 0.83$; CR = 0.80; AVE = 0.64	
Our company has produced more new products for our customers than our key competitors during the past 3 years.	0.68
On average, each year we introduce more new products in our markets than our key competitors.	0.81
Industry experts would say that we are prolific when it comes to introducing new products.	0.76
Environmental munificence: $\alpha = 0.86$; CR = 0.83; AVE = 0.57	
There is a high level of market demand.	0.78
There is a high degree of community support.	0.79
There is availability of financial resources in the business environment.	0.77
Environmental dynamism: $\alpha = 0.78$; CR = 0.77; AVE = 0.53	
In this market, it is easy to predict the actions of one’s competitors.	0.66
New markets are emerging for products and services.	0.80
In this market, production/manufacturing technology is constantly changing.	0.74
Fitness of measurement model	
Chi-square/df	1.23
RMSEA	0.03
CFI	0.97
NNFI	0.95
SRMR	0.04

Note: IPF = intense positive feelings; IC = identity centrality. Following methodological prescriptions of Cardon and Kirk (2015), we excluded the item measuring identity centrality from the CFA model. AVE = average variance extracted; CR = composite reliability.

exploitation activities. This approach was used because our major focus was on new ventures. Accordingly, a new venture’s exploration and exploitation activities were measured using six items

each. To arrive at the overall score for exploration (exploitation), we calculated the mean values for each of the six items associated with exploration (exploitation).

Entrepreneurial passion. EP includes three measures of passion for inventing, passion for founding and passion for developing established by Cardon *et al.* (2013). Additionally, for each passion scale, two subscales were captured: the intense positive feelings the entrepreneur had towards the particular activity and the identity centrality of each entrepreneurial role (inventing, founding and developing) (Cardon *et al.*, 2013). In all, 13 items measured EP. The intense positive feelings component encompasses four passion-for-inventing items, three passion-for-founding items and three passion-for-developing items. Correspondingly, the identity centrality component was measured with one item for each passion domain. A final score for each passion domain was calculated by following the previous treatment of passion (Cardon and Kirk, 2015). Specifically, a multiplicative interaction between intense positive feelings and the identity centrality of activity was computed by multiplying the identity centrality score by its corresponding composite intense positive feeling measure. For example, a founder identity centrality multiplied by intense positive feelings for founding led to a weighted score for passion for founding.

Control variables. We entered several control variables to account for exigencies that may influence the model. These are firm size, firm age, environmental munificence, environmental dynamism, founding experience, industry type, gender, entrepreneurs' age and education. Firm size and firm age were added as control variables because previous studies indicate that large and old firms possess resources that could be used to improve their innovation capabilities (Bouncken, Ratzmann and Kraus, 2021; Hansen, 1992). We controlled for environmental munificence as it has the potential to contribute to innovation processes in entrepreneurial firms (Xue, Ray and Sambamurthy, 2012). We measured firm size as the number of firm employees (Hmieleski and Baron, 2009). We measured firm age as the number of years the business has been operational since its inception. Environmental munificence was measured using three items from Baum and Locke (2004). This measure captures the support the environment provides new ventures in terms of availability of financial resources, market demand and community support. We also controlled for en-

vironmental dynamism because previous research shows that it plays an important role in explaining innovation outcomes (Baron and Tang, 2011; Wang and Chen, 2010). Environmental dynamism was captured using three items from Jaworski and Kohli (1993). As entrepreneurial experience can affect firm outcomes (Hmieleski and Baron, 2009), we also controlled for it. Following prior research (Hmieleski and Baron, 2009), we measured founders' founding experience using a single survey item, asking founders to report 'the number of new ventures started before the founding of your current business'. Although some studies dummy-coded entrepreneurial experience as 0 or 1 (Cooper, Folta and Woo, 1995), the actual number of new ventures started (from 0 to 6) allowed for additional learning each time an entrepreneur founded a venture (Hmieleski and Baron, 2009). We used nine manufacturing industry classifications as control variables (Karami and Tang, 2019). These are: (1) food, beverage and tobacco products; (2) textile, leather, clothing and footwear; (3) wood and paper products; (4) printing; (5) petroleum, chemical, polymer and rubber products; (6) non-metallic mineral products; (7) metal products; (8) transport machinery and equipment; and (9) furniture and other manufacturing. These were then categorized as high- or low-technology industries based on R&D expenditure scores and the percentage of knowledge workers in each industry (Karami and Tang, 2019). These classifications were used because firms operating in high-technology industries are more likely to innovate than firms in low-technology industries (Covin and Slevin, 1990). Petroleum, chemical, polymer and rubber products; non-metallic mineral products and metal products industries were classified as 'high-technology' industry, coded '0'. The rest of the industries were considered as 'low-technology' industry, coded '1'. We also controlled for entrepreneur's age in years, gender (male = 0; female = 1) and educational attainment by asking founders to indicate their highest level of education from the following: 1 = 'high school'; 2 = 'bachelor's degree'; 3 = 'master's degree'; and 4 = 'doctoral degree'. These individual-level factors were added as control variables, as previous research shows that individual-level factors influence innovation outcomes (Fuentelsaz, Maicas and Montero, 2018).

Validity and reliability of the measurement model

Prior to testing the hypotheses, we undertook a confirmatory factor analysis (CFA) to ensure that the measurement items and their respective constructs are valid and reliable. Thus, we estimated a CFA model, with all items loading on their theoretical latent construct. Accordingly, the seven-factor CFA model produced the following acceptable fit indices, as per existing recommendations (Bagozzi and Yi, 1988; Kline, 2015): $\chi^2/df = 1.23$; RMSEA = 0.03; CFI = 0.97; NNFI = 0.95; SRMR = 0.04. Additionally, all the items loaded significantly ($p < 0.001$) on their respective constructs.

A further test of reliability and validity indicates that Cronbach's alpha, average variance extracted (AVE) and composite reliability (CR) scores all exceeded the recommended threshold values of 0.70, 0.50 and 0.60, respectively (Hair, Babin and Krey, 2017; Hair *et al.*, 2014). Finally, a comparison of the AVE scores and the interconstruct correlation coefficients shows that all the multi-item constructs achieved discriminant validity. Table 1 provides details of the measurement items for all constructs and the relevant statistics for our CFA estimation. Table 2 shows the means, standard deviations and correlations of the study variables.

Common method variance

Although it has been recommended that different data sources be used to measure independent and dependent variables to avoid potential common method bias (Podsakoff *et al.*, 2003), this is not particularly feasible in certain contexts such as new ventures and developing countries. Therefore, we adopted several ex-ante and ex-post procedures (Chang, Van Witteloostuijn and Eden, 2010) to ensure that common method bias does not affect our data. For the ex-ante procedure, we mixed the order of questions and used different scale types to reduce the likelihood of 'consistency motive and theory-in-use biases' (Chang, Van Witteloostuijn and Eden, 2010; Podsakoff *et al.*, 2003). In particular, founders completed several filler tasks, which created a psychological separation between the measurement of one variable and the other (Fulmer, Barry and Long, 2009). In addition, we time-lagged our data collection. We contacted the founders of 356 firms who responded to our survey approximately 12 months after the end of the

first survey (T1) to capture our dependent variable (T2). This approach is similar to the one used by Mihalache *et al.* (2014).

In the ex-post procedure, we estimated three competing CFA models: (1) *method only*, $\chi^2/df = 11.79$; RMSEA = 0.18; CFI = 0.53; NNFI = 0.51; SRMR = 0.16; (2) *trait only*, $\chi^2/df = 1.23$; RMSEA = 0.03; CFI = 0.97; NNFI = 0.95; SRMR = 0.04; and (3) *method and trait*, $\chi^2/df = 1.20$; RMSEA = 0.03; CFI = 0.98; NNFI = 0.97; SRMR = 0.04. When the three CFA models were compared, we found that the method and trait model was not substantially better than the trait-only model. However, the method and trait model and the trait-only models performed better than the method-only model. Thus, common method variance has little or no influence on our data.

Estimation approach

All the direct relationships were tested using hierarchical regression analysis. We first predicted the direct effects of passion for inventing, developing and founding on PII to test H1a–c. Second, we examined the mediating effects (H2a–c and H3a–c) by employing the PROCESS macro (Hayes, 2013; Preacher and Hayes, 2008). Previous research has adopted the same approach to test mediation hypotheses (e.g. Breugst *et al.*, 2012; Oo *et al.*, 2019), and this approach has proven to be robust. This approach allows us to test our multiple indirect effects through bootstrapping. Thus, we estimate different indirect effects for each domain of passion for PII via exploration and exploitation. For each indirect effect, the bootstrapped estimates and their corresponding 95% lower and upper confidence intervals are reported.

Results

Table 2 presents the descriptive statistics and correlations of all the variables. Prior to conducting the regression analysis, all the variables were mean-centred to prevent multicollinearity (Aiken and West, 1991). The largest variance inflation factor (VIF) value was 3.92, which is well below the suggested cutoff point of 10 (Neter *et al.*, 1996), suggesting that multicollinearity is not considered a serious issue in our analysis. In addition, we checked our data against potential violations such

Table 2. Means, standard deviations and correlations

No.	Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	Firm age	4.74	1.47																
2	Firm size	22.18	13.30	0.43															
3	Industry type ^a	-	-	0.12	-0.01														
4	Entrepreneurial experience	2.12	1.50	0.02	0.08	0.08													
5	Gender ^a	-	-	0.08	0.05	-0.19	-0.10												
6	Level of education ^a	-	-	-0.03	-0.07	0.05	0.08	-0.09											
7	Entrepreneur's age ^b	3.60	0.21	0.10	-0.01	-0.01	0.35	-0.04	-0.03										
8	Environmental munificence	4.82	0.99	0.01	0.17	0.08	-0.04	-0.02	0.06	-0.01									
9	Environmental dynamism	4.76	0.96	0.12	0.20	0.08	-0.08	-0.13	0.03	-0.02	0.45								
10	Passion for founding	21.65	9.74	0.05	0.05	-0.03	-0.04	-0.04	0.06	-0.04	0.13	0.16							
11	Passion for inventing	26.08	9.03	-0.12	-0.07	-0.18	-0.13	-0.08	0.01	0.02	0.13	-0.02	0.21						
12	Passion for developing	25.48	9.49	-0.12	0.00	-0.06	0.04	-0.05	0.01	0.06	0.09	0.07	-0.02	0.04					
13	Exploitation	4.98	0.91	0.03	-0.01	-0.11	-0.08	-0.07	-0.04	0.02	0.15	0.01	0.04	0.40	0.18				
14	Exploration	5.19	1.11	0.11	0.03	-0.07	-0.03	0.12	0.05	-0.06	0.16	-0.03	0.11	0.20	0.19	0.24			
15	Product innovation intensity	4.72	1.14	0.09	-0.09	-0.06	0.00	-0.10	-0.02	-0.03	0.04	0.01	0.02	0.16	0.12	0.28	0.33	1.00	

Notes: Correlations above 0.10 and 0.17 are significant at $p < 0.05$ and $p < 0.001$, respectively.

^aDummy variable; M = mean; SD = standard deviation.

^bNatural logarithm transformation of the original values.

Table 3. Prediction of the dependent variable (product innovation intensity)

Variables	Model 1 Product innovation intensity	Model 2 Product innovation intensity	Model 3 Product innovation intensity
<i>Controls</i>			
Firm age ^a	0.20 (2.90)**	0.23 (3.34)**	0.15 (2.27)*
Firm size ^a	-0.19 (-2.67)**	-0.19 (-2.70)**	-0.16 (-2.44)*
Industry type ^b	-0.12 (-1.91)	-0.09 (-1.33)	-0.06 (-1.04)*
Entrepreneur's experience ^a	0.04 (0.60)	0.06 (0.90)	0.05 (0.92)
Entrepreneur's age	-0.08 (-1.22)	-0.10 (-1.56)	-0.07 (-1.16)
Entrepreneur's education	-0.05 (-0.79)	-0.05 (-0.81)	-0.05 (-0.92)
Gender	-0.13 (-2.17)*	-0.11 (-1.80)	-0.13 (-2.23)*
Environmental munificence	0.09 (1.29)	0.05 (0.76)	-0.02 (-0.28)
Environmental dynamism	-0.03 (-0.36)	-0.01 (-0.18)	0.03 (0.45)
<i>Main effects</i>			
Passion for inventing		0.16 (2.50)*	0.03 (0.62)
Passion for developing		0.14 (2.25)*	0.05 (0.73)
Passion for founding		-0.03 (-0.37)	-0.03 (-0.52)
<i>Mediating effects</i>			
Exploration			0.18 (2.72)**
Exploitation			0.28 (4.47)**
R ²	0.06	0.11	0.23
ΔR ²	-	0.05	0.12
F-value	1.89	2.52*	4.70**

Notes: Standardized coefficients are reported. t-Values in parentheses. *p < 0.05; **p < 0.01.

^aNatural logarithm transformation of the original values.

^bDummy variable.

as normality assumptions and outliers. The results from our analysis suggest no significant violations. Thus, the data were appropriate for regression analysis. We present the results of the direct effects in Tables 3 and 4.

The results in Table 3 indicate that both passion for inventing ($\beta = 0.16$, t-value = 2.50, $p < 0.05$) and developing ($\beta = 0.14$, t-value = 2.25, $p < 0.05$) positively relate to PII. This provides support for our H1a, b. Contrary to H1c, we find no significant relationship between passion for founding and PII ($\beta = -0.03$, t-value = -0.37). This indicates that H1c was not supported. Although we did not explicitly hypothesize for the relationship between domains of passion on exploration and exploitation, consistent with our H2a, b and H3a, b, we found that passion for inventing ($\beta = 0.17$, t-value = 2.76, $p < 0.01$) and developing ($\beta = 0.21$, t-value = 3.50, $p < 0.01$) positively influence exploration, while passion for founding has no significant effect on exploration ($\beta = 0.06$, t-value = 1.04). Relative to exploitation, the analysis showed that passion for inventing ($\beta = 0.38$, t-value = 6.16, $p < 0.01$) and developing ($\beta = 0.17$, t-value = 2.90, $p < 0.01$) have positive effects on exploitation. The results also reveal

that passion for founding has no effect on exploitation ($\beta = -0.05$, t-value = -0.89). Similarly, we did not explicitly hypothesize the direct effect of exploration and exploitation on product innovation. However, our findings indicate a positive relationship between exploration and PII ($\beta = 0.18$, t-value = 2.7, $p < 0.01$) and exploitation and PII ($\beta = 0.28$, t-value = 4.47, $p < 0.01$). These findings are consistent with H2a, b and H3a, b. Tables 3 and 4 present details of the hierarchical regression analysis and its model fit (i.e. R² values and the significance of F-values).

To test the mediation hypotheses, we used the PROCESS macro (Hayes, 2013). Specifically, we tested the mediating mechanism of exploration (H2a-c) and exploitation (H3a-c) in the relationship between founders' passion (i.e. founding, inventing and developing) and PII. Table 5 presents the estimates of the indirect effects and the corresponding 95% lower limit confidence interval (LLCI) and upper limit confidence interval (ULCI). The results in Table 5 show a significant positive indirect effect of passion for inventing on PII via exploration ($\beta = 0.07$, 95% CI = 0.02, 0.12). Thus, H2a was supported. Also, the indirect effect of passion for developing on PII via

Table 4. Prediction of mediating variables (exploration and exploitation)

Variables	Model 1 Exploration	Model 2 Exploration	Model 3 Exploitation	Model 4 Exploitation
<i>Controls</i>				
Firm age ^a	0.16 (2.72)**	0.19 (2.89)**	0.09 (1.33)	0.14 (2.20)*
Firm size ^a	-0.06 (-0.85)	-0.07 (-0.91)	-0.06 (-0.89)	-0.06 (-0.86)
Industry type ^b	-0.09 (-1.40)	-0.04 (-0.64)	-0.14 (-2.21)*	-0.06 (-1.05)
Entrepreneur's experience ^a	0.01 (0.14)	0.03 (0.50)	-0.09 (-1.33)	-0.04 (-0.61)
Entrepreneur's age	-0.08 (-1.16)	-0.10 (-1.58)	0.04 (0.55)	-0.01 (-0.05)
Entrepreneur's education	0.05 (0.77)	0.04 (0.72)	-0.05 (-0.73)	-0.05 (-0.81)
Gender	0.09 (1.25)	0.11 (1.82)*	-0.11 (-1.84)	-0.06 (-1.07)
Environmental munificence	0.23 (3.31)**	0.17 (2.68)**	0.21 (2.94)**	0.13 (1.92)
Environmental dynamism	-0.12 (-1.73)	-0.12 (-1.78)	-0.09 (-1.27)	-0.06 (-0.79)
<i>Main effects</i>				
Passion for inventing		0.17 (2.76)**		0.38 (6.16)**
Passion for developing		0.21 (3.50)**		0.17 (2.90)**
Passion for founding		0.06 (1.04)		-0.05 (-0.89)
R ²	0.08	0.16	0.07	0.22
ΔR ²	-	0.08	-	0.15
F-value	2.35*	3.79**	1.95*	5.64**

Notes: Standardized coefficients are reported. t-Values in parentheses. *p < 0.05; **p < 0.01.

^aNatural logarithm transformation of the original values.

^bDummy variable.

Table 5. Mediation analysis with bootstrapped effect estimates

Hypothesized mediation paths	Indirect effect	SE	LL 95% CI	UL 95% CI
Inventing → exploration → product innovation intensity	0.07*	0.03	0.02	0.12
Inventing → exploitation → product innovation intensity	0.09*	0.04	0.02	0.17
Developing → exploration → product innovation intensity	0.07*	0.03	0.03	0.12
Developing → exploitation → product innovation intensity	0.04*	0.03	0.01	0.09
Founding → exploration → product innovation intensity	0.03	0.02	-0.01	0.06
Founding → exploitation → product innovation intensity	0.00	0.01	-0.02	0.04

Note: *Non-zero within the boundaries (significant). CI are bias corrected based on 10,000 bootstrap samples. CI = confidence interval; LL = lower limit; SE = standard error; UL = upper limit.

exploration ($\beta = 0.07$, 95% CI = 0.03, 0.12) was positive and significant, providing support for H2b. However, the results in Table 5 indicate that the indirect effect of passion for founding on PII via exploration was non-significant ($\beta = 0.03$, 95% CI = -0.01, 0.06). Thus, H2c was not supported. Moreover, the results in Table 5 indicate a significant and positive indirect effect of passion for inventing on PII via exploitation ($\beta = 0.09$, 95% CI = 0.04, 0.17). This finding provides support for H3a. Additionally, we found a positive and significant indirect effect of passion for developing on PII via exploitation ($\beta = 0.04$, 95% CI = 0.01, 0.09), providing support for H3b. Contrarily, the indirect effects of passion for founding on PII via exploitation ($\beta = 0.00$, 95% CI = -0.02, 0.04) was non-significant. Thus, H3c was not supported.

Robustness analyses

We performed additional analyses to substantiate the robustness of our research model using an alternative measure of innovation (novelty of innovation) as our dependent variable. Specifically, we used the three-item scale developed by Naman and Slevin (1993) to measure novelty of innovation. We used the same PROCESS macro (Hayes, 2013) to examine the indirect effects of the three passion domains on innovation. The results show that exploration mediates the relationship between passion for inventing (indirect effect = 0.05, SE = 0.03, 95% CI = 0.02, 0.17), passion for developing (indirect effect = 0.07, SE = 0.04, 95% CI = 0.09, 0.22) and novelty of innovation. These results confirm H2a, b. The results further show that exploration does not

mediate the relationship between passion for founding and novelty of innovation (indirect effect = 0.02, SE = 0.01, 95% CI = -0.02, -0.08). Thus, H2c was not supported. In addition, the results show that exploitation positively mediates the relationship between passion for inventing (indirect effect = 0.07, SE = 0.05, 95% CI = 0.04, 0.18), passion for developing (indirect effect = 0.05, SE = 0.06, 95% CI = 0.03, 0.19) and novelty of innovation. These results confirm H3a, b. However, exploitation does not mediate the relationship between passion for founding and innovation (indirect effect = -0.02, SE = 0.02, 95% CI = -0.03, 0.13), providing no support for H3c.

Discussion

Since the operationalization of the EP scale (Cardon *et al.*, 2013), several studies have examined the effects of EP on diverse entrepreneurial behaviours and outcomes (Drnovsek, Cardon and Patel, 2016; Mueller, Wolfe and Syed, 2017; Stenholm and Renko, 2016; Strese *et al.*, 2018). These studies have provided unique insights that have substantially enhanced our understanding of this domain. However, this body of literature is still in its emerging phase, and there are a number of ways through which scholars can improve our theoretical and empirical understanding of this domain. In this study, we contribute to the EP literature by theorizing and empirically examining the relationship between the three domains of passion (inventing, founding and developing) and new ventures' PII. Furthermore, we examine the mediating effect of new venture activities (exploration and exploitation activities) on the relationship between EP and PII. Consistent with the conceptualization of EP (Cardon *et al.*, 2009), we argue that EP is associated with entrepreneurs' affect and self-identity rather than assuming EP domains to be connected with specific venture stages.

Our findings indicate that there is a direct positive relationship between passion for inventing and developing and new ventures' PII. In contrast, we find no significant direct relationship between passion for founding and new ventures' PII. Our findings suggest that EP for inventing and developing, which is defined as experiencing positive and intense feelings for creative and growth-related activities, respectively, along with identity salience and centrality of being an inventor and developer, mo-

tivates entrepreneurs to take actions that ensure new product development and commercialization (i.e. PII). This is consistent with prior studies which find that passion for inventing is related to venture innovation outcomes (Strese *et al.*, 2018) and passion for developing is associated with venture growth (Drnovsek, Cardon and Patel, 2016). Furthermore, we find a positive indirect relationship between passion for inventing and developing and new ventures' PII through both the exploration and exploitation activities. However, we find that passion for founding is not associated directly or indirectly with PII. Our findings indicate that entrepreneurs' passion (inventing, founding and developing) has differential effects on new venture activities and outcomes. Thus, our study highlights the importance of examining the effects of the three EP domains on entrepreneurs' behaviours and venture activities rather than just focusing on a specific EP domain.

Implications for research

Our first contribution is to the emerging EP literature, which has emphasized the differential effects of EP on new venture activities and outcomes. Researchers have previously acknowledged that EP has differential effects on entrepreneurial activities and outcomes (Cardon *et al.*, 2009), but empirical examination of this remains scant. Researchers have predominantly focused on examining the relationship between a specific type of EP (e.g. passion for developing) and venture outcomes (Drnovsek, Cardon and Patel, 2016; Mueller, Wolfe and Syed, 2017), and a few researchers have examined the relationship between the three EP domains and venture outcomes. For instance, Stenholm and Renko (2016) examined the relationship between the three EP domains and entrepreneurial survival but found no relationship between them. However, they did find that bricolage positively mediates the relationship between EP for inventing and developing and entrepreneurial survival. Interestingly, Breugst *et al.* (2012) found that entrepreneurs' passion for inventing and developing increases employee commitment, whereas passion for founding decreases it. Our findings indicate that both passion for inventing and passion for developing are positively associated with new ventures' PII, whereas passion for founding has no positive or adverse effect. This indicates that EP differentially affects

new venture activities, which might enable or hinder the acquisition and application of knowledge necessary to develop and commercialize new products (Sirén, Kohtamäki and Kuckertz, 2012). Our study provides further proof that EP is independent of venture stage and is associated with entrepreneurs' affect and self-identity. Our findings also suggest that additional research is needed to better understand the relationship between EP domains and venture outcomes.

Second, our study contributes to the EP literature by examining the mechanism through which EP affects new venture outcomes. Although prior studies suggest that EP drives entrepreneurial behaviours and consequently affects venture outcomes (Drnovsek, Cardon and Patel, 2016; Mueller, Wolfe and Syed, 2017; Stenholm and Renko, 2016; Strese *et al.*, 2018), we still lack understanding of how the three EP domains differentially affect venture activities and outcomes. To address this shortcoming, we examine the mediating effect of exploration and exploitation activities on the relationship between EP and PII. We suggest that specific EP domains either enable or hinder entrepreneurs' ability to engage in exploration and exploitation activities. In some situations, exploration and exploitation activities might be completely aligned with the founders' EP, while in other situations exploration and exploitation activities may be complementary to activities associated with founders' EP (even if they are not fully in sync). In contrast, certain EP-driven activities may not fit with exploration and exploitation activities. In other words, the activities associated with founders' EP (e.g. developing and founding) are either compatible or incompatible with exploration and exploitation activities. Our estimates suggest that founders' inventing EP particularly complements exploitation activities. If the activities associated with founders' EP are compatible, then founders can regulate their attention and effort towards these activities, and this could enhance venture outcomes. Otherwise a conflict arises, and this makes it hard for founders to regulate their attention and effort towards those activities, which could adversely affect venture outcomes. Indeed, prior research findings indicate that (mis)fit between passion and activities necessary for the venture stage affects venture performance (Boone, Andries and Clarysse, 2020).

Our results indicate that certain EP domains are a better fit with exploration and exploitation

activities than others. Specifically, both passion for inventing and passion for developing are positively related to both exploration and exploitation activities, and consequently PII. More importantly, none of the EP domains have conflictive effects. That is, none of the EP domains facilitating exploration activities impede exploitation activities. This is consistent with the literature, which has emphasized the mutually reinforcing relationship between exploration and exploitation (Parida, Lahti and Wincent, 2016; Raisch *et al.*, 2009). Our findings also complement recent research findings which indicate that founders' behaviours influence small firms' exploration and exploitation activities (Kammerlander *et al.*, 2015; Volery, Mueller and von Siemens, 2015; Voss and Voss, 2013) and enable us to gain a better understanding of exploration and exploitation activities in new ventures.

The third contribution of our study is related to the generalizability of the EP literature. The developing country study context, Ghana, provides an interesting setting to examine the relationship between EP, exploration and exploitation activities and PII. The Ghanaian context is significantly different from developed countries in terms of economic, financial and infrastructure development. The poor market institutions and weak enforcement capacity of regulatory institutions create business uncertainties (Acquaah, 2007; Obeng, Robson and Haugh, 2014) and barriers for new ventures in Ghana (Robson and Obeng, 2008). As the primary decision-maker in new ventures, founders play a critical role in implementing new venture activities. This is particularly true in developing economies like Ghana, where ventures are operated primarily by founders and a great power disparity exists between the founder and employees (Adomako, Opoku and Frimpong, 2017; Amoako and Matlay, 2015; Fainshmidt *et al.*, 2018). For example, it is common in developed countries for entrepreneurs to start new ventures with other team members (co-founders). In the event of conflict among founding team members, the board of directors, investors or legal institutions are well equipped to resolve such conflicts.³ However, this is not the case in a developing country like Ghana, which raises concerns about agency costs (Rashid, 2016). This lack of trust leads to

³<https://techcrunch.com/2017/02/18/co-founder-conflict>; <https://medium.com/@jason/resolving-co-founder-conflicts-647d141d9cd5>.

centralized decision-making in which the founders are closely involved in day-to-day operations of the ventures (De Vries, 1989). Furthermore, there are differences in human capital in developed and developing countries (Hanushek, 2013). Recruiting individuals who can independently manage the new ventures in the absence of the founders is challenging in developing countries, and this further necessitates founders being closely involved in the operation of their ventures. This could also compel founders in developing countries like Ghana to perform venture activities in-house, as they cannot rely on support from other organizations or institutions for complementary activities. While founders in developed countries might be able to engage in exploration and exploitation activities by outsourcing certain activities or hiring experienced employees to manage certain activities (Schreuders and Legesse, 2012), this is less likely to occur in Ghana due to lack of trust (weak institutional environment) and resource constraints (including human capital). This suggests that in certain contexts, exploration and exploitation activities are balanced at the firm level (Benner and Tushman, 2003) rather than at the broad institutional level (Gupta, Smith and Shalley, 2006).

Implications for practice

The insights of our study provide several practical implications for founders. First, it is important for founders to recognize that certain types of passion may result in conflict with venture activities that are important for a particular venture stage, and this could have an adverse effect on venture outcome. Founders should consciously try to regulate their passion-fuelled activities so that they can engage in appropriate venture activities to sustain innovation and growth. Failure to appropriately regulate their passion could have an adverse impact on venture outcomes, especially when the passion-fuelled activities are incompatible with activities needed for a particular venture stage. Second, founders who are passionate about founding and interested in pursuing new entrepreneurial opportunities (e.g. habitual entrepreneurs) should try to recruit a partner (co-founder) or a manager to manage the venture activities. Founders should evaluate the EP of the individuals they are recruiting and select individuals whose EP is compatible with the required venture activities. This will ensure that

the venture is well managed when the founders focus on other entrepreneurial opportunities. However, this might be challenging to achieve in developing countries due to a lack of human capital (Hanushek, 2013). In such contexts, founders will likely need to develop capabilities to perform both exploration and exploitation activities to successfully grow their ventures. Prior research suggests that resource-constrained firms, such as new ventures, engage in 'leadership-based contextual ambidexterity' to pursue both exploration and exploitation activities at the same time (Kammerlander *et al.*, 2015; Lubatkin *et al.*, 2006). Alternatively, in situations in which EP is incompatible with activities necessary for venture development and growth, entrepreneurs should be taught about the adverse impact of pursuing passion-fuelled activities and advised on alternate courses of action. For instance, entrepreneurs with a passion for founding could be encouraged to exit their current venture before pursuing new entrepreneurial opportunities. Third, researchers have highlighted how passion could affect access to financial resources such as grants (Galbraith *et al.*, 2014), venture capital funding (Chen, Yao and Kotha, 2009) and crowdfunding (Li *et al.*, 2017). The insights of our study indicate that the three EP domains have differential effects on outcomes. In general, better firm outcomes increase the chances of funding success. Therefore, it would be prudent for entrepreneurs to display the right fit between passion and venture activities to increase their chances of funding success.

Limitations and future research

Despite our unique insights, like all research, our study has limitations that provide opportunities for future research. First, although our dependent variable is time lagged, we cannot make causal claims about the relationship between EP, exploration and exploitation activities, and innovation. We do not examine the dynamics of EP or exploration and exploitation activities over time. For instance, it is possible that higher innovation levels lead to greater passion for inventing. Future research should seek to collect data at multiple points (e.g. Collewaert *et al.*, 2016) to better understand the dynamic relationships between EP, related mechanisms and venture outcomes. We believe that a longitudinal mixed-method study of

new ventures in various contexts could enable researchers to disaggregate the constructs and provide nuanced insights on these relationships over time. Second, our study relies on self-reported measures. Although we have conducted several statistical checks to mitigate the influence of common source and method bias, future research should seek to utilize alternate designs to further mitigate this issue. One possible option could be gathering data from multiple sources. Relatedly, our dependent variable is a subjective and generic measure of innovation. Although our conceptualization of PII (Boso, Cadogan and Story, 2013) encapsulates broader aspects of innovation than just the radicalness of innovation (Strese *et al.*, 2018) and is an appropriate outcome to examine in our study context, future research can enhance our understanding by using objective measures for venture outcomes and disaggregating it to measure both innovation for existing customers as well as new customers. Fourth, based on the studies by Cardon *et al.* (2009, 2013), we assumed that founders experience three types of passion related to the entrepreneurial process. We did not check if the founders experienced any other types of passion. Recent research has indicated that founders experience additional sources of passion (Cardon, Glauser and Murnieks, 2017) and non-EP (Huyghe, Knockaert and Obschonka, 2016). Future research should seek to account for different sources of entrepreneurial and non-EP that could impact entrepreneurial behaviours, cognitions and outcomes. Fifth, while we controlled for firm age and firm size as proxies for firm resources, new ventures have limited organizational and managerial resources, which could hinder their ability to engage in exploration and exploitation activities. Future research should investigate the conditions in which exploration and exploitation activities reinforce or contradict each other. Likewise, future research should examine how environmental factors such as complexity and competitive intensity affect the relationships in our model. Specifically, future research could build on our study to examine the boundary conditions under which the relationship between EP domains and exploration and exploitation activities differ. Indeed, prior findings indicate that there is a positive relationship between managers' market orientation and SMEs' exploration activities, as well as exploitation activities (Abebe and Angriawan, 2014). However, findings reveal that competitive intensity negatively

(positively) moderates the relationship between managers' market orientation and SMEs' exploitation (exploration) activities. Relatedly, future research could examine if the context affects the relationship between EP and exploration and exploitation activities. Although prior research suggests that founders can shift their focus between exploration and exploitation activities (Kammerlander *et al.*, 2015; Lubatkin *et al.*, 2006), research also indicates this could cause cognitive strain (Keller and Weibler, 2015). This suggests that in certain contexts (e.g. dynamic, technology-intensive industries) founders could experience challenges in shifting their focus between these two distinct activities. Finally, our study focuses on the passion of the key decision-maker (founder). Recent empirical evidence indicates that team EP (Boone, Andries and Clarysse, 2020; de Mol *et al.*, 2020; Santos and Cardon, 2019) can provide richer insights. Future research can build on our study by investigating the effects of team passion on venture outcomes in contexts where teams play an influential role in venture founding.

In conclusion, our study investigates the direct and indirect effects of the three EP domains on new venture PII. We find that these three types of passion have differential effects on new venture exploration and exploitation activities, as well as on PII. Furthermore, by examining exploration and exploitation activities, we address the relative lack of understanding of these activities in the context of new ventures. We hope that our study motivates future research to holistically examine the effects of the three EP domains on new venture activities and outcomes.

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