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Measuring entrepreneurial passion: Conceptual foundations and scale validation ☆

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ABSTRACT

Along with other affective and emotional dimensions, passion is at the heart of entrepreneurship. Yet past research on entrepreneurial passion (EP) has been hindered by the lack of a sound measurement instrument. Through a series of empirical studies conducted with samples from relevant populations, we develop and validate an instrument to capture EP and its inherent dimensions. We show that the task-specific dimensions of EP (intense positive feelings toward the domains of inventing, founding and developing, and the centrality of these domains to entrepreneurs' self-identity) are conceptually and empirically distinct from one another, and from other emotions and cognitions known to play a role in entrepreneurship. Our theory and results indicate that proper measurement of entrepreneurial passion incorporates the interaction between entrepreneurs' feelings and identity centrality for each domain. We discuss the implications of our model, instrument and findings for future research on the affective components of innovation and entrepreneurship. We also develop specific guidelines for using our validated instrument in future research.

1. Executive summary

Passion is at the heart of entrepreneurship, because it can foster creativity and the recognition of new information patterns critical to the discovery and exploitation of promising opportunities (Baron, 2008; Sundararajan and Peters, 2007). Moreover, passion has been associated with entrepreneurs' ability to raise funds from investors (Cardon et al., 2009b; Mitteness et al., 2012; Sudek, 2006), and to hire and motivate key employees (Cardon, 2008). Accordingly, scholars have pressed for a deeper understanding of passion as a central element of entrepreneurial efforts (Cardon et al., 2009a; Chen et al., 2009).

In spite of this interest for understanding the nature, causes and effects of entrepreneurial passion (EP), there is a dearth of systematic empirical evidence for the role of passion in entrepreneurship. At the heart of this problem, scholars and practitioners have lacked a robust and validated instrument for measuring passion and its dimensions in the specific context of entrepreneurship. In addition, extant research has failed to articulate the theoretically-relevant relationships between the experience of intense positive feeling commonly associated with passion, and the meaning of these feelings for entrepreneurs' self-identity.

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To address these issues and advance theory and empirical research on EP, we develop and test a new instrument designed to capture the experience of passion in different domains of entrepreneurship (inventing, founding, and developing). Through a series of studies with different samples of entrepreneurs, we show that the dimensions of EP (intense positive feelings and identity centrality) are conceptually and empirically distinct from each other, and from other aspects of emotion and cognition known to play a role in entrepreneurship. More importantly, we demonstrate that relationships between EP and relevant outcomes are a function of interactions between intense positive feelings towards activities associated with each domain and the identity centrality of that domain to the entrepreneur.

At a theoretical level, our work clarifies the ontological nature of EP, its relevant dimensions (i.e., feelings and identity centrality) and its domains (i.e., EP for inventing, founding, and developing). Building on Cardon et al.'s (2009a) model of entrepreneurial passion, we articulate the role of identity centrality as an integral dimension of entrepreneurial passion. At a methodological level, we contribute a validated set of measures for investigating the antecedents and consequences of EP's dimensions and domains. Because such an instrument was not available before, scholars interested in studying passion in entrepreneurship had to rely on more generalized measures of passion, which do not reflect the challenges specific to entrepreneurship (Murnieks, 2007; Murnieks and Mosakowski, 2006). Finally, at an empirical level, we contribute evidence that the relationships between EP and relevant outcomes vary between different domains.

A primary implication of our work is to facilitate future research on the unique and distinct roles of EP in entrepreneurship, and especially to distinguish EP from other affective and emotional constructs. To this aim, we offer specific guidelines for using the instrument developed in this paper. By developing and validating an instrument for measuring the dimensions and domains of EP, we hope to help advance entrepreneurship research not only on the antecedents and consequences of EP, but also on the broader role of affect and emotion in what remains a fascinating human endeavor.

2. Introduction

Passion is at the heart of entrepreneurship (Cardon et al., 2005). Given the uncertain success of launching new products and services, and the challenges of developing new organizations with limited resources, passion can become a key driver of entrepreneurial action. More concretely, passion can "fuel motivation, enhance mental activity, and provide meaning to everyday work" (Brännback et al., 2006: 6). It can foster creativity and the recognition of new information patterns critical to the discovery and exploitation of promising opportunities (Baron, 2008; Sundararajan and Peters, 2007). Moreover, passion has been associated with the ability of entrepreneurs to raise funds from investors (Cardon et al., 2009b; Mitteness et al., 2012; Sudek, 2006), and to hire and motivate key employees (Cardon, 2008). Accordingly, scholars have pressed for a deeper understanding of passion as a central element of entrepreneurial efforts (Cardon et al., 2009a; Chen et al., 2009).

In spite of recent interest in the role of affect and emotions in entrepreneurship (e.g., Baron, 2008; Cardon et al., 2012; Foo, 2011; Foo et al., 2009), theory about the nature, dimensions, origins and effects of entrepreneurial passion (EP) is underdeveloped (Cardon et al., 2009a). More importantly, the development of such theories into concrete strategies for empirical research is limited, leading to a paucity of empirical findings (e.g., Murnieks, 2007). As a result, we lack systematic evidence about the critical role that passion may play in fostering entrepreneurs' increased efforts (Baum et al., 2001), dedication to relevant tasks (Bierly et al., 2000), persistence towards goals despite significant obstacles (Utsch and Rauch, 2000), or in improving new venture survival and performance.

Two issues appear particularly pressing. First, in spite of Vallerand et al.'s (2003) efforts to draw attention to the role of identity in passion (cf. p. 757–758), we still lack theoretically-consistent measures that account not only for the extent of one's feelings towards various activities, but also for the centrality of these activities for one's self-identity (Cardon et al., 2009a; Murnieks and Mosakowski, 2006; Murnieks et al., 2012; Perttula, 2004). From a theoretical standpoint, passion is more than the experience of strong emotions: it specifically concerns intense positive feelings for activities that are *central* and *meaningful* to an individual's self-identity (Cardon et al., 2009a; Farmer et al., 2011; Fauchart and Gruber, 2011; Murnieks and Mosakowski, 2006; Murnieks et al., 2012; Perttula, 2004). Therefore, measures of passion must specifically integrate the two dimensions of intense positive feelings and identity centrality. Second, we must show that the construct of entrepreneurial passion adds to our understanding of entrepreneurial dynamics. In other words, we must demonstrate that the measurement of entrepreneurial passion is distinct from other cognitive and affective variables that play a role in entrepreneurship, and that it casts new light on the factors and processes that foster entrepreneurship. Otherwise, passion may be construed to be simply an extension of other constructs already in the literature, such as positive affect (Baron, 2008) or optimism (Hmieleski and Baron, 2009).

To address these issues and advance theory and empirical research on EP, we develop and test a new instrument designed to capture the experience of passion in different domains of entrepreneurship (inventing, founding, and developing). Through a series of studies, we show that the dimensions of EP (intense positive feelings and identity centrality) are conceptually and empirically distinct from each other, and from other aspects of emotion and cognition known to play a role in entrepreneurship. We also show that the relationships between EP and relevant outcomes are a function of interactions between intense positive feelings towards activities associated with each domain and the identity centrality of that domain to the entrepreneur.

To our knowledge, ours is among the first empirical studies of passion to specifically examine the potentially interactive role that intense positive feelings and the centrality of target activities for the self-identity of respondents play in an overall model of passion. Thus, we contribute findings concerning this hitherto empirically unexplored aspect of passion. In addition, we help specify the nature of EP and its dimensions, and untangle the relationships between EP and other affective components in

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entrepreneurship. We also contribute an instrument that we hope will enable rigorous research on the affective underpinnings of entrepreneurship, innovation and organizational performance in the future.

We begin by articulating the theoretical foundations of EP and its relevant dimensions and domains, and specify the relationships between EP and other relevant variables. We then present the methods and results of the studies we conducted to test the validity, reliability and applicability of our instrument. We conclude the paper by discussing the contributions and implications of our findings, and by developing an agenda for future studies incorporating EP.

3. The concept of entrepreneurial passion

Broadly speaking, entrepreneurs are those who "discover and exploit new products, new processes, and new ways of organizing" (Baum and Locke, 2004: 588). Although these pursuits can take many forms, entrepreneurial efforts are generally defined in terms of the recognition and exploitation of business opportunities, notably through the founding of new ventures (Baron, 2008; Venkataraman, 1997). Within this general domain, Chen et al. (2009) define entrepreneurial passion as "an entrepreneur's intense affective state accompanied by cognitive and behavioral manifestations of high personal value" (pp. 199). Consistent with this definition, Chen and colleagues centered their empirical studies on the effects of entrepreneurs' *displayed* manifestations of passion. Focusing on the specific context of entrepreneurs making business plan presentations to potential investors, Chen and colleagues studied *investors' perceptions* of the affective, cognitive and behavioral manifestations of entrepreneurs' passion. To capture affective manifestations of passion, for instance, these authors asked investors to evaluate entrepreneurs' facial expression, voice and body language. For cognitive manifestations of passion, they asked investors to evaluate the preparedness that entrepreneurs displayed in their business plan presentation. For behavioral manifestations of passion, Chen et al. asked investors to evaluate entrepreneurs' apparent commitment toward their ventures. Although the Chen et al. (2009) study has augmented our understanding of some cognitive and behavioral manifestations of passion, the observed passion they focus on may not accurately reflect *experienced* passion, and instead may simply be a function of impression management by the presenting entrepreneurs.[1]

Our approach specifically focuses on *entrepreneurs' experience* of passion — as entrepreneurs 'live' the influence of this passion. As such, our work continues Chen et al.'s (2009) important theoretical focus on the affective aspects of passion, but focuses on how entrepreneurs report the passion they experience, not how others observe any potential displays of such passion. In addition, consistent with Cardon et al.'s (2009a) model of the nature and experience of entrepreneurial passion, we adopt the view that cognitive or behavioral manifestations are *outcomes* of the affective experience of passion, rather than part of the experience itself. As such, we use Cardon et al.'s (2009a) definition of EP 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" (p. 517). Conceived from this experiential perspective, measuring EP thus requires that we consider three specific aspects of this definition: 1) passion involves the experience of intense positive feelings, 2) these feelings are experienced for activities that are central to the self-identity of the individual, and 3) the feelings and identity centrality are focused on three specific entrepreneurial domains. We discuss each requirement in turn.

3.1. The experience of intense positive feelings

The first requirement for measuring EP is that we must capture the experience of intense positive feelings. Intense positive feelings are central to scholarly research on passion in psychology (cf. Damasio, 2003; Schwarz and Clore, 2007), organizational behavior (Liu et al., 2011), and entrepreneurship (Baum and Locke, 2004; Baum et al., 2001; Chen et al., 2009; Perttula, 2010). Consistent with Vallerand et al. (2003), we do not conceive of EP as a personality trait, but rather as an affective phenomenon that one may experience when engaging in or thinking about certain activities. Passion thus consists of deeply experienced positive feelings for something important to the entrepreneur and, as a result, is more enduring than the experience of episodic emotions associated with external stimuli (Wincent et al., 2008). In practice, this demands that we examine the discriminant validity of measures of EP with measures of positive or negative emotions, as well as the enduring nature of EP's intense positive feelings. We consider both issues in our studies below.

In addition to distinguishing passion from more instinctive and episodic emotions, we follow prior work that defines passion as referring to intense positive feelings that are *consciously accessible* (Cardon et al., 2009a). This notion implies that individuals may reflect on the intensity of their feelings vis-à-vis different tasks and activities. When individuals are passionate about an activity, they cannot help but to think about that activity (Chen et al., 2009). It thus follows that among other options, a valid approach for measuring EP is to ask participants to report the intensity of their positive feelings towards entrepreneurship-relevant activities.

3.2. The centrality of these activities for entrepreneurs' self-identity

The second conceptual requirement for measuring EP is the notion that EP's intense positive feelings concern activities associated with roles that are meaningful and central to the self-identity of individual respondents (Farmer et al., 2011; Fauchart

[1] We thank an anonymous reviewer for this point.

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and Gruber, 2011; Murnieks et al., 2012). As Vallerand et al. (2003) and Perttula (2004) emphasize, passion implies *both* an intensity of feelings *and* a deep identity connection to the object of those feelings (Cardon et al., 2009a). In spite of Vallerand et al.'s (2003) efforts to draw attention to the role of identity meaningfulness in passion (cf. p. 757–758), this aspect of "activity valuation" remains largely unexplored in the literature (Cardon et al., 2009a; Murnieks, 2007; Perttula, 2004). In practice, the majority of extant studies of passion are conceived so they focus on activities that are presumed important to respondents — e.g. music, gambling, or a particular sport (Vallerand, 2008). As a result, the bulk of scholarly knowledge about passion rests on research designs that ignore or assume away the meaningfulness that target activities may have for the self-identity of respondents. Indeed, the identity centrality aspect of passion remains largely empirically unexplored (see Perttula, 2004; Murnieks, 2007; and Murnieks et al., 2012 for exceptions).

Interestingly, the relationships between self-identity and individual commitments, motivations, and actions have been well documented in both social psychology (Burke and Reitzes, 1981, 1991; Goffman, 1959; Stryker and Burke, 2000) and entrepreneurship (Gartner et al., 1999). The concept of identity refers to internalized expectations that individuals have about the characteristics they hold as central, distinctive and enduring, and that are at least partially reflected in the roles they enact (Burke and Reitzes, 1991). As such, self-identity is often comprised of many individual identities (Farmer et al., 2011; Murnieks, 2007). Stryker and Burke (2000) argued that an individual's identities are organized hierarchically, such that identities placed higher in the hierarchy are more salient and central to one's self-identity than identities placed lower. This is consistent with the view that not all entrepreneurs are alike when it comes to their identity (Fauchart and Gruber, 2011; Gartner et al., 1999; Hoang and Gimeno, 2010; Murnieks, 2007; Ucbasaran et al., 2008). In practice, these variations in identity lead entrepreneurs to engage in those activities they identify more closely with, and to disengage from those with which they do not.

Building on these observations, we develop a measurement approach that specifically articulates the distinctions between a) the experience of intense positive feelings toward particular activities and b) the centrality of these activities for the self-identity of entrepreneurs. By extension, these conceptual nuances imply that in order to understand the nature and role of EP, we need to not only examine the direct effects of intense positive feelings towards particular activities and the centrality of these activities to the self-identity of respondents, but also their complementary (or multiplicative) relationship. Doing so forms an integral part of our empirical studies, especially when we consider the relationships between EP and other constructs.

3.3. The domains of entrepreneurial passion

The third requirement for measuring EP is that we consider the relevance of passion's intense positive feelings and identity centrality toward tasks and activities specifically germane to entrepreneurship. Although the overall role of "being an entrepreneur" may be the object of passion (Murnieks, 2007; Murnieks et al., 2012), a more nuanced approach focuses on three distinct roles that different entrepreneurs may experience differently, but are consistently found at the heart of the entrepreneurial process: 1) inventing new products or services, 2) founding new organizations, and 3) developing these organizations beyond their initial survival and successes (Cardon et al., 2009a). Each of these roles involves distinct sets of tasks and activities, reflecting the challenges associated with different aspects of the entrepreneurial process (Gundry and Welsch, 2001; Katila and Ahuja, 2002; Ronstadt, 1988). Consistent with these observations, our articulation of EP is neither centered on the broad idea of entrepreneurship as a whole, nor too narrowly focused on the idiosyncratic details of one's particular venture, in the sense of one's particular products and services, the industry where this venture competes, or the particular markets and customers it targets, for example.

Passion for inventing concerns activities associated with scanning the environment for new market opportunities, developing new products or services, and working with new prototypes (Cardon et al., 2009a). Entrepreneurship is often associated with key changes of the economic or social landscape (Drucker, 1985). Some entrepreneurs search for innovative ideas deeper and more frequently than others (Katila and Ahuja, 2002), and the desire to deliver new solutions to the marketplace is often an important motivator for entrepreneurs. Individuals 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. Such people enjoy tinkering with new product designs and exploring the articulation of these designs in concrete applications. For instance, Nikola Tesla (alternating current (AC), wireless communication, and many other inventions), Howard Head (laminate skis, oversized tennis rackets), or Steve Jobs (the Apple Macintosh, the iPod, and the iPhone) were all known for the intense devotion they have shown towards finding and developing new products or services and exploring their commercial application.

Passion for founding relates to assembling the necessary financial, human, and social resources needed to create a new venture (Cardon et al., 2009a). The desire to found an organization is an important motivator for many entrepreneurs (Aldrich and Zimmer, 1986) and the founder role identity can be both complex and central to an entrepreneur's self-concept (Hoang and Gimeno, 2010). Entrepreneurs often have a need for achievement that manifests itself in the founding event — a tangible representation that they have done "something" entrepreneurial (Katz and Gartner, 1988). Entrepreneurs who experience passion for founding primarily enjoy the process of founding a venture, and often develop identities that are intertwined with the venture identity (Cardon et al., 2005). For instance, a type of entrepreneur who may manifest high levels of passion for founding is a habitual entrepreneur, i.e., individuals who launch several new ventures over the course of their career (Ucbasaran et al., 2008; Westhead and Wright, 1998). Some of these entrepreneurs are so passionate about launching that they soon entrust the management of their ventures to trusted aides or sell the business altogether, only to begin working on their next venture or invention — a phenomenon known as sequential entrepreneurship (Ronstadt, 1988). Some habitual entrepreneurs retain ownership and manage their ventures as part of a larger portfolio of businesses. Sir Richard Branson (Virgin Group) is an example

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of such a portfolio entrepreneur (Westhead and Wright, 1998). Not all entrepreneurs passionate for founding will be habitual or portfolio entrepreneurs, but we suggest that habitual entrepreneurs will tend to experience high levels of passion for founding. We investigate this notion below.

Passion for developing is associated with the growth and expansion of the venture after founding (Cardon et al., 2009a). Many entrepreneurs are motivated not by a desire to found an organization, but by a conscious motivation to grow and expand a venture (Cliff, 1998). These individuals often exhibit different strategies for organizational management than their counterparts (Gundry and Welsch, 2001). They also tend to rely on different management styles (Smith and Miner, 1983), and to communicate with key stakeholders in a manner that promotes the organization's continued expansion (Baum and Locke, 2004). While in many cases entrepreneurs who demonstrate high passion for developing do so in a venture they have founded themselves, it is equally plausible that a non-founding entrepreneur could also experience high levels of passion for stepping into an existing start-up and developing it into a more lasting, valuable, or sustainable venture. Entrepreneurs who experience passion for developing their firm(s) may enjoy activities such as increasing sales, hiring new employees, or finding external investors to fund such developments. For example, Ray Kroc did not found McDonalds, but certainly loved turning the small hamburger stand he purchased into a worldwide icon. Herb Kelleher, co-founder of Southwest Airlines, has demonstrated passion for developing the corporate culture and operational excellence of Southwest, which has earned his firm numerous mentions as a leader in the industry and one of America's most-admired companies.

In principle, these three roles of inventing, founding and developing point to the multi-dimensional nature of EP across three domains of activities specifically relevant for entrepreneurship. In practice, the experience of EP towards these activities may vary not only based on the contexts and challenges that entrepreneurs face at each stage of the firm's development, but also with the particular background and life experiences of different entrepreneurs. This implies that the experience of EP need not be uniform across all three domains: some entrepreneurs can be more passionate for some activities, and less so for others. This implies that the levels of EP within and across the three domains may vary with an entrepreneur's gender, age, level of education, or with the age of their current firm and number of firms they have founded in the past, among other factors. In order to establish the criterion validity of our proposed instrument, we examine these possibilities in our tests below.

4. Relationships between EP and related concepts

In order to establish the validity of our proposed measures, we also examine the relationships between the different dimensions of EP and relevant concepts. In a pilot study, we first consider whether EP is conceptually and empirically distinct from three broader notions of passion, namely *harmonious passion* and *obsessive passion* (Vallerand, 2008; Vallerand et al., 2003), and *passion for work* (e.g., Baum and Locke, 2004; Baum et al., 2001).

Second, we explore the extent to which EP and its dimensions are distinct from, yet related to other affective and cognitive variables known to play a role in entrepreneurship. Building on the notion that EP is believed to have important cognitive and behavioral manifestations (Chen et al., 2009), we specifically examine the discriminant validity of our measures from *hopefulness* (Snyder et al., 1991), the *experience of positive or negative emotion* (Foo, 2011; Foo et al., 2009), and *entrepreneurial self-efficacy* (Zhao et al., 2005). We focus on these particular variables because, although they refer to conceptually distinct phenomena, they share with EP a similar influence on entrepreneurial dynamics and outcomes. Like passionate individuals, *hopeful* individuals may be more skilled at dealing with surprises and unforeseen stress (Alexander and Onwuegbuzie, 2007; Lopez et al., 2003) because they are more willing to engage in activities for what they believe will be satisfactory outcomes. Similarly, we know that *temporary emotions*, both positive and negative, can have profound effects on entrepreneurial actions and outcomes (cf. Baron, 2008; Shepherd, 2003). Lastly, EP and *self-efficacy* both highlight the importance of engaging in activities that are meaningful for one's self-identity (Bandura, 1997; Vignoles et al., 2006). For instance, passion for an activity is likely to lead an individual to undertake it more often, in which case they are likely to develop a competency, adding not only to their ability to perform the task, but also to their sense of self-efficacy (Cardon et al., 2009a).

Finally, and in order to assess the criterion validity of our proposed measures, we investigate the direct and multiplicative relationships between EP's intense positive feelings and identity centrality on relevant outcomes. Building on the notion that passion may allow entrepreneurs to recognize unique patterns and relationships among information in the environment, and consequently to engage in creative problem solving (Amabile, 1997) and pursue novel and creative paths of action (Cardon et al., 2009a; Liu et al., 2011; Vallerand et al., 2003), we examine the relationship between EP (specifically EP for inventing and founding) and an entrepreneurs' *self-reported creativity* (Lee et al., 2004; Ward, 2004). In similar fashion, we assess the relationship between EP (specifically EP for founding and developing) and *persistence* (Shane et al., 2003; Wu et al., 2007), based on the view that the experience of EP encourages the entrepreneur to engage in activities that reinforce his or her self-identify and to persist in such activity engagement (Cardon and Kirk, 2010; Cardon et al., 2009a). Because entrepreneurship involves extreme experiences that are often cognitively and affectively demanding (Schindehutte et al., 2006), we also examine the relationship between EP (specifically EP for developing) and the experience of zen-like states of *absorption* or *flow* (Csikszentmihalyi, 1990, 1997), where entrepreneurs are so caught up in their activities that they enter a flow-like state and lose all sense of time and their surroundings. We must highlight that our investigation of these relationships is *not* to test specific theory and hypotheses about the effects of EP and its dimensions. Consistent with the validation objectives of the present paper, we examine the extent to which our proposed measures capture theoretically-plausible relationships that have been developed elsewhere (specifically, in Cardon et al., 2009a) in order to document the criterion validity of our instrument (Lewis, 2003).

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5. Scale development and pilot studies

Building on relevant exemplars from this and other journals (Chandler et al., 2011; Lewis, 2003; Shipp et al., 2009; Tang et al., 2012), we followed a three-stage procedure to assess our instrument in terms of multiple dimensions of validity (Cook and Campbell, 1979; Scandura and Williams, 2000). First, we drew from psychometric research (e.g., Nunnally and Bernstein, 1994) to articulate our measurement strategy and develop theoretically consistent items. We then conducted three pilot studies to fine-tune our items and obtain preliminary evidence for our measurement approach. Finally, we surveyed experienced entrepreneurs to examine the structural, nomological and criterion validity of our instrument.

5.1. Measurement strategy and development of relevant items

We structured the measurement instrument as an acquiescence task where respondents expressed the extent of their agreement/disagreement with statements meant to characterize them. This formulation follows common practice in applied psychology research (e.g., Button et al., 1996; Lewis, 2003), and is consistent with EP's conceptual anchoring in terms of one's enjoyment of and identification with activities associated with entrepreneurship.

In line with our model of EP, we formulated items around the expression of intense positive feelings, with bases such as 'I greatly enjoy to…', 'I love to…', '…is exciting to me', or '…is thrilling'. Consistent with the notion that EP's intense positive feelings are focused on the domains of passion for inventing, founding, and developing (Cardon et al., 2009a), we used a domain-sampling procedure (Nunnally, 1978) to develop theory-consistent items reflecting activities relevant for each domain. In practice, this focus on entrepreneurship activities provides respondents with a referent that augments our items' criterion validity (Arthur et al., 2007). For inventing, we developed items around activities such as 'figuring out new ways to solve unmet market needs' and 'searching for new ideas for products and services.' For founding, items reflect activities like 'establishing a new company' or 'nurturing a new business through its emerging success.' Items for developing focus on activities related to growth in new ventures, including 'trying to convince others to invest in my business', 'finding the right people to market products and services to', and 'assembling the right people to work for my business.'

Consistent with the theoretical arguments above, we also developed separate items to capture the identity centrality that respondents attach to each of these three domains of activities (inventing, founding, and developing). Given the paucity of existing measures of entrepreneurial identity (Murnieks, 2007; Murnieks et al., 2012), we built on Callero's (1985) work on identity centrality and on Stryker and Serpe's (1982; 1994) approach to measure identity salience. Callero articulates items of identity centrality around formulations like '…is an important part of who I am' or '…is something I frequently think about' or 'I would feel a loss if I were to give up…'. Stryker and Serpe's (1982; 1994) measure of identity salience focused on how individuals would introduce themselves to different groups of people for the first time, in different contexts. We developed items corresponding to both approaches. For the identity centrality of founding, for instance, we formulated items like 'Being the founder of a business is an important part of who I am' and 'When they think about who I am, people who know me well say that at heart, I am a business founder.' We followed the same approach for the identity centrality of inventing and developing.

5.2. Pilot studies

Having developed an initial set of items, we pilot-tested a first version of the instrument with entrepreneurs to obtain preliminary evidence of the validity of our approach with members of the target population. We randomly selected 1000 potential participants from the 4000+ individuals listed in the 2008 Dun and Bradstreet (D&B) Selectory database for a US metropolitan area. The participants, CEOs of privately-owned, independent, small to medium-sized firms founded since 1998, were invited to complete a paper-based survey on entrepreneurs' perceptions and attitudes. We received 57 fully completed surveys after two reminders.[2] The survey included 18 items developed to measure feelings of passion (six for each domain of inventing, founding and developing) and four identity centrality items (one for each domain plus an overall measure for the centrality of entrepreneurship to the self-identity of respondents).

Analyses allowed us to identify and parcel out feelings items that loaded across domains of activities or that proved unreliable (e.g., item-total correlations below .5; see Netemeyer et al., 2003: pp. 144–145). For each domain, we observed that the correlations between feelings and identity centrality items were smaller than .30, suggesting that feelings and identity centrality items form empirically-distinct constructs (Cohen, 1992; Shipp et al., 2009). Interestingly, our measures of feelings across each domain of inventing, founding and developing exhibited small and non-significant correlations with existing measures of harmonious and obsessive passion (Vallerand et al., 2003) and passion for work (Baum et al., 2001). This supports the relevance of developing entrepreneurship-specific measures of passion.

Building on the results from the first pilot study, we discarded items that were unreliable and developed a set of new items. We then conducted a second pilot study to specifically examine the content validity of the proposed instrument. In order to replicate our observations across individuals with different kinds of backgrounds and experience (Amir and Sharon, 1991; Tsang and Kwan, 1999), we conducted this study with individuals from two different populations: 1) a panel of 32 management

[2] Since 134 surveys proved undeliverable and 10 entrepreneurs indicated that their business had closed down, we had an effective response rate of 6.7%. Although this is somewhat low, it is consistent with other samples of entrepreneurs through D&B listings (cf. Hmieleski and Baron, 2009).

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scholars with relevant expertise in individual-level research; and 2) a panel of 75 working professionals completing their MBA at a US University.

Following procedures developed by Schriesheim et al. (1993) and Hinkin and Tracey (1999), we presented participants with 24 feeling items, and asked them to rate the extent to which each corresponded to a particular domain of EP (e.g., passion for inventing, passion for founding, passion for developing). We randomly varied the order of domains between different groups, and the order of the different items across tasks. In a separate forced-choice sorting task, we also asked participants to specify the one domain of EP to which each of the 24 items most corresponded. We present a summary of the analyses in Appendix A (Table A1). Results of Q-factor analyses (Schriesheim et al., 1993) and means comparisons (Hinkin and Tracey, 1999) converged, and identified items that loaded ambiguously across multiple domains of EP. We discarded these items from further investigations.

In order to develop an instrument that is not only valid, but also parsimonious and efficient for data collection purposes, we conducted a third pilot study to examine the reliability of single-item measures of identity centrality, and to test alternate wordings of items that stress the enduring nature of EP's feeling items. In order to obtain assessments from individuals with different kinds of backgrounds and experience (Amir and Sharon, 1991; Tsang and Kwan, 1999), we conducted this pilot study with two samples: MBA students registered to a graduate seminar in entrepreneurship at two US universities ($n = 51$), and individuals recruited by a national panel study organization on the basis that they were the founder of a privately-owned, independent, seven-year old or less US-founded new venture with at least one employee ($n = 111$).

The survey instrument for both samples included 24 items targeting the identity centrality of inventing, founding and development activities (eight items per domain). Results indicated that using multiple items for capturing identity centrality had important drawbacks. In their open-ended comments at the end of the survey, several respondents commented that our questions were repetitive. Building on observations by Sackett and Larson (1990) that using single-item measures could be warranted when the construct of interest is clear to respondents and sufficiently narrow, we therefore considered the possibility of using single indicators of identity centrality for each domain. Following Wanous and Hudy (2001; see also Wanous et al., 1997), we assessed the reliability of single-item indicators of identity centrality for each domain by using principal component analysis and examining the items' communalities (h^2) — the proportion of variance that each item has in common with other items. We report detailed results of these analyses in Appendix B, Table B1.

Analyses revealed that the single target items we had tested in the first pilot study exhibited high communalities with other items targeting the same dimensions. For MBA students and entrepreneurs, respectively, we observed h^2 values of .71 and .70 for inventing; .81 and .80 for founding; and .79 and .83 for developing. These findings suggest that the single items targeting identity centrality in Pilot Study 1 exhibit at least 70% of shared variance of with other items targeting the same constructs. Consistent with Wanous and Hudy (2001), these observations support the reliability of a parsimonious single-item approach to capturing the centrality of inventing, founding and developing activities to the self-identity of entrepreneurs.

Since we theorized that EP's positive feelings are more enduring than the experience of episodic emotions associated with external stimuli (Wincent et al., 2008), we also examined the relevance of formulating items that specifically stressed the enduring nature of these feelings. To this aim, a subset of 16 MBA participants completed two versions of the survey, two weeks apart. The first version included the same items we tested in the first pilot study; the second version had reworded items that stressed the long-term experience of EP's intense positive feelings (e.g., 'Searching for new ideas for products/services gives me *durable* feelings of joy.'). The 111 entrepreneurs in this pilot study completed only the 'enduring' items.

We present the items and relevant analyses in Appendix C. For the student data, correlations between the corresponding items for intense positive feelings for inventing and for developing were all significant at the .01-level (average correlations of .66 and .64 ($p \leq .01$), respectively). Inter-item correlations were smaller in magnitude and not significant for three of the five items targeting intense positive feelings for founding. In addition to the limited power afforded by the small sample size, we suspect that MBA students might have less consistent feelings for founding than entrepreneurs. To examine this possibility, we compared the results of Pilot Study 1 and Pilot Study 3. Principal component and confirmatory factor analyses revealed that the relationships between the items and their intended domain of activities were the same across the original and revised items (cf. Table C1). We conclude that from a reliability standpoint, the extra language stressing the long-term nature of EPs' feelings was thus not necessary.

6. Main study: validation of the instrument with experienced entrepreneurs

Building on the three pilot studies above, we fine-tuned the instructions and items, and developed a survey to explore the relationships between EP and other relevant concepts. Through this study, we sought to establish the internal consistency, reliability, and structural validity of our proposed instrument, as well as its discriminant and criterion validity.

6.1. Participants and procedures

We conducted the study with a sample of experienced entrepreneurs identified through the same procedures we employed for Pilot Study 1. We selected all remaining members ($N = 3085$) of the population of entrepreneurs that corresponded to our criteria after removing those who had been contacted for the pilot study and those with only one employee (the entrepreneur him or herself). We sent potential participants a postcard inviting them to take part in the study. Participants could complete the study online using the web address provided on the card or on a paper questionnaire that was mailed one week later. The only incentive offered for participation was a summary of the study results. Surveys for 404 respondents were undeliverable and 14

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company representatives indicated that their businesses had closed, reducing our sample frame to 2667. We sent two reminder invitations two weeks apart. Of the 168 surveys received after a month, 10 had incomplete sets of answers. The final sample of 158 thus corresponds to a response rate of 5.9% — a rate relatively consistent with other studies using D&B databases for research on entrepreneurs (cf. Hmieleski and Baron, 2009), and for surveys of upper-echelon managers (cf. Bartholomew and Smith, 2006). We observed no significant differences in target or control variables between early and late respondents, or between respondents' and non-respondents' firm characteristics (age, number of employees, or sales).

Respondents ranged in age from 26 to 85 years old (average = 48.6 years, S.D. = 9.8 years). In terms of new venture experience, 94 respondents (59.5%) had founded a single new venture in their career, whereas 25 (15.8%) had founded two, and 16 (10.1%) had founded three. Only three entrepreneurs in our sample had founded more than six new ventures in their career (two had seven, and one had 10). On average, respondents indicated having 12.1 years of industry experience before they launched their current firm. The typical firm had a median age of seven years (average = 8.6), and median of five employees (average = 15.1). D&B databases report median sales of $295,000 for 2007 (average = $811,500).

6.2. Measures

Building on the pilot study results, the survey included 15 items for measuring EP's intense positive feelings (12 items) and identity centrality (3 items) across the three domains of inventing, founding and developing. Consistent with our validation objectives, the survey also included validated measures of affective and cognitive variables that we expected to be related to yet distinct from EP. We measured entrepreneurs' *hope* via the instrument developed by Snyder et al. (1991) and used the PANAS scale (Watson et al., 1988) to capture respondents' recent *experiences of positive and negative emotions*. We also included measures of *entrepreneurial self-efficacy* devised by Chen et al. (1998).

Consistent with our theoretical developments above, the survey also included measures of target outcomes thought to be related to EP, including creativity, persistence, and absorption in current activities. We measured creativity using a 13-item scale developed by Zhou and George (2001) that has been used in many studies of creativity in the workplace (e.g., Gilson and Shalley, 2004; Perry-Smith, 2006; Zhou, 2003). To measure persistence, we used items developed by Baum and Locke (2004). Finally, we measured absorption using 7 items developed by Schindehutte et al. (2006). To minimize the common-method biases inherent in surveys (cf. Podsakoff et al., 2003), we guaranteed the anonymity of respondents and counterbalanced question order. We also included measures of participants' learning goals (Button et al., 1996) as marker variables. Because this concept is unrelated to EP's dimensions and domains, it provides an opportunity to assess the presence of common method bias (cf. Williams et al., 2010).

6.3. Measurement model and analyses

Consistent with the theoretical considerations discussed above, we develop a measurement model that specifically articulates EP's two dimensions – intense positive feelings and identity centrality – across the three domains of inventing, founding, and developing. From a measurement standpoint, the theoretical arguments of Cardon et al. (2009b) point towards a three-order multidimensional construct (Edwards, 2001). We represent this measurement model in Fig. 1, which also specifies the relationships between the dimensions and their indicators (Diamantopoulos and Siguaw, 2006; Edwards, 2011; MacKenzie et al., 2005).

At the lower order, the measurement of intense positive feelings and identity centrality toward each domain of activity is *reflective* (Bollen and Lenox, 1991). This implies that an entrepreneur's intense feelings toward developing activities should be consistently reflected in his or her answers across a series of items targeting feelings towards developing activities. At the intermediate level, and consistent with both our theoretical developments and pilot study observations, we advance that feelings and identity centrality form separate dimensions of EP for each domain of inventing, founding, and developing. Because it is theoretically possible that an entrepreneur would experience intense positive feelings for some activities without these activities being necessarily central to his or her identity, we model the relationships between EP and its two dimensions of intense positive feelings and identity centrality as *formative* (Bagozzi, 2007; Diamantopoulos et al., 2008; Howell et al., 2007; Kline, 2005). Finally, consistent with theory, we advance that respondents' experience of EP need not be simultaneously high (or low) across all domains of activity: in other words, an entrepreneur may experience more passion for one particular domain of activity and less so for another. To model this important distinction in measurement terms, we advance that the relationships between measures of EP in each domain and an overall assessment of EP are *formative* (Bagozzi, 2007; Diamantopoulos et al., 2008; Howell et al., 2007). Fig. 1 clarifies the reflective and formative aspects of our model, and is consistent with recent discussions about the formulation of hybrid multidimensional models (cf. Bollen, 2007; Edwards, 2001, 2011). As such, the model suggests that different entrepreneurs will report different patterns of feelings and identity centrality toward the domains of inventing, founding and developing.

We discuss below the specific findings reported in Fig. 1. Preliminary analyses with all 15 items from the survey revealed that one feeling item for founding exhibited low item-total correlations, and one feeling item for developing exhibited evidence of cross-loadings across domains (high modification indices). We discarded these items from further analyses.

We conducted our Confirmatory Factor Analyses (CFA) using AMOS 18, and Maximum Likelihood Estimation (MLE) procedures. For all other statistical analyses, we used SPSS 18. In line with recommendations by Edwards (2001) and Hoyle and Panter (1995), we used several fit indices to evaluate the soundness of our models. We focused on indices that are deemed more

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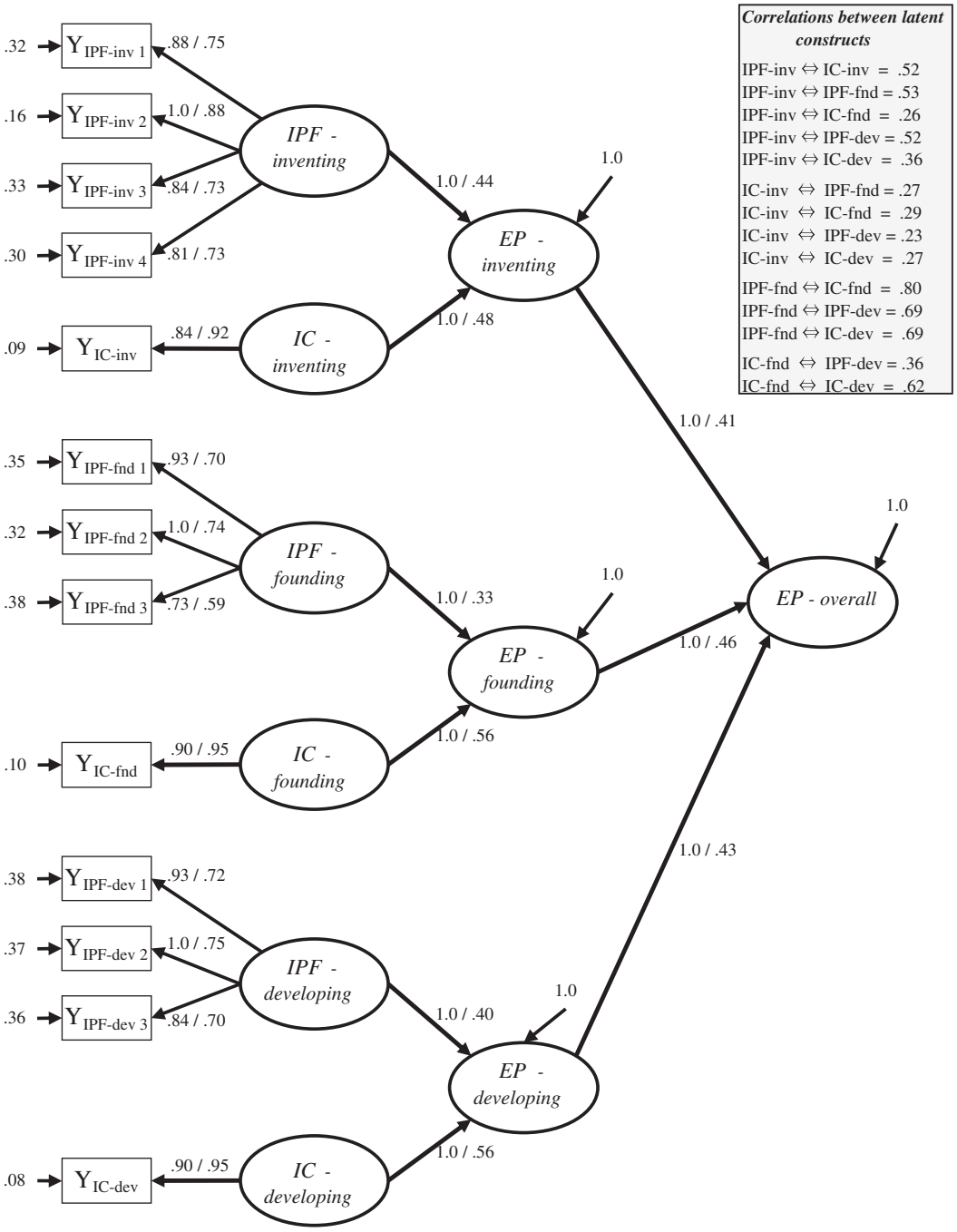

Fig. 1. Measurement model and results of confirmatory factor analysis.Note. Un-standardized coefficients appear before the slash; standardized coefficients after. For ease of reading, we omitted covariance relationships between latent variables from the figure. IPF = intense positive feelings; IC = identity centrality; and EP = entrepreneurial passion.Consistent with standard CFA practices, we allowed latent constructs for IPF-inventing, founding and developing to load 'freely' on all but one of their respective items — and this to allow for proper model identification. Because of this, the correlations reported above depart slightly from those reported in Table 1, although they remain in the same order of magnitude (Cohen, 1992).In order to examine the structural validity of our measures, we include in this CFA model an overall construct of EP across all domains. Future research should investigate antecedents and consequences of EP's dimensions in each domain separately, and not through an overall all-inclusive construct.

stable for smaller samples, such as the comparative fit index (CFI) and incremental fit index (IFI) (Fan et al., 1999). For both indices, we used an ideal target criterion of .95 and above to indicate adequate fit (Hu and Bentler, 1999; Marsh et al., 2004). Given the tradeoffs between Type I and Type II error noted for the behavior of fit indices in sample sizes smaller than 250, we follow Hu and Bentler's (1999: p. 28) suggestion to use a combination rule of root mean square error of approximation (RMSEA) less than .06 and standardized root mean square residual (SRMR) of less than .09. Following standard practices in structural

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equation methods to compare the fit of nested models (Edwards, 2001; John and Benet-Martinez, 2000; Williams et al., 2010), we used Chi-square difference tests to evaluate the soundness of alternate models that include the same indicators with different path specifications. Combined with an examination of modification indices (for evidence of cross-loadings), such comparison technique provides evidence for the structural validity of our model (cf. Edwards, 2001; 2011), for assessing the presence of common method bias (cf. Williams et al., 2010), and for examining the discriminant validity of our measures (cf. Eby et al., 2008; Lewis, 2003).

6.4. Results

In the following sections, we present our findings regarding different aspects of validity. We report in Appendix D the instructions, scale anchors and final items composing our measure.

6.4.1. Are the measures of EP's intense positive feelings consistent and reliable?

We used scale analysis techniques to identify items that exhibited poor item-to-total correlations to their intended construct. Netemeyer et al. (2003, p.145) recommend retaining items that show item-to-total correlations in the .50 to .80 range. Item-total correlations were all above .65 for the feelings for inventing subscale (average = .69), above .51 for the feelings for founding subscale (average = .54), and above .57 for the feelings for developing subscale (average = .60). This indicates substantial relationships between items and their intended domain. Alpha reliabilities for the subscales were .85, .72 and .77 respectively. These findings suggest that the items are reliable and form internally consistent subscales.

6.4.2. Are measures intense positive feelings distinct from measures of identity centrality?

Table 1 reports the means, standard deviations and correlations for the Study. Building on the above results, the measures for intense positive feelings (IPF) for inventing, founding and developing in these analyses (as well as in subsequent regression analyses) consist of the summated average score for their respective items (four items for IPF-inventing, and three each for IPF-founding and IPF-developing). Consistent with prior work, correlations provide a first line of evidence for the discriminant validity of specific constructs within our overall model.[3] We first observe significant correlations of .45, .62 and .38 between feelings for inventing, founding, and developing, and their corresponding identity centrality items (all $p \leq .01$). This observation suggests that though they are related, feelings and identity centrality items only share moderate amounts of variance. Second, we note that save for the .55-correlation ($p \leq .01$) between the feelings for founding and the identity centrality of developing, the cross-domain correlations between feelings and centrality items tend to be significant but are smaller in magnitude.

To further examine the discriminant validity of feelings and centrality items, and consistent with the methods advocated in validation monographs from Bagozzi, Yi, and Phillips (1991) and John and Benet-Martinez (2000), we used confirmatory factor analysis (CFA) to evaluate the fit of alternate measurement models where feelings and identity centrality items for each domain loaded as separate dimensions of a superordinate formative construct (e.g., the subset model of EP-inventing in Fig. 1), or together on a single construct (cf. Edwards, 2001; 2011).[4]

Results indicate that for each domain of EP, the fit of the superordinate target model was better than that of the single construct model (for EP-inventing: CFI = .99/.45; $\Delta\chi^2_1 = 166.2$; $p \leq .001$; for EP-founding: CFI = .95/.85; $\Delta\chi^2_1$ 20.9; $p \leq .001$; for EP-developing: CFI = 1.0/.36; $\Delta\chi^2_1 = 92.8$; $p \leq .001$). To further establish the validity of these observations, we report in Table 2 the factor loadings (squared correlations) of tau-equivalent models (where all the paths between latent constructs and indicators are fixed to 1, as they would be when using summated average scores). Results indicate that the fit of the models for EP-inventing and EP-developing is above commonly-accepted criteria, and not worse than that of unconstrained congeneric model (no modification indices; $\Delta\chi^2_3$ 6.8; $p = .08$ for EP-inventing, and $\Delta\chi^2_2$ 4.1; $p = .13$ for EP-developing). However, results indicate that constraining the paths of EP-founding items lowers model fit below acceptable criteria. Modification indices revealed that entrepreneurs who express high levels of intense positive feelings for founding also tend to systematically report high levels of identity centrality for founding (hence the lower fit associated with constrained paths). However, the fit of this model remains well above that of a single-construct model where feelings and identity items would load together. Taken together, these observations support the validity of modeling feelings and identity centrality as two distinct dimensions of EP within each of the three domains of inventing, founding, and developing.

6.4.3. Is EP differentiated across the three domains of inventing, founding, and developing?

Results in Table 1 indicate that the measures of intense positive feelings for inventing, founding and developing exhibit significant correlations among themselves (.42, .43, .54), yet these correlations are not overly large: for instance, feelings for

[3] A rigorous assessment of the relationships between our measures and relevant concepts required that we not only consider the significance of these correlations, but also that we make judgments about their magnitude (Cohen, 1992). To facilitate this task, we used the benchmarks advocated by Shipp et al. (2009): we interpreted statistically significant correlations that were equal or smaller than .30 as 'small', significant correlations between .30 and .50 as 'moderate', and significant correlations greater than .50 as 'large'. Because they are higher than the guidelines proposed by Cohen (1992), these benchmarks provide added rigor, a strategy that is particularly appropriate in the context of self-reported measures of variables that are conceptually close.

[4] In order to conduct these analyses in a rigorous manner, we fixed the path coefficient between the identity centrality construct and its indicator to the square root of the communality documented in Pilot Study 3, and the error variance of the indicator to the item variance times 1.0 minus its communality (cf. Edwards, 2011; Kline, 2005; Lewis, 2003). This allowed us to run the analyses in spite of the single indicator for centrality.

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Table 1
Means, standards deviations, reliabilities (α) and correlations for main study.

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. IPF-inventing	4.08	0.69	(.85)																		
2. IPF-founding	4.29	0.65	.42**	(.72)																	
3. IPF-developing	4.03	0.73	.43**	.54**	(.77)																
4. IC-inventing	4.15	0.73	.45**	.22**	.18*																
5. IC-founding	4.19	0.98	.21**	.62**	.30**	.25**															
6. IC-developing	4.06	0.93	.32**	.55**	.38**	.24**	.56**														
7. Learning goals	4.37	0.58	.46**	.29**	.32**	.36**	.14	.17*	(.86)												
8. Hopefulness	3.51	0.41	.38**	.42**	.28**	.43**	.26**	.27**	.35**	(.86)											
9. Postv emotns	3.96	0.65	.54**	.50**	.44**	.33**	.33**	.19*	.46**	.43**											
10. Negatv emotns	2.16	0.81	−.00	−.05	−.01	−.04	−.04	−.02	.00	−.29**	−.03										
11. ESE innov.	3.97	0.79	.54**	.36**	.23**	.36**	.22**	.25**	.28**	.49**	.39**	−.20*	(.82)								
12. ESE mgmt	4.05	0.60	.44**	.38**	.36**	.44**	.22**	.23**	.44**	.64**	.41**	−.13	.56**	(.74)							
13. Creativity	4.37	0.55	.64**	.35**	.38**	.53**	.29**	.34**	.41**	.51**	.48**	−.13	.58**	.50**	(.90)						
14. Persistence	3.92	0.61	.38**	.34**	.27**	.32**	.32**	.29**	.40**	.40**	.48**	.02	.21**	.43**	.40**	(.76)					
15. Absorption	3.95	0.59	.33**	.35**	.35**	.29**	.42**	.29**	.36**	.36**	.37**	−.20*	.29**	.37**	.40**	.35**	(.76)				
16. Gender	−0.09	0.31	−.25**	−.05	−.13	−.17*	.06	−.03	−.05	−.03	−.15	.07	−.11	−.02	−.02	.02	−.00				
17. Education	4.10	1.25	.01	−.07	−.10	−.02	−.08	−.10	−.06	−.06	.02	.01	−.04	−.10	−.05	.00	.03	−.05			
18. $Age_{(ln)}$	48.62	9.87	−.07	−.06	−.02	.19*	−.01	−.04	−.05	.06	−.09	−.18*	.00	.03	.01	−.08	.08	−.03	.03		
19. $Firms\ fnd_{(ln)}$	1.56	1.80	.24**	.11	.15	.17*	.05	.24**	.18*	.13	.03	−.16*	.19*	.11	.09	.06	.09	−.29**	.06	.17*	
20. $Firm\ age_{(ln)}$	8.63	6.61	−.02	.13	.10	.06	.18*	.09	.09	.08	.06	−.11	.080	.09	.13	.11	.14	−.01	.01	.32**	.05

Note. Reliability indices (α) are displayed in parentheses on the diagonal; n = 158 entrepreneurs/firms (n = 128 for 'survival 08–10', Δ 'size 08–10' and 'Δ sales'); IPF = intense positive feelings; IC = identity centrality; ESE = entrepreneurial self-efficacy; and (ln) = indicates variables that were ln-transformed for subsequent analyses in order to control for non-normal distribution (mean and standard deviations = non-transformed values). Measures for IPF-inventing, founding and developing consist of the summated average score for their respective items.

** $p \leq .01$.

* $p \leq .05$.

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founding and developing share no more than 29% of variance ($.54^2$). In a similar fashion, the correlations between the centrality items are significant (.25, .24, 56) but suggest low to moderate amounts of shared variance.

To further examine the validity of differentiating between the measures of passion in the three domains of inventing, founding, and developing, we used CFA techniques to examine the structural validity of the target model represented in Fig. 1.[5] Although our sample size is small to test such a complex model in a robust fashion, results suggest that model fit is only slightly outside of the ideal criteria for fit (CFI = .93; IFI = .93; SRMR = .04; RMSEA = .08). The path coefficients represented in Fig. 1 are all significant at the .001 level, and account for an average of 61% of the variance in individual items.

To further assess the structural consistency of our measures, we tested a tau-equivalent model with all relationships between latent constructs and their indicators fixed at 1. Fit indices were similar to that of the congeneric model in Fig. 1 (CFI = .92; IFI = .92; SRMR = .05; RMSEA = .08), the χ^2_7-difference of 12.4 between the tau and congeneric models was non-significant ($p = .09$), and the correlations between EP's domains and dimensions proved similar. These observations provide further support for the structural validity of our proposed model, where passion for inventing, founding, and developing are viewed as separate constructs.

More importantly, the fit of the target model in Fig. 1 is largely superior to that of an alternate model where the centrality items load together with the feelings items for each domain (CFI = .68; IFI = .69; SRMR = .13; RMSEA = .16; $\Delta\chi^2_9 = 208.9$; $p \leq .001$), to that of a model where all items across all domains load together on a single EP construct (CFI = .33; IFI = .34; SRMR = .46; RMSEA = .23; $\Delta\chi^2_{13} = 492.1$; $p \leq .001$), or to that of a model where the identity centrality items load together on their own latent construct, separate from three latent constructs for the feelings items in each domain (CFI = .00; IFI = .02; SRMR = .08; RMSEA = .29; $\Delta\chi^2_9 = 793.1$; $p \leq .001$).[6] Taken together, these results provide converging support that treating EP's dimensions of feelings and identity centrality separately across the three domains of inventing, founding and developing is both theoretically and empirically sound.

Consistent with recent discussions about the specification of multidimensional measurement models (Bollen, 2007; Edwards, 2001, 2011), it is important to observe that in the context of the specific tests we conduct here, the superordinate latent construct of EP across all domains is only a statistical tool to assess the validity of distinguishing between the experience of EP across the three domains of inventing, founding, and developing. An overall measure of EP across all domains is theoretically inconsistent, and should not be used in empirical investigations of the antecedents and/or effects of passion. From a technical perspective, Edwards (2011) observes that "if the construct associated with formative measures is defined as nothing more than a combination of its measures, then the construct itself can be eliminated from the model, and the relationships between the measures and other variables can be examined jointly" (p. 384). All in all, these theoretical, methodological and empirical observations reinforce the importance of examining the specific antecedents and consequences of EP for the different domains of inventing, founding, and developing.

6.4.4. Are common-method biases affecting our results?

Building on the work of Brannick et al. (2010) and Williams et al. (2010), we tested for the presence of possible common-method bias (Podsakoff et al., 2003) by comparing a series of models that included a marker variable thought to be unrelated to EP's dimensions and domains — in this case, a measure of participants' learning goals (Button et al., 1996). Comparisons between baseline and constrained models (cf. Williams et al., 2010) indicate that if there were method biases, these were unlikely to be uniform across all items ($\Delta\chi^2_1 = 3.35$; $p = .07$). Accordingly, we tested an un-constrained model to assess the magnitude of a possible methods effect: results revealed that on average, the methods factor explained 10.6% of item variance and 14.1% of construct reliability — values that are substantially lower than the 32% value documented by Doty and Glick (1998). Lastly, comparisons between the un-constrained and restricted model (cf. Williams et al., 2010) indicate that the presence of small method biases does not affect the pattern of correlations between EP's dimensions within and across domains ($\Delta\chi^2_{15} = 4.46$; n.s.). These observations support the notion that common-method biases are unlikely to affect the validity of our proposed measures.

6.4.5. Are the dimensions of EP distinct from other psychological constructs?

We followed similar procedures as reported in Section 6.4.3 above to investigate the extent to which each domain and dimension of EP is empirically distinct from conceptually related affective and cognitive variables — namely entrepreneurs' hopefulness, their experience of positive and negative emotions, and their entrepreneurial self-efficacy. Results displayed in Table 1 show that the correlations between the dimensions of EP across all three domains and relevant affective and cognitive variables were generally moderate in magnitude (i.e., between .30 and .50; cf. Shipp et al., 2009). For instance, we found that feelings for each domain of EP were moderately correlated with hopefulness (with r of .38, .42, and .28 (all $p \leq .01$). Correlations between the identity centrality items and hopefulness were similar (with r of .43, .26, and .27 (all $p \leq .01$). To further assess the nomological validity of our measures, we compared alternate CFA models with different model specifications (cf. Edwards, 2001; Lewis, 2003; Williams et al., 2010). Results indicated that for all three domains of EP, the fit of a CFA model treating hopefulness as

[5] In order to test this measurement model, we followed the guidelines set forth in Edwards (2011) that "to achieve identification, the loadings relating to (the formative relationships) must be fixed to constant (2011: 382–3)."

[6] Given the complexity added by the inclusion of centrality measures for all three domains, we also examined simpler CFA models that only included intense positive feeling items. Results indicate that the fit of a target model treating each domain as its own latent construct was superior to that of a model where all items load on an overall measure (CFI = .95/.72; IFI = .95/73; SRMR = .04/08; RMSEA = .08/17; $\Delta\chi^2_3 = 136.4$; $p \leq .001$).

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Table 2
Relationships between feelings and identity centrality items.

Domain and item #	Validated items	CFA factor loadings (squared correlations) tau-equivalent model		
IPF-inv$_1$	It is exciting to figure out new ways to solve unmet market needs that can be commercialized.	.58		
IPF-inv$_2$	Searching for new ideas for products/services to offer is enjoyable to me.	.68		
IPF-inv$_3$	I am motivated to figure out how to make existing products/services better.	.57		
IPF-inv$_4$	Scanning the environment for new opportunities really excites me.	.58		
IC-inv$_1$	Inventing new solutions to problems is an important part of who I am.	.84		
	Correlation between IPF and IC constructs	.52		
IPF-fnd$_1$	Establishing a new company excites me.		.44	
IPF-fnd$_2$	Owning my own company energizes me.		.51	
IPF-fnd$_3$	Nurturing a new business through its emerging success is enjoyable.		.44	
IC-fnd$_1$	Being the founder of a business is an important part of who I am.		.90	
	Correlation between IPF and IC constructs		.79	
IPF-dev$_1$	I really like finding the right people to market my product/service to.			.49
IPF-dev$_2$	Assembling the right people to work for my business is exciting.			.52
IPF-dev$_3$	Pushing my employees and myself to make our company better motivates me.			.55
IC-dev$_1$	Nurturing and growing companies is an important part of who I am.			.90
	Correlation between IPF and IC constructs			.46
	CFI	.98	.88	1.0
	RMR	.05	.08	.04
	RMSEA	.08	.19	.02

Note. IPF = intense positive feelings; IC = identity centrality; and tau-eq. = tau-equivalent model (paths fixed to 1).

a separate construct is significantly better than the fit of a model collapsing hopefulness and EP items on a single latent construct ($\Delta\chi^2 \leq .001$). These observations support our argument that EP is conceptually and empirically distinct from hopefulness.

We also find supportive evidence for a relationship between EP and positive affect, but not with negative affect. Correlations between feelings for inventing, founding and developing and positive affect were .54, .50 and .44 ($p \leq .01$), but near zero (and negative) with negative affect. With r of .33, .33 ($p \leq .01$) and .19 ($p \leq .05$) for positive affect and near zero for negative affect, correlations between identity centrality indicators and positive/negative affect followed a similar pattern. Here as well, comparisons of alternate model specifications revealed that the fit of CFA models treating positive or negative emotions as separate constructs from EP were significantly better than the fit of models collapsing positive or negative emotions together with EP items on a single latent construct ($\Delta\chi^2 \leq .001$). These observations support the notion that EP is conceptually and empirically distinct from the experience of either positive or negative emotions. We report additional results below about the enduring nature of EP feelings.

We used the same techniques to investigate the relationships between EP and two dimensions of self-efficacy: innovation self-efficacy and management self-efficacy (Chen et al., 1998; Zhao et al., 2005). We found that EP feelings for all three domains were significantly correlated with innovation self-efficacy ($r = .54$, .36, and .23 ($p \leq .01$)), as were the identity centrality measures for the three domains ($r = .36$, .22, and .25 ($p \leq .01$)). Similarly, we found that feelings and identity centrality for the three domains were significantly correlated with managerial self-efficacy (with r of .44, .38, and .36 ($p \leq .01$) for feelings for inventing, founding, and developing respectively, and .44, .22 and .23 for identity centrality of those domains). Comparisons of alternate model revealed that the fit of CFA models treating either measure of ESE as a separate construct from EP was significantly better than the fit of models collapsing measures of ESE together with EP items on a single construct ($\Delta\chi^2 \leq .001$). As above, these results indicate that for all three domains of inventing, founding and developing, EP and innovation self-efficacy, and EP and managerial self-efficacy are best modeled as empirically separate variables, rather than as loading on the same latent construct.

6.4.6. Do different entrepreneurs report different levels of EP?

As part of our effort to establish the criterion validity of our proposed measures of EP, it is relevant to explore the extent to which EP's different dimensions and domains vary systematically with key individual variables. Past studies refer to this aspect of validation as known-group validity (Lewis, 2003; Spector, 1992). As we noted in our theoretical development, it is theoretically plausible that levels of EP towards inventing, founding and developing vary with the particular challenges faced by entrepreneurs at different moments in the growth of their ventures, or according to background and life experiences. To examine this question, we regressed entrepreneurs' reported experience of EP on the key characteristics of gender, age, highest level of education achieved, number of firms founded in the past, and current firm age. Results indicated that entrepreneurs' intense positive feelings toward inventing are significantly higher for males ($B = .42$; $p = .02$) and increase with the number of firms founded in the past ($B = .22$; $p = .02$). Evidence also suggests that entrepreneurs' intense positive feelings and identity centrality for founding increase with the age of their firm ($B = .14$; $p \leq .05$, and $B = .27$; $p \leq .01$, respectively). This indicates that entrepreneurs from older firms still experience intense feelings for founding and are deeply attached to their identity as founders. Finally, we observed that entrepreneurs' identity centrality toward developing is positively related to the number of firms they have founded

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Table 3
Criterion validity: relationships between the dimensions of EP and relevant target behaviors.

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	DV: creativity		DV: creativity		DV: persistence		DV: persistence		DV: absorption	
(Constant)	4.37***	4.42***	4.37***	4.30***	3.93**	3.86***	3.93***	3.91***	3.95***	3.93***
Gender	.02	.27**	.02	.02	.09	.08	.09	.10	.05	.08
$Age_{(ln)}$	−.14	−.14	−.14	−.07	−.43	−.35	−.43	−.36	.07	.13
Education	−.03	−.02	−.03	−.03	.00	.00	.00	.02	.01	.02
Num. firms $fnd_{(ln)}$	.09	−.03	.09	.01	.08	.00	.08	−.00	.08	−.03
Firm $age_{(ln)}$	.10	.10*	.10	.06	.12†	.07	.12†	.09	.10	.06
IPF-inventing		.41***								
IC-inventing		.24***								
IPF∗IC-invent.		−.08								
IPF-founding				.34***		.31***				
IC-founding				.10 †		.15*				
IPF∗IC-found.				.18***		.17**				
IPF-developing								.17**		.25***
IC-developing								.14**		.13*
IPF∗IC-devel.								.06		.10*
R^2	.03	.54	.03	.21	.04	.21	.04	.14	.03	.20
ΔR^2		.51***		.18***		.17***		.10***		.17***
F	.9	21.5***	.9	4.9***	1.1	4.8***	1.1	3.0**	.8	4.5***

Note. n = 158 entrepreneurs; IPF = intense positive feelings; IC = identity centrality; and (ln) = indicates variables that were ln-transformed for subsequent analyses in order to control for non-normal distribution (mean and standard deviations = non-transformed values).
Measures for IPF-inventing, founding and developing consist of the summated average score for their respective items. All variables were mean-centered prior to the analyses.

*** $p \leq .001$.
** $p \leq .01$.
* $p \leq .05$.
† $p < .10$.

in the past (B = .39; $p \leq .001$). This suggests that habitual entrepreneurs are particularly passionate about growing the new ventures they start.

Taken together, the above findings confirm that our proposed measures can capture systematic variations in how entrepreneurs with different background and characteristics experience EP across its different dimensions and domains.[7] These theoretically-consistent findings contribute to establish the criterion validity of our measures.

6.4.7. Are the dimensions of EP related to relevant behaviors?

We used regression techniques to examine relationships between EP and three entrepreneurship-relevant behaviors: creativity, persistence, and absorption in one's activities. This approach allowed us to investigate an important feature of our model of EP: the independent and interactive effects of feelings and identity centrality. To further the rigor of our analyses, our tests specifically focus on the relationships advanced by Cardon et al. (2009b) in their conceptual model of the nature and experience of EP, namely: a) the relationships between EP for inventing and EP for founding and creative problem-solving (cf., Propositions 2 and 4, p. 521); b) the relationships between EP for founding and EP for developing and persistence (cf., Proposition 4 and 6, p. 521–522); and c) the relationship between EP for developing and absorption (Proposition 6, p. 522). Consistent with our model, we found evidence that feelings and identity centrality can have distinct relationships with different individual-level outcomes. More importantly, we observed significant interactions between EP's intense positive feelings and identity centrality. We report the results of these analyses in Table 3.

In support of the criterion validity of our measures, both feelings for inventing and identity centrality of inventing were significantly and positively related to creativity (Model 1: B = .41, $p \leq .001$; and B = .24 $p \leq .001$). Feelings for founding were also significantly and positively related to creativity (Model 2: B = .34, $p \leq .001$), and there is evidence of a significant interaction between feelings for founding and identity centrality for founding on creativity (Model 2: B = .18, $p \leq .001$). This indicates that the significant and positive relationship between intense positive feelings towards founding and creativity is larger in magnitude for entrepreneurs who report that founding is very important to their identity than it is for entrepreneurs who report that founding is less important.

We also found evidence of significant and positive relationships between feelings for founding and persistence (Model 3: B = .31, $p \leq .001$), between identity centrality for founding and persistence (Model 3: B = .15, $p \leq .05$), and for an interaction between feelings and identify centrality for founding in their relationships with persistence (Model 3: B = .17, $p \leq .01$). In

[7] Additional tests confirmed that our observations remain significant when controlling for firm size and industry.

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concrete terms, this latter result indicates that the significant and positive relationship between intense positive feelings towards founding and persistence increases in magnitude with the centrality of founding to an entrepreneurs' identity. Next, we observed that both feelings and identity centrality for developing were significantly and positively related to persistence (Model 4: B = .17, $p \leq .01$; and B = .14 $p \leq .01$).

Finally, we found evidence of significant and positive relationships between feelings for developing and absorption (Model 5: B = .25, $p \leq .001$), between identity centrality for developing and absorption (Model 5: B = .13, $p \leq .05$), and for an interaction between feelings and identity centrality for developing in their relationship with absorption (Model 5: B = .10, $p \leq .05$). This result indicates that the significant and positive relationships between intense positive feelings towards developing and absorption is larger in magnitude for entrepreneurs who report that developing is very important to their identity than it is for entrepreneurs who report that developing is less important.

Taken together, these observations indicate that our proposed measure can capture distinct relationships between the experience of EP in different domains and relevant entrepreneurial behaviors. More importantly, our results point to the importance of considering the direct and multiplicative effects of intense positive feelings and identity centrality toward each domain of entrepreneurial activity.

7. Follow-up study: the enduring nature of EP

Based on Cardon et al. (2009a), we built our measurement on the idea that EP is an enduring phenomenon, persisting over several months or years. This helps distinguish EP from the experience of more temporary emotions. To assess this claim we collected longitudinal data from a sample of entrepreneurs as part of a separate study. The sampling frame for this follow-up study focused on entrepreneurs who ran high-technology manufacturing ventures in the US states of Indiana, Illinois, Kentucky, Ohio, and Missouri. We contacted entrepreneurs listed in *Corptech Directory* from 1526 high tech companies in October of 2009 and asked them to participate in an online survey about the role of entrepreneurs in promoting strategic initiatives in ventures. The survey included the same 15 items used in the main study above. We received responses from 219 entrepreneurs (a 14.35% response rate). On average, the responding firms were 7.9 years old, had 22 employees, and had sales of $1.25 million. The responding CEOs were 38 years old on average, with more than 15 years of industry experience. Five percent of the respondent CEOs were female. We observed no significant differences in target or control variables between early and late respondents, or between respondents' and non-respondents' firm characteristics (as listed in Corptech).

Eighteen months after the initial survey (April 2011), we re-contacted all 219 entrepreneurs and sent them a follow-up survey that contained the same EP items. We received responses from 122 CEOs (a retention rate of 56.7%). To assess follow up bias, we first measured sampling error of the firms responding in the follow-up compared to firms not responding in the follow-up round. Our tests indicated no significant biases or pattern differences in returning versus non-returning respondents. Building on this data, we examined the extent to which entrepreneurs' experience of EP's across different domains and dimensions had changed over the 18-month period. We report these results in Table 4.

Results indicate that entrepreneurs' experience of passion was enduring. Paired t-tests of entrepreneurs' responses to each item across the two periods did not reveal any significant differences. Pearson correlations were high and significant for all items, and measures of Cohen's kappa were well above the recommended cutoff of 0.8 (Landis and Koch, 1977). In order to further establish the enduring nature of EP, we tested the equivalence of alternate model formulations (cf. Vandenberg and Lance, 1992). Results of these model comparisons provided evidence for configural equivalence (i.e., same number of factors: CFI = .98; SRMR = .02; RMSEA = .05), for metric equivalence (i.e., similar factor loadings: CFI = .97; SRMR = .02; RMSEA = .05), and for

Table 4
Enduring nature of EP: entrepreneurs' responses across time.

Domain of EP and item #	Original item	October 2009		April 2011		Paired *t*-test	Pearson *r*	Cohen's κ
		Mean	SD	Mean	SD			
IPF-inv$_1$	It is exciting to figure out new ways to solve unmet market needs that can be commercialized.	2.61	0.57	2.46	.30	−.23	.86***	.96
IPF-inv$_2$	Searching for new ideas for products/services to offer is enjoyable to me.	2.34	0.41	2.44	.55	.15	.89***	.95
IPF-inv$_3$	I am motivated to figure out how to make existing products/services better.	2.64	0.37	2.32	.56	−.48	.88***	.94
IPF-inv$_4$	Scanning the environment for new opportunities really excites me.	2.49	0.31	2.37	.39	−.24	.85***	.95
IC-inv$_1$	Inventing new solutions to problems is an important part of who I am.	2.63	0.78	2.49	.56	−.15	.83***	.94
IPF-fnd$_1$	Establishing a new company excites me.	2.27	0.34	2.69	.32	.90	.87***	.93
IPF-fnd$_2$	Owning my own company energizes me.	2.23	0.73	2.31	.37	.10	.89***	.94
IPF-fnd$_3$	Nurturing a new business through its emerging success is enjoyable.	2.70	0.37	2.44	.78	−.30	.80***	.94
IC-fnd$_1$	Being the founder of a business is an important part of who I am.	2.35	0.37	2.41	.40	.11	.87***	.95
IPF-dev$_1$	I really like finding the right people to market my product/service to.	2.48	0.69	2.51	.78	.03	.86***	.94
IPF-dev$_2$	Assembling the right people to work for my business is exciting.	2.34	0.57	2.4	.30	.09	.79***	.93
IPF-dev$_3$	Pushing my employees and myself to make our company better motivates me.	2.61	0.72	2.46	.49	−.17	.82***	.94
IC-dev$_1$	Nurturing and growing companies is an important part of who I am.	2.34	0.37	2.30	.56	−.06	.86***	.94

Note. IPF = intense positive feelings; IC = identity centrality; inv = inventing; fnd = founding; and dev = developing.
*** p<.001.

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scalar equivalence (i.e., similar intercepts: CFI = .98; SRMR = .01; RMSEA = .04). These observations provide support for the enduring nature of EP, and of the temporal validity of our proposed measures of feelings and identity centrality for each of the three domains of inventing, founding, and developing. In addition, along with results documented with Pilot Studies 1 and 3b (cf., Appendix C), observations that our measurement model exhibited high levels of fit with this additional sample of entrepreneurs provide initial evidence of the generalizability of our measures.

8. Discussion

In spite of the central role that affect and emotions play in entrepreneurship (e.g., Baron, 2008; Cardon et al., 2012; Foo et al., 2009), theory and methods for studying the nature and effects of entrepreneurial passion (EP) have so far fallen short of the substantial scholarly interest in the construct. The net result has been a dearth of rigorous empirical findings about passion and its effects. Seen in this light, the present paper makes important contributions at three distinct levels.

At a theoretical level, our work clarifies the ontological nature of EP, its relevant dimensions (i.e., feelings and identity centrality) and its domains (i.e., EP for inventing, founding, and developing). Our work thus builds on Cardon et al.'s (2009a) model of entrepreneurial passion by articulating the often-overlooked dimension of identity centrality in empirical research on passion (see Murnieks, et al., 2012 for a notable exception). This point is theoretically significant: without the role of identity centrality, the concept of passion may be little more than context-specific positive affect. By advancing a model of EP that encompasses both dimension of intense positive feelings *and* identity centrality, we contribute to refining theoretical conceptualizations of passion. More importantly, the model and measures we develop in this paper specifically include consideration of the interactive effects between the experience of intense positive feelings and identity centrality.

At a methodological level, we contribute a validated set of measures for investigating the antecedents and consequences of EP's dimensions and domains. Because such an instrument was not available before, scholars interested in studying passion in entrepreneurship had to rely on more generalized measures of passion, which do not reflect the challenges specific to entrepreneurship (Murnieks, 2007; Murnieks and Mosakowski, 2006). Along this line, our work shows that the domains and dimensions of EP are distinct from each other, and from other affective and cognitive variables known to play a role in entrepreneurship (e.g., hopefulness, the experience of positive and negative emotions, and entrepreneurial self-efficacy). By developing and validating a set of measures for capturing EP's underlying dimensions in different domains, we thus provide a concrete way to explore the nature of EP, such as why EP may systematically vary with the background and experience of different entrepreneurs.

Finally, at an empirical level, we contribute evidence that the relationships between EP and relevant outcomes vary between different domains. Since our intention was not to develop or test a model of the specific effects of passion on these outcomes, but simply to provide evidence for the criterion validity of our measures, the findings we report in this regard should not be taken as definitive evidence of these relationships. Our measures capture the direct and interactive relationships between EP's intense positive feelings and identity centrality with relevant outcomes, which provides a rich basis upon which to advance research on entrepreneurial passion, and more broadly, on the affective aspects of entrepreneurial action.

8.1. Implications for future research

A primary implication of our work is to facilitate future research on the unique and distinct roles of EP in entrepreneurship, and especially to distinguish EP from other affective and emotional constructs. Recent empirical research in entrepreneurship has moved beyond the search for the unique personality characteristics of entrepreneurs (e.g., Zhao and Seibert, 2006; Zhao et al., 2010); the new frontiers now concern the operation of cognitive processes that enable entrepreneurs' unique achievements (cf. Grégoire et al., 2011), and/or the critical importance of affect and emotion in supporting entrepreneurial action (Baron, 2008; Cardon et al., 2012). In spite of increased interest in the latter, however, high-impact theoretical contributions have only recently begun to be tested with rigorous empirical work (Foo, 2011; Foo et al., 2009; Liu et al., 2011).

By developing and testing the validity of a new instrument for measuring EP, we provide empirical evidence that EP and its dimensions are empirically distinct from other constructs. Building on the instrument we develop and validate in this paper, it becomes possible to investigate the unique effects of the domains of EP, over and above the effects of other affective and emotional components. In practice, we anticipate that such investigations will first focus on the role and effects of EP on different aspects of the entrepreneurial process. For instance, it has been argued that variations in entrepreneurial passion could help explain why some individuals (but not others) are able to recognize or imagine opportunities to introduce new products or services (Cardon et al., 2009a). But what exactly is the impact of EP (particularly passion for inventing) on individual efforts to identify entrepreneurial opportunities? Does EP simply induce would-be entrepreneurs to view any new project in a more positive light, or does it enable some individuals to perceive unique patterns of meaning among noisy environment signals (Baron and Ensley, 2006)? And if it does enable perception, what is the contribution of EP to this process, over and above that of prior knowledge and other individual dispositions (cf. Grégoire et al., 2010; Shane, 2000)? Is the role of EP unique and separate, or does it interact with other resources and dispositions to facilitate the identification of entrepreneurial opportunities? By extension, are these relationships between EP and opportunity identification the same for nascent and habitual entrepreneurs?

Similarly, identifying an idea for a new business does not guarantee entrepreneurial action. It is generally assumed that particular motivations are needed for one to engage in actual efforts to start a new venture and/or introduce new products or

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services in the marketplace (Baum and Locke, 2004; McMullen and Shepherd, 2006). Accordingly, it becomes legitimate to ask: what is the role of EP in one's commitment to start a new venture (especially in this case, passion for founding)? Is EP simply another form of motivation towards entrepreneurship, or does it have unique implications for scholarly efforts to understand the decision to start? Which domains of EP are particularly relevant for actual founding of ventures? Are these relationships consistent for all entrepreneurs, or do they vary with their background and experience?

In the same vein, prior research suggests that EP could help explain why many entrepreneurs persist in the face of difficulties and uncertain outcomes (Utsch and Rauch, 2000). What is the unique contribution of EP and its dimensions to such persistence, over and above that of other motivating factors and/or affective dimensions? Does EP simply encourage entrepreneurs to maintain their efforts or downplay the difficulties they encounter, or does it instead enable entrepreneurs to learn from their circumstances and adapt their efforts in search of better outcomes? Likewise, we know that not all entrepreneurs are equally passionate about activities associated with the growth and development of new ventures, so does EP (especially EP for developing) explain why some entrepreneurs devote considerable energy towards the growth and development of their ventures, especially after they have successfully passed the initial founding stages?

Many other questions could be investigated for these and other aspects of the entrepreneurial process. We believe that the theoretical and methodological developments we make in this paper enable further explorations of EP. By extension, we suggest that the instrument validated in this paper is not limited to research at the individual-level of analysis, but could be leveraged to study the team and organizational implications of EP and its dimensions. The same kind of questions highlighted above could be asked with respect to the role of EP within organizational efforts towards innovation, strategic renewal and corporate entrepreneurship. For instance, one could ask to what extent is passion contagious (e.g., Cardon, 2008), and what are the mechanism and boundary conditions for passion to 'grow' among co-workers and employees? How does passion operate within founding teams of new ventures, and do all members of the team need to be passionate in order to realize the potential benefits of passion? Should TMT members be equally passionate for the same role and associated activities, or is a team with more balanced passion preferred (cf. Drnovsek et al., 2009)?

8.2. Limitations and avenues of expansion

Naturally, our study is not without limitations. Theoretically, one could question whether the concept of EP is appropriately limited to the three particular domains we focused on. Although we took great care to build our model on extant literature that specifically discussed the nature of EP and its articulation with respect to three salient roles to which individual entrepreneurs may identify themselves, it remains theoretically possible that EP could include other domains. Accordingly, we believe that future research could build upon our model to explore whether EP includes additional domains, and if so, what those domains are. Methodologically, critics could object that our methods and findings are limited by the self-report nature of our observations, and by our reliance on a single method. In spite of the practical advantages of formulating our instrument on these grounds, we agree that an interesting direction for future research would be to explore the convergent validity of our measures with data obtained from biophysical measures that capture the experience of feelings of passion regardless of what the participant is trying to express or professes to have. In the same vein, it would seem important to explore the effects of experiencing different types of passion not only on individual behaviors, but also on firm-level outcomes like survival and growth. In this regard, we believe that the instrument we developed in this paper can be readily integrated with other data collection techniques and methods.

Finally, we must observe that with the exception of the last study, where we surveyed the same entrepreneurs 18 months apart, all our other observations were cross-sectional. Interesting avenues for future research thus lie in exploring the antecedents of EP, and the factors and dynamics that preside over its development and subsequent evolution. In this regard, important questions for future research are to determine whether, to what extent, and why some individuals are naturally predisposed to exhibit high levels of EP before they engage in entrepreneurial activities, or whether, to what extent, and why such high levels of EP may develop over time, as individuals engage in such entrepreneurial activities.

8.3. Guidelines for using this measure

In order to ensure that the instrument we developed and validated has value for capturing entrepreneurs' levels of passion, and for understanding the antecedents and consequences of passion, we offer several specific guidelines and suggestions about the use of our measures.

First, we must guard scholars against the temptation of combining our items into an overall average-across-all-domains measure of EP. Doing so would be inconsistent with extant theory about EP (Cardon et al., 2009a). It would also be methodologically questionable. As we noted above, the higher-order latent construct of overall passion depicted in Fig. 1 has no substantial meaning outside of a measurement model: it is only a statistical tool used to examine the pattern of correlations across the dimensions and domains of EP. Further, our empirical results reinforce the in-appropriateness of compiling an average-across-domains measure of EP.

Accordingly, we recommend that empirical investigations of the antecedents and/or effects of passion consider the three domains of passion separately. Lumping all measures into an overall EP score is likely to obscure important and meaningful distinctions between the three domains of inventing, founding, and developing. These distinctions should be maintained. To advance research in this idea, we need robust models that examine the relationships between a specific domain of passion and its antecedents and outcomes, as well as the explanatory mechanisms for such relationships. Given the very different

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types of activities involved, these models may differ for passion for inventing, passion for founding, and passion for developing. Scholars may choose to explore just one or multiple domains of passion as appropriate for their particular research question.

Second, we strongly recommend that future studies of EP integrate the two dimensions of intense positive feelings and identity centrality. Both dimensions form an integral part of passion, and their interaction appears to be a critical aspect of EP. As Cardon et al. (2009a) noted, "original future work in operationalizing entrepreneurial passion is needed to include direct assessment of (1) the meaningfulness of individual role identities for the entrepreneur…, (2) the intensity of positive feelings for activities associated with individual role identities…, and (3) a rule for combining the preceding evaluations to develop a composite or latent entrepreneurial passion score for *each* identity" (p. 527, emphasis in original). Accordingly, we encourage scholars using our instrument to measure both positive feelings and identity centrality for each domain, and to account for the multiplicative effects of these dimensions.

Finally, we believe it useful to draw attention to the problems of range restriction that can arise when using 5-item Likert scales. These problems are not trivial, and can undermine the noticing of otherwise important relationships. To prevent such issues, and consistent with Aguinis et al. (2009), we recommend that future uses of our measures leverage wider scales and anchors (cf. Appendix D). In short, while we believe the scales developed and validated here constitute an excellent starting point, we believe that theoretical and methodological refinements are an integral part of the scholarship process.

9. Conclusion

Along with other affective and emotional dimensions, passion is at the very heart of the entrepreneurial experience. Yet past research on EP has been limited by the lack of means to translate extant theories into models that reflect the specific nature and context of entrepreneurship, and strategies and tools that are methodologically sound. By developing and validating an instrument for measuring the dimensions and domains of EP, we hope to help advance entrepreneurship research not only on the antecedents and consequences of EP, but also on the broader role of affect and emotion in what remains a fascinating human endeavor.

Appendix A. Analyses and results of Pilot Study 2 (content validity)

Table A1 reports the results of content validity analyses performed for Pilot Study 2. Consistent with Schriesheim et al. (1993), we conducted a Q-factor analysis of participants' ratings of each item on the three domains of inventing, founding, and developing. Whereas traditional factor analysis consists of examining correlations between variables across a sample of subjects, Q-factor analysis focuses on the correlations between *subjects* across a sample of variables — in this case, participants' ratings of each item on the three aforementioned domains. For both panels of academic experts (n = 32) and MBA students (n = 75 MBA), results of Principal Component Analyses (PCA) converged on a four-factor solution. The four factors accounted for 70.1% of the variance in academic experts' ratings of the items, vs. 64.6% of the variance in MBA students' ratings. In line with Schriesheim et al. (1993: p. 400), we consider loadings of .40 and above to indicate a meaningful association between an item and a particular domain. To facilitate readings of the table, we only report loadings above .40. Results are similar across both panels, and tend to group together items targeting intense positive for inventing, founding, developing, and a fourth factor that stresses the creation and commercialization of new products and services. At the same time, results in Table A1 point to items that load on different domains than intended, and/or that cross-load on more than one factor — indicating poor content validity.

To further assess the validity of ambiguous items, we followed the procedures developed by Hinkin and Tracey (1999) and supplemented the above observations with one-way analyses of variance: this allowed us to specifically compare the mean ratings of each IPF item on its intended domain (inventing, founding, or developing), relative to its rating on the other two domains. Table A1 also reports the percentage of participants who classified each item on its intended dimension in a separate sorting task. We indicate in bold the mean ratings for items that were significantly higher on their intended domain of EP. For instance, we observe that in both panels, all six items targeting IPF for inventing exhibit higher rating on their intended domain of inventing than on any other domain.

Table A1 indicates which items we discarded because they loaded across domains and/or did not exhibit consistent mean ratings on their intended domain (we indicated these items with a †). The first two items for IPF developing deserve particular explanations: where academics associated these two items with founding, professional MBA students associated them with developing. Because of the importance of assembling the right team of people to face the challenges of new venture growth, we decided to keep these items in the main study to examine whether entrepreneurs' responses to these items are more closely tied to EP for founding or EP for developing. To cast light on the parallels between this pilot study and the main study, we indicate in Table A1 the reasons why some of the items were eventually discarded. These reasons include items that exhibit poor item-total correlation to their intended subscale in main study (marked ††), and items that showed poor item-total correlation and evidence of cross-loading with other dimensions in main study (e.g., high modification indices — marked †††).

For the mean difference tests, we adjusted for multiple comparisons to address the increased risk of making Type I errors. For comparisons where Levene's test indicated that the groups compared were homogeneous in variance, we used Duncan's Multiple Range test. When there was no statistical evidence that we could assume equal variance, we used Dunnet's C, which is appropriate for pairwise comparisons, and particularly conservative for small samples (Hsu, 1996).

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Table A1
Results of content validity analyses.

		Academic experts (n = 32)								Working professionals MBA students (n = 75)							
		Factor loadings (PCA)				Mean ratings (ANOVA)				Factor loadings (PCA)				Mean ratings (ANOVA)			
#	Domains and items	inv	fnd	dev	com	inv	fnd	dev	%	inv	fnd	dev	com	inv	fnd	dev	%
IPF-inventing items																	
inv_1	It is exciting to figure out new ways to solve unmet market needs that can be commercialized.	.81				**4.5**	3.00***	3.50***	**76**	.42			.73	**4.53**	3.83***	4.12*	**77**
inv_2	Searching for new ideas for products/services to offer is enjoyable to me.	.80				**4.44**	2.66***	3.41***	**76**	.79				**4.67**	3.41***	3.76***	**56**
inv_3	I am motivated to figure out how to make existing products/services better.	.70				**4.31**	2.47***	3.53*	**61**	.71				**4.23**	3.13***	3.45***	**51**
inv_4	Scanning the environment for new opportunities really excites me.	.81				**4.47**	2.63***	3.09***	**70**	.61				**4.61**	3.64***	4.00**	**52**
$inv_5^{\dagger\dagger}$	I feel energized when I am developing product prototypes.	.71				**4.91**	2.22***	2.25***	**97**	.81				**4.67**	3.01***	2.31***	**95**
$inv_6^{\dagger\dagger}$	I really like tinkering with product designs.	.68	−.43			**4.59**	1.84***	2.03***	**97**	.82				**4.40**	2.50***	2.07***	**89**
IPF-founding items																	
fnd_1	Establishing a new company excites me.		.75	−.43	2.41***	**4.88**	2.14***	**97**		.87			3.05***	**4.61**	2.66***	**93**	
fnd_2	Owning my own company energizes me.		.80		1.75***	**4**	2.66***	**91**		.67	.48		2.55***	**3.96**	2.88***	**84**	
fnd_3	Nurturing a new business through its emerging success is enjoyable.		.68		1.88***	**4.25**	3.50*	**52**			.58		2.76***	*4.04*	4.03ns	44	
$fnd_4^{\dagger\dagger}$	I love creating a new firm.		.78	−.40	2.22***	**4.91**	2.02***	**97**		.86			3.15***	**4.6**	2.65***	**91**	
$fnd_5^{\dagger\dagger}$	Trying to convince others to invest in my business motivates me.		.78		1.78***	**4.31***	3.53	30		.64	.48		2.28***	**4.41*****	3.4	15	
$fnd_6^{\dagger\dagger}$	I enjoy figuring out how to take someone else's ideas and market them.		.53		2.77ns	3.25	3.31ns	33			.60		2.47***	3.40	3.79ns	51	
$fnd_7^{\dagger}$	I greatly enjoy talking about my ideas with other people.	.69			3.75ns	3.19	3.06ns	21	.60				3.83ns	3.55	3.17ns	42	
$fnd_8^{\dagger}$	I really enjoy creating and appropriating value for my company.			.45		2.59***	3.45	3.84ns	30			.70		3.16***	3.68	**4.16***	63
$fnd_9^{\dagger}$	Creating something out of nothing is exciting.			−.56	.45	4.22ns	*4.22*	2.63***	40	.61	.47			4.75*	4.32	2.84***	28
IPF-developing items																	
dev_1	I really like finding the right people to market my product/service to.		.66			2.15***	3.75ns	3.59	48			.72		2.41***	3.85ns	*4.13*	*59*
dev_2	Assembling the right people to work for my business is exciting.		.85			1.56***	4.59***	2.93	*55*		.62	.55		2.47***	4.32***	3.32	19
dev_3	Pushing my employees and myself to make our company better motivates me.			.79		1.72***	2.63***	**4.19**	82			.84		2.24***	3.08***	**3.88**	85
$dev_4^{\dagger\dagger\dagger}$	I really enjoy commercializing new products/services.				.80	3.28ns	3.44ns	*3.5*	0				.64	3.33***	3.80ns	*4.13*	44
$dev_5^{\dagger\dagger\dagger}$	Attracting new customers to my existing business is highly motivating.			.83		1.78***	2.84***	**4.59**	91			.80		2.48***	3.16***	**4.70**	93
$dev_6^{\dagger\dagger\dagger}$	Taking a small business and growing it is exciting.			.86		1.81***	2.61***	**4.84**	91			.67	.41	2.67***	3.43***	**4.74**	89
$dev_7^{\dagger\dagger\dagger}$	Expanding my company by offering new products and services excites me.			.84		2.97***	2.41***	**4.75**	91		−.47	.48		3.81*	3.22***	**4.61**	89
$dev_8^{\dagger\dagger\dagger}$	I really like it when we meet or exceed sales projections.			.91		1.53***	2.06***	**4.63**	91			.83		2.11***	3.03***	**4.38**	95
$dev_9^{\dagger\dagger\dagger}$	Expanding the number and type of products and services we offer is thrilling.			.84		3.06***	2.16***	**4.74**	88		−.60			3.93*	2.88***	**4.45**	87

Note. IPF = intense positive feelings; inv = inventing; fnd = founding; dev = developing; and com = commercialization (4th domain factor that emerged in PCA). Item numbers are consistent across all studies. % = percentage of participants who classified the item with its intended domain in a separate forced-choice task.
† = items that were discarded for poor content validity (e.g., cross loadings or loading on unintended domain); †† = items that were discarded in main study because of low item-total correlations; ††† = items that were discarded in main study because of evidence of cross loadings (high modification indices in CFA). Reported significance levels are for comparisons with the mean rating of an item on its intended domain.
Significance levels: ns = non significant; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Appendix B. Analyses and results of Pilot Study 3 (identity centrality)

Table B1 reports the results of Principal Component Analysis of items targeting participants' identity centrality for inventing, founding, and developing (respectively). Results indicate that the target items highlighted in bold share high levels of communality (h^2) with other items). Consistent with Wanous and Hudy (2001) and Wanous et al. (1997), these observations support the validity of a parsimonious single-item approach to capture participants' Identity Centrality.

Table B1
Examining the reliability of single-item measure for identity centrality.

Domain of IC and item #	Items	h^2 MBA students (n = 16)	h^2 Entrepreneurs (n = 111)
IC-inv_1	Inventing new solutions to problems is an important part of who I am.	**.71**	**.70**
IC-inv_2	I frequently think about inventing new solutions to business problems.	.87	.77
IC-inv_3	When I think of who I am, a key aspect of my identity is that I am an innovator.	.74	.82
IC-inv_4	Identifying and developing new business opportunities is central to how I define myself.	.70	.73
IC-inv_5	I think of myself as an idea person.	.40	.49
IC-inv_6	I would feel a loss if I were forced to give up searching for new solutions to business problems.	.58	.65
IC-inv_7	When they think about who I am, people who know me well say that at heart, I'm an inventor.	.89	.72
IC-inv_8	My colleagues and employees think of me as an inventor.	.95	.75
IC-fnd_1	Being the founder of a business is an important part of who I am.	**.81**	**.80**
IC-fnd_2	I frequently think about starting/founding a business.	.27	.35
IC-fnd_3	When I think of who I am, a key aspect of my identity is that I am the founder of a business.	.87	.81
IC-fnd_4	Being the founder of a new business is central to how I define myself.	.87	.87
IC-fnd_5	I think of myself as a business founder.	.78	.70
IC-fnd_6	I would feel a loss if I were forced to give up starting new businesses.	.77	.57
IC-fnd_7	When they think about who I am, people who know me well say that at heart, I am a business founder.	.85	.80
IC-fnd_8	My colleagues and employees think of me as a business founder.	.73	.68
IC-dev_1	Nurturing and growing companies is an important part of who I am.	**.79**	**.83**
IC-dev_2	I frequently think about developing and growing my venture.	.33	.66
IC-dev_3	When I think of who I am, a key aspect of my identity is that I am someone who grows businesses.	.62	.74
IC-dev_4	Being a developer of businesses is central to how I define myself.	.78	.82
IC-dev_5	I think of myself as someone who grows ventures.	.92	.90
IC-dev_6	I would feel a loss if I were forced to give up nurturing and growing companies.	.66	.69
IC-dev_7	When they think about who I am, people who know me well say that at heart, I am someone who grows business ventures.	.81	.80
IC-dev_8	My colleagues and employees think of me as someone who nurtures and develops companies.	.75	.86

Note. IC = identity centrality; inv = inventing; fnd = founding; and dev = developing.

Appendix C. Analyses and results of pilot studies (enduring nature of feelings)

Table C1 reports the results of our pilot studies concerning the relevance of formulating items that stress the enduring nature of participants' reported intense positive feelings vis-à-vis EP's different domains. The fourth column reports the inter-item correlations between the original and reworded items for the 16 working professional MBA students who completed the two versions of the survey, two weeks apart. Correlations were significant and 'large' in magnitude (Cohen, 1992) for all inventing and developing items, but they were only significant for two of the founding items. We suspect that this may be due to MBA students' lack of new venture founding experience. To examine this possibility, we used factor analysis techniques to compare the responses of entrepreneurs in Pilot Study 1 (who answered some of the original items), and entrepreneurs from Pilot Study 3b (who answered the reworded items).[8] Consistent with standard practices, we only report loadings larger than .40. Results indicate that the factor structure between the two groups was similar.

[8] Please note that some items that were in Pilot Study 1 were dropped, and new ones were added for Pilot Study 3.

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Table C1
Examining items emphasizing the enduring nature of EP.

Domain of EP and item #	Original items	Reworded items to stress the enduring nature of EP	Pilot Study 3a	Pilot Study 1			Pilot Study 3b		
			Inter-item	PCA loadings			CFA loadings		
			r	inv	fnd	dev	inv	fnd	dev
IPF-inv1	It is exciting to figure out new ways to solve unmet market needs that can be commercialized.	When I work on figuring out new ways to solve unmet market needs, it excites me for a long time.	.60*	.75	.48		.61		
IPF-inv2	Searching for new ideas for products/services to offer is enjoyable to me.	Searching for new ideas for products/services give me durable feelings of joy.	.77**	.84			.73		
IPF-inv3	I am motivated to figure out how to make existing products/services better.	It motivates me for a long-time to figure out how to make existing products/ services better.	.77**	.80			.62		
IPF-inv4	Scanning the environment for new opportunities really excites me.	I get lasting excitement from scanning the environment for new opportunities.	.67**	–			.66		
IPF-inv5	I feel energized when I am developing product prototypes.	I feel long-lasting energy when I am developing product prototypes.	.62**	.79			.60		
IPF-fnd1	Establishing a new company excites me.	Establishing a new company excites me for a long time.	.54*		.65			.74	
IPF-fnd2	Owning my own company energizes me.	Owning my own company gives me lasting energy.	.42		–			.60	
IPF-fnd3	Nurturing a new business through its emerging success is enjoyable.	Nurturing a new business through its emerging success is enjoyable.	.31		.76			.59	
IPF-fnd4	I love creating a new firm.	My love for creating a new firm has lasted.	.51*		–			.70	
IPF-fnd5	Trying to convince others to invest in my business motivates me.	Trying to convince others to invest in my business motivates me for a long time.	.79**			.63		–	
IPF-dev1	I really like finding the right people to market my product/service to.	I really like finding the right people to market my product/service to for my company.	.69**			.63			.55
IPF-dev2	Assembling the right people to work for my business is exciting.	In the long-term, assembling the right people to work for my business is exciting.	.59*			.79			.70
IPF-dev3	Pushing my employees and myself to make our company better motivates me.	Pushing my employees and myself to make our company better motivates me for a long time.	.64**			–			.63
IPF-dev4	I really enjoy commercializing new products/services.	In the course of running my business, I really enjoy commercializing new products/ services.	.53*	.44		.69			.63

Note. Pilot Study 3a: n = 16 professional MBA students; Pilot Study 1: n = 58 entrepreneurs; Pilot Study 3b: n = 111 entrepreneurs.
IPF = intense positive feelings; inv = inventing; fnd = founding; and dev = developing.
* $p \leq .05$.
** $p \leq .01$.

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Appendix D. Validated instrument for measuring entrepreneurial passion

Table D1 reports the validated items for measuring Entrepreneurial Passion's two dimensions (Intense Positive Feelings and Identity Centrality) across the three domains of inventing, founding, and developing. As we indicated in the text, we welcome future investigations of the experience of EP in additional domains (such as passion for social causes). More importantly, we encourage scholars to study the experience of EP in each domain separately and in parallel (cf. Tables 2 and 3), and *not* to lump all measures into an overall average-across-all-domains measure of EP. Finally, we recommend that scholars not only investigate the independent effects of EP's Intense Positive Feelings and Identity Centrality, but also consider the multiplicative combination of the two dimensions in each domain.

Table D1
Instructions, scale anchors, and items for EP's dimensions and domains.

Instructions	Please indicate the extent to which you agree or disagree with each statement.
Scale anchors	1 = 'strongly disagree'; 2 = 'disagree'; 3 = 'neither agree nor disagree'; 4 = 'agree'; 5 = 'strongly agree'. Note: We recommend that scholars using this instrument consider using 7-point or 9-point scales to guard against issues of range restriction. Note: Please see Appendix B for other identity centrality items that could be included in future studies.
Domain and item #	Validated item
IPF-inv$_1$	It is exciting to figure out new ways to solve unmet market needs that can be commercialized.
IPF-inv$_2$	Searching for new ideas for products/services to offer is enjoyable to me.
IPF-inv$_3$	I am motivated to figure out how to make existing products/services better.
IPF-inv$_4$	Scanning the environment for new opportunities really excites me.
IC-inv$_1$	Inventing new solutions to problems is an important part of who I am.
IPF-fnd$_1$	Establishing a new company excites me.
IPF-fnd$_2$	Owning my own company energizes me.
IPF-fnd$_3$	Nurturing a new business through its emerging success is enjoyable.
IC-fnd$_1$	Being the founder of a business is an important part of who I am.
IPF-dev$_1$	I really like finding the right people to market my product/service to.
IPF-dev$_2$	Assembling the right people to work for my business is exciting.
IPF-dev$_3$	Pushing my employees and myself to make our company better motivates me.
IC-dev$_1$	Nurturing and growing companies is an important part of who I am.

Note. IPF = intense positive feelings; IC = identity centrality; inv = inventing; fnd = founding; and dev = developing.

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