



The interplay between human, social and cognitive resources of nascent entrepreneurs

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Abstract This study integrates human, social and cognitive capital traits into a model of nascent entrepreneurial capital. We hypothesise that the cognitive traits of nascent entrepreneurs play a significant role in moderating the impact of human and social capital endowments on the outcome of the nascent entrepreneurship process. Thus, differences in cognitive traits explain why nascent entrepreneurs with similar stocks of human and social capital resources may experience different outcomes. Using data from the Panel Study of Entrepreneurial Dynamics (PSED), we find that models incorporating cognitive capital traits as moderating variables of human and social capital have a greater explanatory power of nascent entrepreneurship outcomes than models that consider these components of nascent entrepreneurial capital in isolation. The implications of our results are important for researchers, nascent entrepreneurs, venture capitalists and SME support agencies.

Plain English Summary Nascent entrepreneurs' cognitive abilities shape the impacts of their human and social capital on success in the new venture creation process. Entrepreneurship starts long before the actual birth of the new venture. Nascent entrepreneurs are those individuals seeking to establish a new business by discovering opportunities, conceiving strategies and obtaining resources. Human capital (the knowledge entrepreneurs derive from their education and work experience) and social capital (the networks of contacts entrepreneurs use to learn about the market and gain access to resources) are recognised as important determinants of success in launching a business. This study finds that cognitive abilities (the psychological dispositions that influence entrepreneurs' behaviours) also affect the outcome of the nascent entrepreneurship process both directly and by boosting the impacts of human and social capital. This result has implications for researchers as it shows that human and social capital attributes do not act in isolation, but rather interact with cognitive abilities. There are also implications for venture capitalists and SME support agencies. Investment and support decisions need to consider more than the business opportunity and the resources available, as success may hinge on the cognitive abilities of the entrepreneur.

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1 Introduction: background and objectives

Entrepreneurial outcomes such as new venture performance and innovativeness are influenced by the individual characteristics of entrepreneurs (Alvarez & Busenitz, 2001; Erikson, 2002). Many empirical studies have established relationships between founder characteristics and entrepreneurial outcomes (e.g. Baptista et al., 2014; Bosma et al., 2004; Cooper et al., 1994; Kato et al., 2015). A subset of these studies has dealt with success of businesses in the pre-start-up phase (e.g. Davidsson & Honig, 2003; Kessler & Frank, 2009; Kessler et al., 2012; Kim et al., 2006). Studies of the link between entrepreneurial characteristics and performance focus on a variety of entrepreneurial characteristics and outcomes, and have produced mixed results (Marvel et al., 2016; Unger et al., 2011).

While there have been incremental developments in theory and methods, progress towards defining and measuring the entrepreneurial traits that are required from nascent entrepreneurs has been limited. No conclusive resource theory has yet emerged that explains which nascent entrepreneurs and which new ventures will succeed in their gestating efforts (Baluku et al., 2016; Davidsson, 2006; Dimov, 2017; Diochon et al., 2008). No empirical consensus has been reached as to why founders may have comparable bases of knowledge and resources and yet differ in their ability to achieve desired outcomes (Dimov, 2017; Marvel et al., 2016).

In the entrepreneurship literature, the prevalent form of examining the influence of entrepreneurial traits on start-up success to link observable measures of entrepreneurial resources (e.g. human and social capital) with the probability of a desired entrepreneurial outcome (e.g. Cooper et al., 1994; Davidsson & Honig, 2003; Bosma et al., 2004; Baptista et al., 2014; Kato et al., 2015). However, most of these studies fail to integrate the direct and indirect effects of these measures in a comprehensive model of the determinants of success, offering only limited insights into how entrepreneurial resources interact among themselves (Dimov, 2017). Resources are necessary but not sufficient conditions for achieving desired outcomes (Gist & Mitchell, 1992). Looking

at entrepreneurial resources in isolation ignores that entrepreneurs think and act to integrate and combine their resources over time to achieve their objectives.

The present paper proposes to study the interplay between different types of entrepreneurial capital of nascent entrepreneurs. In order to conceptualise this interplay, we propose that entrepreneurs' cognitive traits influence how they integrate and combine resources (e.g. human and social capital) in the formation of new ventures. We define 'entrepreneurial cognitive capital' as consisting of a series of cognitive traits that operate on existing knowledge to guide entrepreneurial action (Baron, 1998; Baron & Ward, 2004; Forbes, 1999). Cognitive traits help guide entrepreneurs as they discover and assess opportunities, formulate exploitation strategies, and acquire and organise resources (Zhao & Seibert, 2006).

In order to provide a framework for our analysis, we propose that 'nascent entrepreneurial capital' (Baluku et al., 2016) is based on the aggregate endowments that the nascent entrepreneur possesses, including:

1. Human capital, relating to knowledge and skills acquired through education, training and on-the-job learning prior to the nascent entrepreneurship process. Human capital theory (Becker, 1962) proposes that individuals invest in the acquisition of knowledge and skills that can be general—e.g. formal education and training—or specific—e.g. experience in industry-specific technical tasks, managerial tasks, and entrepreneurial tasks (Baptista et al., 2014; Bosma et al., 2004). These investments in knowledge and skills contribute to enhance future productivity;
2. Social capital, corresponding to the relations, configurations, and norms of reciprocity that collectively facilitate social actions and undertakings (Nahapiet & Ghoshal, 1998). By building a network of social and professional contacts, the entrepreneur is able to access information and resources. Social capital can be gauged in terms of social role models, social skills and the flows of supportive social resources (networks of social ties) that individuals accumulate over time (Coleman, 1988; Davidsson and Honig, 2003; Davidsson & Gordon, 2011);
3. Cognitive capital, corresponding to the psychological traits or dispositions that translate how

behaviours emerge and affect outcomes. Of particular interest for the nascent entrepreneurship process are the entrepreneurs' cognitive styles and risk perceptions, the way they search for and process information, as well as their confidence and persistence, expectancies and desires.

In order to study the interplay between different types of nascent entrepreneurial capital, we examine the direct and combined effects of human, social and cognitive capital on the outcome of the nascent entrepreneurship process, paying particular attention to the interaction effects between cognitive capital and the other two entrepreneurial resources. We use data from the PSED-I survey. The PSED (Panel Study of Entrepreneurial Dynamics) is a longitudinal panel data set of adults in the process of founding new ventures who were identified from a phone screening of 64,222 individuals in the USA (Reynolds, 2007; Reynolds & Curtin, 2008, 2011). The uniquely detailed nature of the PSED surveys allows us to extract comprehensive sets of indicators of nascent entrepreneurs' cognitive capital, human capital and social capital.

Investigating the moderating effect of cognitive capital on the relationship between resources (human and social capital) and the outcome of the nascent entrepreneurship process represents a novel contribution to the literature that should inform our understanding of why nascent entrepreneurs vary in their ability to utilise resources, helping explain why potential entrepreneurs with similar human and social capital resources pursue different opportunities and reach different outcomes. Rather than aiming to provide a comprehensive model of the nascent entrepreneurship process, the present study contributes to amplify and extend the nascent entrepreneurship literature by reconciling cognitive factors with other entrepreneurial resources, shedding light on the complex interdependencies among factors influencing entrepreneurial outcomes (Schjoedt, et al., 2013).

Furthermore, the present study contributes by responding to two calls for research. The first is by Baluku et al. (2016) and Dimov (2017), who call for new and diverse ways to improve the conceptualisation of entrepreneurial capital. The second is the appeal by Baron and Ward (2004) and Rauch and Frese (2007) for research focusing on the interaction

between cognitive traits and the types of knowledge the entrepreneur possesses.

It has now been well over a decade since the second of these calls for research. Rauch and Frese (2007) pointed to a scepticism in the entrepreneurship literature about the relationship between personality traits and entrepreneurial outcomes. Around the same time, Borghans et al. (2008) stressed that many researchers had yet to be convinced of personality traits' predictive validity, stability and their causal status for economic outcomes. Indeed, assessing cognitive capital in the context of new venture creation is particularly complex. This limitation has likely constrained the ability of researchers to address the scholarly calls towards exploring the role of cognitive traits in entrepreneurship. Cognitive capital is often acknowledged to be present in entrepreneurship studies but is mostly implicit in the entrepreneur's capacity for action and deployment of resources (Daspit et al., 2021).

Arguably, these obstacles have been gradually surmounted with improved theory and data collection. Relationships between cognitive capital and entrepreneurial outcomes have been tackled by several studies (e.g. Chadwick & Raver, 2020; De Carolis et al., 2009; Dimov, 2010; Hack et al., 2016; Haynie et al., 2012; Johansson et al., 2021; Obschonka & Stuetzer, 2017; Renko et al., 2012; Robinson & Marino, 2013). However, studies have not addressed the interplay between cognitive capital and other entrepreneurial resources (e.g. human and social capital). By collecting data covering the components of human, social and cognitive capital, the PSED surveys offer an opportunity to address this gap.

The rest of this paper proceeds as follows. Section 2 addresses the literature on the role played by cognitive capital in nascent entrepreneurship, linking it to the research on entrepreneurial human and social capital. By bridging these literatures, we develop a set of hypotheses regarding the effect of nascent entrepreneurial capital on the likelihood of success in the nascent entrepreneurship process. Section 3 presents the data and variables to be used in the testing of the hypotheses while Section 4 discusses the methodology used in the study. Section 5 presents the results. Section 6 of the hypotheses while Sect discusses the results and implications of the analysis, while Section 7 addresses its limitations. Section 8 concludes.

2 Theoretical background

2.1 The role of human and social capital in new venture creation

Human capital and social capital theories of entrepreneurship, as well as a significant stream of empirical works, establish that the chances of success of both nascent and actual entrepreneurs are boosted by their levels of general human capital (e.g. education, training), specific human capital (e.g. start-up experience, industry experience, managerial experience) and social capital (i.e. networks of social ties, social role models, social skills). Bosma et al. (2004) find that entrepreneurs' investments in human and social capital are associated with better performance. Davidsson and Honig (2003) find similar results for nascent entrepreneurs.

Previous knowledge assists in the integration and accumulation of new knowledge, as well as integrating and adapting to new situations. Human capital may be more important in the early stages of the entrepreneurial process, when there is greater uncertainty, remark by helping business owners deal with the complexity and ambiguity of entrepreneurial decisions (Davidsson & Honig, 2003). Entrepreneurs face decisions about opportunity assessment, entrepreneurial entry, exploiting opportunities and entrepreneurial exit. Often these decisions are made in extreme contexts characterised by high uncertainty, time pressure and intense emotions (Shepherd et al., 2015). Entrepreneurs with higher levels of human capital are better able to map alternatives and criteria for decision-making.

In the nascent phase of a new business, human capital can influence decisions related to opportunity recognition and assessment. Sarasvathy (2001) proposes that entrepreneurs shape decisions about opportunities according to their own knowledge and resources. Thus, as entrepreneurs learn and build up human capital, their opportunity-related decisions change. Haynie et al. (2009) find that entrepreneurs assess opportunities as more attractive when the opportunity is highly inimitable and when it is related to the entrepreneur's human capital. If knowledge is critical to both the discovery and exploitation of entrepreneurial opportunities, we can formulate the following hypothesis:

H1: *Entrepreneurial human capital has a significant positive effect on the outcome of the new venture creation process (i.e. probability of success in creating a new venture).*

By success in creating a new venture, we mean successful exploitation in terms of creating an operational business entity.

Social capital refers to the ability of actors to extract benefits from their social structures and networks provided by extended family and community-based or organisational relationships. These benefits derive from building and accessing networks of social ties, observing social role models, and acquiring social skills. Coleman (1988) and Nahapiet and Ghoshal (1998) argue that social capital supplements the effects of education and experience.

Social capital can be a useful resource for the nascent entrepreneur, for instance bridging external networks in order to access knowledge and resources (Adler & Kwon, 2002; Aldrich & Zimmer, 1986) or acquire social skills (Baron & Markman, 2000, 2003). Individuals form personal and organisational ties that provide information and facilitate access to resources. Granovetter (1973) famously highlights the importance of maintaining an extended network of weak ties (i.e. loose relationships between individuals) since these are useful in obtaining information that would otherwise be unavailable or costly to locate.

Social capital assists nascent entrepreneurs by exposing them to new and different ideas (Aldrich & Zimmer, 1986; Davidsson & Honig, 2003). Entrepreneurs often make decisions as a result of associations based on friendship or advice (Brüderl & Preisendorfer, 1998). Aldrich and Zimmer (1986) find that networks of strong ties (i.e. family and close friendships) may provide resources, including conventional factors of production such as capital (e.g. by facilitating relationships with angel investors or venture capitalists) as well as critical production or marketing information.

Social capital provides considerable resources when properly leveraged for the nascent entrepreneur and may be of particular importance in environments of incomplete information. We thus propose that:

H2: *Entrepreneurial social capital has a significant positive effect on the outcome of the new venture creation process (i.e. probability of success in creating a new venture).*

2.2 The role of cognitive capital in new venture creation

2.2.1 *Cognitive traits*

Building on the growing interest in psychological aspects of economics, over the last two decades scholars have employed the cognitive perspective to explain the reasons, thinking and motivations underlying the new venture creation phenomenon (Mitchell et al., 2002; Shane et al., 2003; De Carolis and Saporito, 2006; De Carolis et al., 2009; Haynie et al., 2012; Obschonka & Stuetzer, 2017; Chadwick & Raver, 2020; Johansson et al., 2021). While human capital defines ‘what you know’ and social capital defines ‘who you know’, cognitive capital is said to define ‘who you are’ (Hmieleski & Carr, 2008). Borghans et al., (2008, p. 2) argue that cognitive traits can be powerful predictors of economic and social outcomes. For instance, people can demonstrate different levels of self-confidence despite similar levels of knowledge and experience, leading to different outcomes in their pursuits (Bandura & Locke, 2003). Differences in cognitive traits should lead to differences in how entrepreneurs exploit, integrate and extend knowledge and other resources used in the entrepreneurial process.

The present paper proposes that nascent entrepreneurs’ cognitive capital—i.e. the psychological dispositions that translate how entrepreneurs’ behaviours emerge and affect entrepreneurial outcomes—comprises the following traits: information gathering and processing; confidence; persistence; cognitive style; risk perception; desires; expectancies. We discuss each trait in turn in the context of their impact on the nascent entrepreneurship process.

2.2.2 *Information gathering and processing*

Nascent entrepreneurs have access to various sources or corridors of information as a product of their stocks of human and social capital (Davidsson, 2015; Shane & Venkataraman, 2000; Ucbasaran et al., 2008). By accessing intelligence from these sources, entrepreneurs gather and process knowledge that should help them make sound judgements regarding opportunity recognition and assessment. Forbes (1999) refers to the use of categorisation, arguing that people process information by assigning new data to pre-defined

mental categories and entrepreneurs are predisposed to categorise equivocal business situations more favourably than non-entrepreneurs. Hill and Levenhagen (1995) suggest that entrepreneurs function ‘at the edge of what they don’t know’ (p. 1057), utilising ‘metaphors’ and mental frameworks to retain patterns of actions that optimise their outcomes and reduce the chances of dealing with unfamiliar situations. Nascent entrepreneurs with stronger cognitive traits are able to rapidly and effectively select and use relevant information, connecting experience, knowledge, facts and intuitions to discover opportunities and obtain the resources required for implementation. Thus, abilities for information gathering and processing should contribute to a favourable outcome of the new venture creation process.

2.2.3 *Confidence and persistence*

Confidence and persistence are manifested in how entrepreneurs view the relative value of their information and resources, and their ability to exploit those resources in the pursuit of venture opportunities (Shane & Venkataraman, 2000). Entrepreneurs with stronger cognitive traits are more likely to avoid decision-making biases associated with overconfidence, including subjective decision-making (Tversky & Kahneman, 1974), distorted perception of one’s abilities (Busenitz, 1999; Lowe & Ziedonis, 2006) and illusion of control (Langer, 1975). Stronger cognitive traits in this context are associated with the self-adequacy and resilience required to manage achievements and failures during the gestation process (Chadwick & Raver, 2020). Nascent entrepreneurs with stronger cognitive traits are more likely to avoid the pitfalls of overconfidence in judging the attractiveness of opportunities and valuing the resources required for exploitation, thus being more likely to achieve a favourable outcome of the new venture creation process.

2.2.4 *Cognitive styles*

Cognitive style refers to entrepreneurs’ mental patterns in structuring novel information and perspectives along analytic-intuitive dimensions in ways that leverage their ability to recognise and adapt to new contexts and take advantage of new socio-economic conditions (Baron, 2000). Cognitive styles embody two modes of thought that drive entrepreneurial

judgement: intuitive and analytic thinking. Intuitive thinking is the ‘unconscious perception’ that can be applied to simple, easily structured problems and allows entrepreneurs to form convictions and detect hidden aspects in more complex contexts (Carland et al., 1996). Analytical thinking uses rational and systematic principles to combine information and recognise patterns. By balancing analytical and intuitive thinking, enterprising individuals detect links and patterns in unstructured information in order to discover opportunities and gather resources, being therefore more likely to drive the successful founding of new ventures.

2.2.5 Risk perception

Risk perceptions involve the way individuals make sense of the degree of uncertainty and the possibility for loss associated with particular actions. Risk perception is a cognitive behaviour that is influenced by individuals’ level of confidence in their abilities, views of reality, locus of control, optimism and fear of failure (Sitkin & Pablo, 1992; Palich and Bagby, 1995). Entrepreneurial judgement regarding opportunity discovery and the organisation of resources is influenced by entrepreneurs’ subjective perceptions of and attitudes towards risk and uncertainty (Cooper et al., 1988; Forlani & Mullins, 2000; Foss et al., 2008). Nascent entrepreneurs with weaker cognitive traits may engage in starting new ventures not because they knowingly accept risks but because they do not accurately perceive them (Shook et al., 2003; Simon et al., 2000). Nascent entrepreneurs with stronger cognitive traits are more likely to exercise better judgements in the face of uncertain outcomes, being more likely to successfully launch their new businesses.

2.2.6 Desires

The desire to establish a new venture also represents an important cognitive factor for nascent entrepreneurs. Gatewood et al. (1995) find that nascent entrepreneurs who are driven by desires that relate to a need for autonomy have a higher likelihood of attaining success. Shook et al. (2003) find that the desire for business creation differs across countries and contexts and is mainly influenced by aspirations that relate to status, prestige, idea development and

learning. Other studies have focused on entrepreneurial desires as distinctive traits that drive entrepreneurial outcomes, finding that desires driven by intrinsic reasons (i.e. putting personal ideas into action and desire for independence) increase the propensity for creating new ventures and attaining subsequent success (Peña, 2002; Van Praag & Cramer, 2001). Nascent entrepreneurs driven by a stronger desire to start a business will likely be more persistent and therefore more likely to progress toward a favourable outcome of the new venture creation process.

2.2.7 Expectancies

Expectancies represent a cognitive facet that relates to the individuals’ perception of their future prospects. Vroom (1964) claims that there is a relationship between expectancies and performance outcomes in organisational settings. In the case of nascent entrepreneurs, expectancies may refer to future profits and growth as well as enhanced social standing (Gatewood, 2004). Renko et al. (2012) argue that expectancy is a key component of entrepreneurial motivation and closely related to those intentions, efforts and behaviours that will eventually lead to operating a firm. Gatewood et al. (2002) link entrepreneurial expectancy to effort and performance and find that entrepreneurial expectancies are boosted when entrepreneurs receive positive feedback regarding their abilities. The transformation of entrepreneurial expectancies into active efforts to pursue the founding of new ventures is key to entrepreneurial action at the early stage of development (Dennis & Solomon, 2001; Liao & Welsch, 2003; Renko et al., 2012), likely having a positive effect on the likelihood of success in the nascent entrepreneurship process.

2.3 Cognitive traits and the nascent entrepreneur

Nascent entrepreneurs make decisions based on their subjective knowledge of the relevant business environment (Mahoney & Michael, 2005). Their cognitive traits determine their subjective perception of the environment, thus guiding their decisions (Foss et al., 2008). As nascent entrepreneurs strive to make sense of cues in the new venture environment, update their knowledge structure and imagine a course of tactical actions, their cognitive traits enable information gathering and processing, cognitive thinking and

risk assessment. Nascent entrepreneurs' confidence and persistence, desire and expectancies help propel them forward towards the realisation of the new venture. Together, these different traits act synergistically to shape the nascent entrepreneur's cognitive capital (Baluku et al., 2016).

Regardless of the nature of the new venture, nascent entrepreneurs need to possess cognitive capital in order to attain a general state of alertness that enables them to discover and evaluate opportunities, drawing exploitation strategies to obtain and deploy resources and persisting in their efforts towards the establishment of their new business. We therefore propose that:

H3: *Entrepreneurial cognitive capital has a significant positive effect on the outcome of the new venture creation process (i.e. probability of success in creating a new venture).*

2.4 The interaction between human capital and cognitive capital

The way knowledge is accumulated and influences entrepreneurial decisions is shaped by the individual's cognitive traits. Human capital is highly personal and often embedded in an individual's cognitive processes (Brymer et al., 2011; Sommer & Haug, 2011). Cognitive capital is central to the value derived from human capital. Research suggests that the perception of knowledge is in many cases more critical than the actual knowledge/experience in terms of explaining attained outcomes (Sommer & Haug, 2011). Education and training experiences that are similar when viewed from the outside become unique to the individuals who experience them because their interpretation of the knowledge and the observation of the environment around them is predicated on their cognitive styles and information processing.

Figure 1 presents a model of the interaction between cognitive and human capital characteristics. Cognition is fundamentally involved in knowledge processing (Brymer et al., 2011). Cognitive capital enables distinguishing between which human capital to process, which human capital to look for, which human capital to enact, and which human capital to dispose of. Nascent entrepreneurs employ information search and processing, and different cognitive styles to link existing and emerging knowledge, compensating for gaps and unlocking ambiguities.

Confidence and persistence play a key role in the formation and utilisation of human capital. Confidence and persistence encourage nascent entrepreneurs to engage in critical tasks and question existing assumptions, develop new insights, identify patterns, and explore meanings embodied in different contexts, thus transforming feelings, thoughts and experiences into new knowledge (Sommer & Haug, 2011). Human capital is also sensitive to cognitive desires, expectancies and risk perceptions that define the boundary of its applicability at the founding level. Klyver and Schenkel (2013) find that nascent entrepreneurs who combine prior knowledge and experiences with cognitive desires, and expectancies driven by non-economic aspirations (e.g. social status) may have greater chances of successfully creating new ventures, compared to nascent entrepreneurs who combine their knowledge and experiences with cognitive capital driven strictly by economic considerations, as the latter are likely to be more risk-averse and less willing to capitalise on unprofitable opportunities (Santarelli & Tran, 2013).

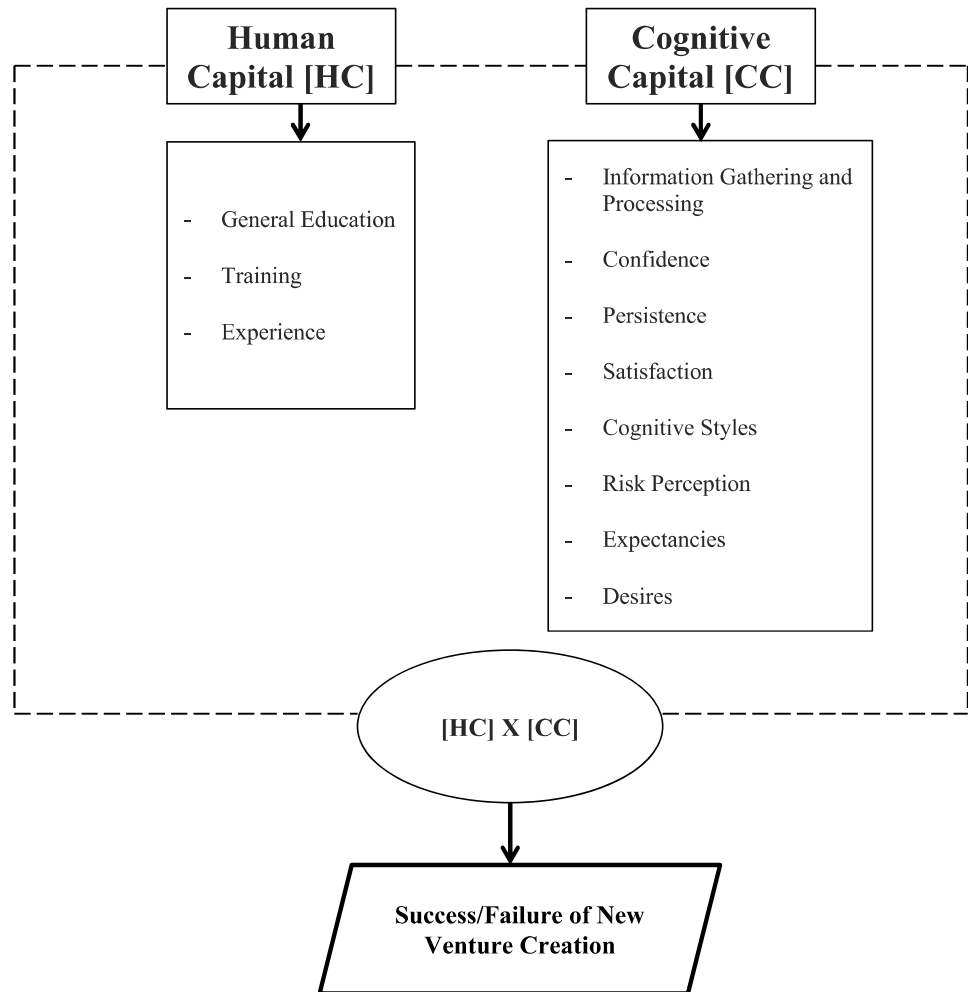
Cognitive and human capital thus seem to be associated through reciprocal and complementary relationships. Nascent entrepreneurs' ability to use and extend their existing stock of knowledge is a function of their cognitive traits. We therefore hypothesise that:

H4: *The interaction effect between entrepreneurial human and cognitive capitals has a significant effect on the outcome of new venture creation process.*

2.5 The interaction between social capital and cognitive capital

New venture creation is a function of the interplay of social capital and cognition (De Carolis & Saporito, 2006; De Carolis et al., 2009). An entrepreneur's network of social contacts allows access to various information sources. Information search and processing in social networks is likely governed by the entrepreneur's cognitive traits (in particular, cognitive styles and information gathering). Learning from social role models is likely to be associated with cognitive traits such as confidence, desire and expectancies. Cognitive styles and information gathering facilitate the recognition of opportunities from information available in the social environment, while confidence and persistence aid the search for rare resources linked

Fig. 1 The combined effect of human and cognitive capitals



with strong and weak social ties. Lowik et al. (2012) claim that social relations based on strong ties act as an interactive platform for exchanging complex knowledge, specific experiences and tacit knowledge, reducing the transaction costs of accessing resources.

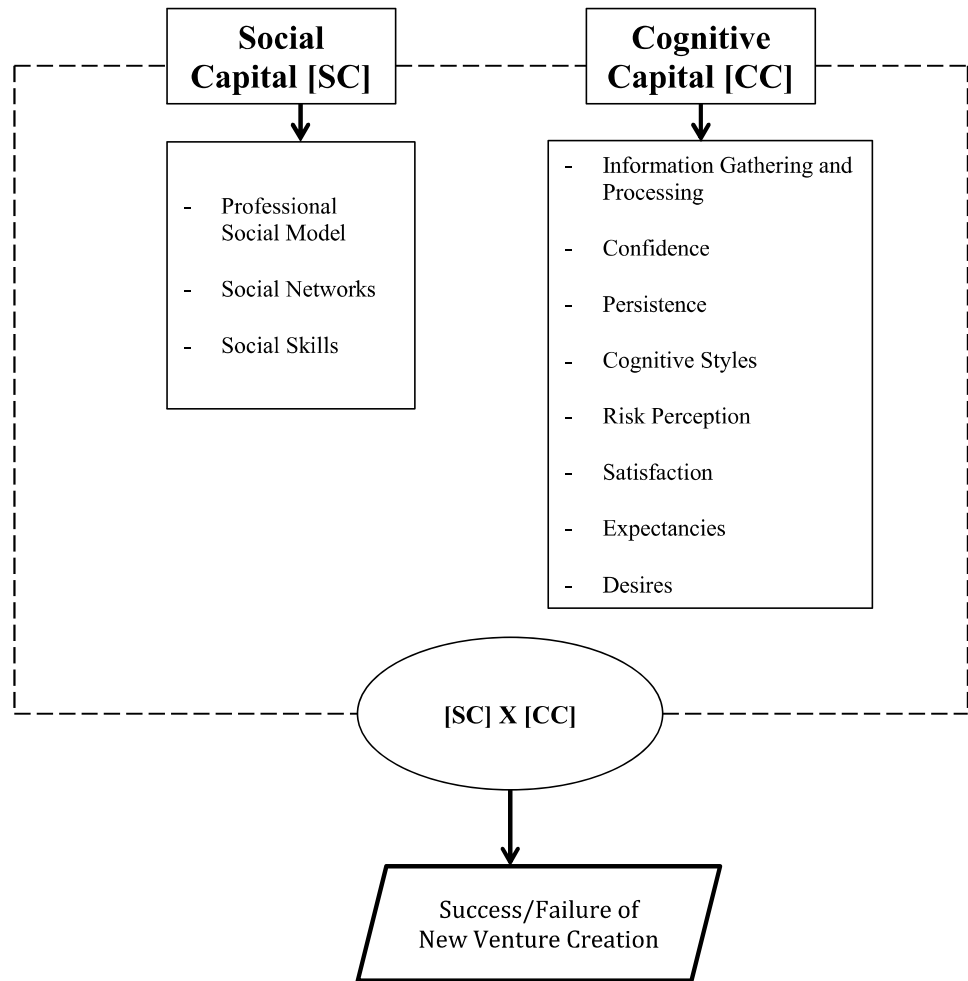
Social cognitive theory (Bandura, 1986) proposes that cognitive capital (in particular, confidence and desires) facilitates the use of social knowledge leading to productive action. As such, cognition can act as a ‘transformative process’ between social reality and entrepreneurial action (Brymer et al., 2011). Cognitive thoughts and emotions affect social interactions which in turn can determine the extent to which social knowledge is acquired and enacted. Figure 2 presents a model of the interaction between cognitive and social capital characteristics.

The social environment is also likely to shape the nascent entrepreneur’s cognitive traits. According to social learning theory, as individuals engage in different forms of social interaction, they develop specific

world views and working styles that are reflected in their cognitive traits (Gibson, 2003, 2004). Individual cognitive capital is shaped by social role models and strong ties on the basis of trust, common values and mutual interests. Strong ties provide a coherent, trusted and coordinated social context that helps mould the entrepreneur’s cognitive capital with regard to confidence, desires and expectancies (Shaver & Scott, 1991). Hmieleski et al. (2015) argue that social consistency and cohesion driven by strong ties and role models (e.g. family members who are entrepreneurs themselves) provide entrepreneurs with collective stability that enhances confidence and persistence (Aldrich & Zimmer, 1986; Coleman, 1988).

Following Minniti (2004) and De Carolis et al. (2009), we expect that nascent entrepreneurs with greater social capital coupled with superior cognitive traits are more likely to make progress towards creating a new venture. Cognitive capital enhances the nascent entrepreneur’s ability to use social and

Fig. 2 The combined effect of social and cognitive capital



professional networks, while social capital provides a channel for information, resources, role models and social ties. Nascent entrepreneurs with greater levels of cognitive capital are more likely to navigate and conclude the process of new venture creation. We therefore propose the following hypothesis:

H5: *The interaction effect between entrepreneurial social and cognitive capitals has a significant effect on the outcome of new venture creation process.*

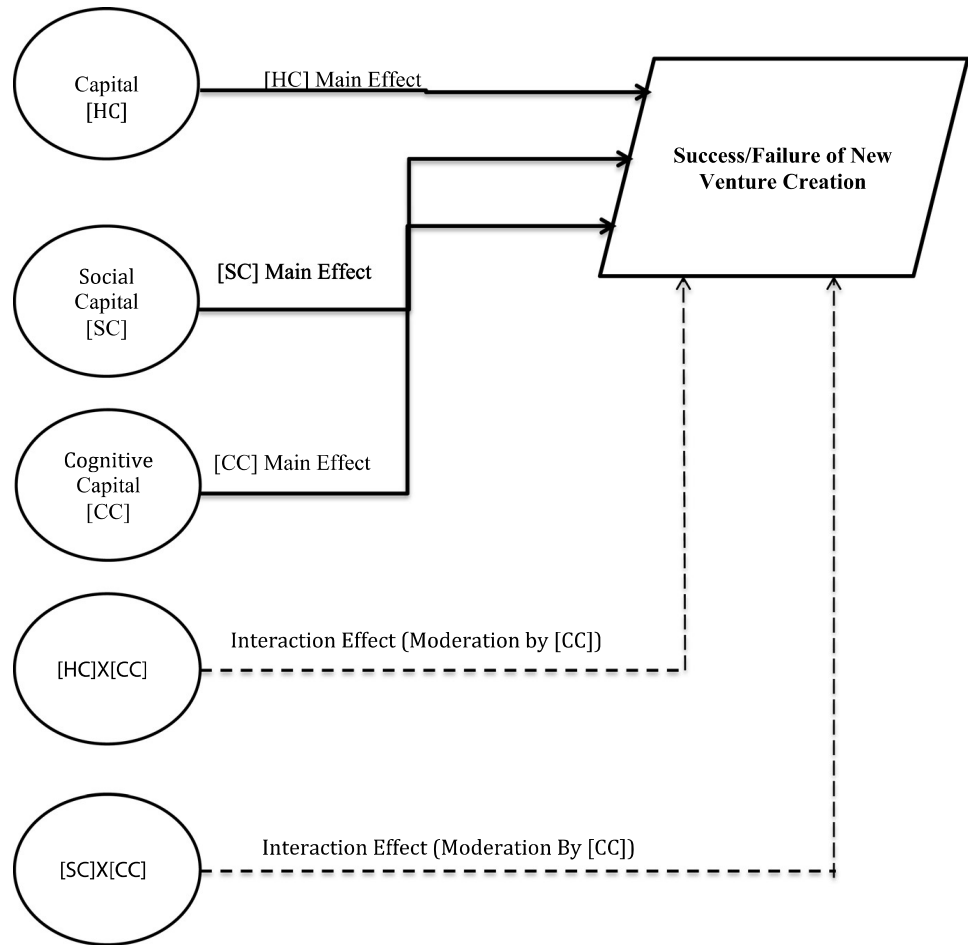
2.6 A model of nascent entrepreneurial capital

The present paper contributes to the literature by arguing that cognitive capital has a significant impact on the nascent entrepreneurship process and exerts significant influence on the effects of human and social capital. The interaction between cognitive capital and social and human capitals can inform our understanding of how prior knowledge and the social context intersect with nascent entrepreneurs' mental

states and enable them to deal with the ambiguity and uncertainty inherent to the business formation process. Thus, in order to address nascent entrepreneurs' chances of success in their progress towards venture creation, we need to integrate their human, social and cognitive capitals.

Figure 3 presents a model of nascent entrepreneurial capital. While human capital (HC), social capital (SC) and cognitive capital (CC) directly affect the nascent entrepreneur's chances of success in new venture creation, CC components also act as moderators of the effects of HC and SC. Specifically, the model proposes that cognitive capital's traits affect the magnitude of the relationship between human and social capital components, and the outcome of new venture creation process. Thus, nascent entrepreneurs with similar human and social capital profiles are likely to have different chances of success if their cognitive capitals are significantly different.

Fig. 3 Nascent entrepreneurial capital model



This integrative model of human, social and cognitive capital extends empirical frameworks beyond direct, additive and linear relationships between entrepreneurial resources and outcomes (Davidsson, 2005). Access to resources including prior knowledge and experience, and information and role models present in social networks is likely to improve the entrepreneur's capacity to discover and exploit viable entrepreneurial opportunities (Alvarez & Busenitz, 2001; Davidsson & Honig, 2003), but this effect will depend on the entrepreneur's cognitive capital, which determines how prior knowledge and social information are used and built upon.

3 Data and empirical methodology

3.1 Data collection and sample

The empirical model in the present study is tested using data from the Panel Study of Entrepreneurial

Dynamics (PSED). The PSED is a longitudinal data set of adults in the process of founding new ventures who were identified from a phone screening of 64,222 individuals in the USA (Reynolds, 2007; Reynolds & Curtin, 2008, 2011). The longitudinal (panel) dataset was collected in four annual waves (1997–2000), each capturing 1 year of observations for the variables selected. A screening criterion for eligibility was followed to qualify respondents as nascent entrepreneurs. Based on this criterion, 3592 nascent entrepreneurs were identified, of whom 2763 were involved in founding their own ventures.

While the data is relatively old, it provides a unique perspective of the nascent entrepreneurship process, allowing the researcher to access comprehensive survey data not just on human and social capital, but also on the components of cognitive capital. The PSED affords us the best chance to generate meaningful interpretations of the nascent stage of business venturing (Davidsson & Gordon, 2012; Reynolds & Curtin, 2011).

The PSED-I cohort was selected for this study because it includes a greater diversity of variables than more recent waves. By including detailed questions relating to cognitive traits of nascent entrepreneurs, this cohort allows for more in-depth analysis of nascent entrepreneurial capital. Also, by selecting the first cohort, we can derive greater benefits from the longitudinal nature of the data, exploring the gestation process in ‘real time’ and thus reducing the potential for hindsight bias, self-presentational concerns or memory decay (Cassar, 2010).

Data collection consisted of phone interviews and mail questionnaires. The original sample of qualified nascent entrepreneurs was reduced by attrition to a mixed gender sample of 816 nascent entrepreneurs who completed the detailed phone interview over three additional waves of data collection (phone interview and mail questionnaire). For a more comprehensive account of the PSED’s data collection and selection criteria, see Gartner et al. (2004).

It should be noted that data collection in the PSED-I survey focuses on the nascent entrepreneur/founder as the unit of analysis. Some of these entrepreneurs are identified as solo founders, while others are identified as having partners, possibly forming an entrepreneurial team. In the cases of entrepreneurial teams, only one entrepreneur—deemed the main active founder—is considered per new venture. Questionnaires covering detailed information on human, social and cognitive capital traits focus on this individual only (Gartner et al., 2004). Thus, our analysis focuses on the nascent entrepreneurial capital of the main active founder of the nascent venture.

3.2 Robustness tests: sample structure

Any representative sample of nascent entrepreneurs is undoubtedly heterogeneous (Davidsson, 2006; Dimov, 2010). In order to control for heterogeneity and ensure acceptable internal validity for testing the relationship between the nascent entrepreneur’s traits and new venture formation, we divided our sample between a sub-sample of 391 nascent entrepreneurs that were starting their businesses alone and those who were team-based founders. Following estimations for the full sample, we repeat the analysis on the sub-sample excluding the nascent entrepreneurs who were identified as solo founders.

We find that results are not sensitive to the choice of sample.

In addition, a potential source of heterogeneity is the varying motivation of the sample entrepreneurs and its impact on nascent venture performance. A number of economic perspectives tend to posit that entrepreneurial action is motivated by pull or push factors (e.g. Amit & Muller, 1995). These motivating factors can also facilitate entrepreneurial success or failure. When we eliminated the sample driven by push factors from the PSED I items, the impact on the results was not significant.

3.3 Measurement

3.3.1 *Dependent variable*

Having objective measures¹ that pinpoint the moment of emergence is difficult (Davidsson & Gordon, 2011) due to the fact that the new venture creation phenomenon is a gradual process and not a simple discrete event (Carter et al., 1996). In the present study, the determination of the completion of the new venture creation process is achieved through self-assessment² by the nascent entrepreneur on whether the nascent venture is launched or not.

In order to adequately compare entrepreneurs making their decisions across four waves, our analysis makes use of the final value for the outcome variable, as last recorded in the sample (2000 wave) and controlled for when the firm was founded. The dependent variable is the binary outcome of the new venture creation process engaged in by nascent entrepreneurs, which takes a value of 1 for the nascent entrepreneurs who were successful in launching their new venture,

¹ One of the measures widely used to determine the point of success in forming a business is the measure of the sales generated. However, according to Davidsson (2006), nascent ventures may generate first sales even before engaging in the business founding activities, and hence this indicator may not reflect a conclusive measure in this respect.

² The actual question used in the PSED was: ‘How would you classify the status of your firm? (1) operational and running; (2) you are still setting up the business; (3) you have temporarily delayed your start-up effort; (4) you have completely abandoned your start-up effort’. It is worth noting that, while such subjective measures are widely recognised and used in management studies research (e.g. Parker and Belghitar, 2006; Van Gelderen et al., 2000), variables based on self-perceptions are subject to distortion (Kessler et al., 2012).

transitioning from the nascent stage (pre-start stage) to the operational stage (start-up phase); and 0 otherwise; bundling together the struggling attempts and failed cases (Lichtenstein et al., 2007; Van Gelderen et al., 2005).

3.4 Explanatory variables

As we remarked in our description of the data, the PSED-I survey collects information on only one founder per nascent venture. While the survey identifies those founders who have partners, detailed data on human, social and cognitive capital is collected only for the main active founder (Gartner et al., 2004). Thus, our analysis focuses on the nascent entrepreneurial capital of the main active founder of the nascent venture and the explanatory variables accounting for human, social and cognitive capital are operationalised at the founder level (one founder per nascent venture).

While this choice is forced on us by data constraints, aggregating entrepreneurial capital across new venture founders is not a straightforward task. It is not clear whether simply adding indicators of entrepreneurial capital across the entrepreneurial team would produce an accurate measure of entrepreneurial capital for the firm. Be that as it may, it is likely that the resources of other founding team members also play a significant role in achieving success in the nascent entrepreneurship process (Klotz et al., 2014). We expect the characteristics of the main active entrepreneur with regards to human, social and cognitive capital to be representative of the entrepreneurial team as a whole.

3.4.1 Human capital measurement

The selection of the PSED human capital measures in the present study is based on human capital theory (Becker, 1962), as well as the entrepreneurship literature emphasising the role of general and specific knowledge in the context of business start-ups (Marvel et al., 2016; Unger et al., 2011). General and specific facets of knowledge, formal education, training and various types of professional experiences have been recognised as important determinants of productivity for entrepreneurs. Table 1 details how human capital variables were measured and operationalised.

3.4.2 Social capital measurement

Measures of social capital were selected from the PSED-I data based on previous literature examining the role of social capital in driving the entrepreneurial process (Bosma et al., 2004; Brüderl & Preisendorfer, 1998; Davidsson & Honig, 2003; Stam et al., 2014). Since social capital is context specific, multiple measures are required, each referring to a separate portion of accessible social resources. For this purpose, we use the ‘resource generator’ method (Van Der Gaag & Snijders, 2005) in order to focus on potential flows of supportive social capital that analyse the effects of social resources in terms of the skills attained, the value and the motivation accessed via social role models and finally the expressive benefits attained through strong and weak ties. Table 2 details how the social capital variables were measured and operationalised.

3.4.3 Cognitive capital measurement

There is no established agreement among scholars of what constitutes cognitive capital. For the purpose of the present analysis, a mix of items from PSED-I was employed to measure cognitive capital, focusing primarily on the main traits identified in Sect. 2 above: information gathering and processing, cognitive styles, confidence and persistence, perception of risk, expectancies and desires. We follow the approach designed by the PSED team and described in Shaver (2004). The CC variables of this study were measured with nine items identified from the literature, using a mix of scales. Table 3 details how the CC variables were measured and operationalised.

3.5 Control variables

Variables were introduced in the model to control for competing explanations of nascent venture creation outcomes. Including these covariates helps isolate the variance in outcomes attributable to the actions taken by entrepreneurs from the variance attributable to other explanations. These variables, listed in Table 4, account for entrepreneurial characteristics such as wealth (partially accounting for financial resources) and gender which have been shown to influence the outcomes of the new venture creation process (Evans & Jovanovic, 1989; Fairlie & Robb, 2009). Even

Table 1 Human capital variables

Variable	Definition
Managerial experience	Nascent entrepreneur managed a business owned by someone else, either as the senior executive or part of the senior management team 1 = if yes, 0 otherwise
Supervision experience	Number of people between nascent entrepreneur and CEO (Binned Variable) 0 = CEO; (1–2) high rank; (3–4) Med Rank, (5+) Low rank
Ownership/prior start-up experience	Nascent entrepreneur had founded at least one firm in the past 1 = if yes, 0 otherwise
Technical/industrial experience	Nascent entrepreneur had a production and plant management (technical/industrial experience) 1 = if yes, 0 otherwise
Experience in parents' start-ups	Nascent entrepreneur had a work experience in parents' start-ups 1 = if yes, 0 otherwise
General education	The founder level of educational attainment (1–4) categories 1 = Up to high school 2 = Pre-college 3 = College degree 4 = Post-college
Training	Number of trainings in different functional areas (0–3 binned variables) 0 = none; 1–2 = low; 3–4 med; 5+ = high

Source: PSED I Codebook

Table 2 Social capital variables

Variable	Definition
Social skill	Social skills dealing and communicating with stakeholders (1–5) Likert scale: 1 = if completely untrue; 5 = if completely true
Professional social role model	Social support provided by friends and relatives in social networks who had start-up experience (1–5) Likert scale: 1 = if completely untrue; 5 = if completely true
Social networks:	
Strong ties	Social support provided by social contacts, those that would NOT be on the start-up team, who have been particularly helpful to you in getting the business started. Variable = 1 if yes, otherwise 0
Weak ties	Business support provided by professional mentoring and consultancy via weak ties. Professional mentors provide advice as subject matter experts in business domain (1–5) Likert scale: 1 = if completely untrue; 5 = if completely true

Source: PSED I Codebook

though our robustness test suggests that team-based entrepreneurs are not significantly different from solo, we include a dummy variable accounting for entrepreneurs who have partners.³

³ This variable is never significant throughout our estimations.

4 Empirical analysis

4.1 Principal component analysis

Since we are dealing with high-dimensional data based on a multitude of survey questions, in order to generate viable indicators of human, social and

Table 3 Cognitive capital variables

Variable	Definition
Cognitive confidence	Confidence in their abilities and skills (attaining success, communicating) (1–5) Likert scale: 1 = if completely untrue; 5 = if completely true
Cognitive information gathering and processing (active/passive)	Collecting information prior to business decision (1–5) Likert scale: 1 = if completely untrue; 5 = if completely true
Cognitive desire	The extent to which the reason to [income, family, recognition, power, innovation, learning challenge] is important in establishing this new venture (1–5) Likert scale: 1 = limited extent; 5 = very great extent
Cognitive satisfaction	Nascent entrepreneur satisfaction level in his/her previous job (1–5) Categories: 1 = very dissatisfied, 5 = very satisfied
Cognitive expectancies (sales)	Nascent entrepreneur future sales expectations in the 1st year after establishing the business (1–4) Categories: 1 = low expectation, 4 = high expectation
Cognitive style (analytical /intuitive)	Preference to do things better (analytical), doing things differently (Intuitive) (1–3) Categories: 1 = Doing things better 2 = Doing things differently 3 = Both
Cognitive persistence	I persist to do my own business rather than working an employee (1–5) Likert scale: 1 = if completely untrue, 5 = if completely true
Cognitive expectancies (growth–employment base)	Expected number of full-time employees who will be hired to work in the new venture over the next 5 years (binned variable)
Risk perception	Risk appetite 0 = strong, 1 = moderate, 2 = low, 3 = no competition

Source: PSED I Codebook

Table 4 Control variables

Variable	Definition
Gender (dummy coded)	The gender of nascent entrepreneurs 1 = male, 2 = female
Wealth (natural log transformation)	Natural log transformation for nascent entrepreneurs: total investment + savings + assets
Industry (dummy coded)	9 Industry dummies at 3-digit level
Team members	1 = Solo, 2 = team-based founders

Source: PSED I Codebook

cognitive capital we use principal component analysis (PCA) as a data reduction technique.⁴ Construct variables were reduced into specific dimensions (latent variables), focusing on the minimum number

of factors that capture the construct with the highest representation of the original set of variables in order to make it suitable for the more complex statistical analysis that will follow.⁵

⁴ Data sets stemming from large surveys using long and complex questionnaires (as is the case of the PSED) contain high-dimensional data, hindering the researcher's ability to visualise patterns (Hair et al., 2006). Examination of a reduced dimension data set allows the researcher to spot trends, patterns and outliers in the data.

⁵ We acknowledge that there are some inherent issues with this reduction technique which have caused a reduction in its use. For example, there is no guarantee that the dimensions are interpretable. Moreover, variance maximization in the dimensional space of the data under a quadratic constraint may result in a large number of variables loading on the first principal component. In order to overcome these limitations, we use Varimax and Orthomax rotation (Hair et al., 2006).

The PCA procedure yielded components accounting for 70%, 79% and 55% of the total variance among the items in HC, CC and SC, respectively.⁶ Pearson correlation analysis was conducted to eliminate redundancy. The results show that the independent variables are not correlated highly enough to indicate a problem of multicollinearity (Curto & Pinto, 2011; Field, 2013; Hair et al., 2006). PCA analysis followed the bivariate correlation to reduce the data and identify the loaded factors that represent the maximum variation within the correlation matrix. Based on the results of the correlation analysis and the criterion ($r \geq 0.3$)⁷ for the correlation coefficient, the following were included in each linear model: HC—25 items; SC—18 items; CC—30 items.

At first, all items used in the study to capture human, social and cognitive capital (25 items for HC, 18 for SC and 30 for CC) were selected to run the PCA. There is a degree of subjectivity in deciding the number of components to be retained for further analysis. The objective is to explain as much of the variance as possible using as few components as possible. After the extraction of the components, the standard criteria were used in deciding the number of components to retain (see Hair et al., 2006).⁸

4.2 Logistic analysis

A binary logistic (logit) regression with a multi-step analysis of the main and combined effect drivers of venture success was conducted to test the hypotheses and examine the binary outcomes in terms of success or failure. The analysis made use of the ultimate outcomes for each variable, as last recorded in the sample. The use of this approach favours drivers that are

stable over time and therefore exhibit the strongest aggregate main effects (Menard, 2010).

In the first step, logit estimation included the variables (components) retained representing each type of entrepreneurial capital (human, social and cognitive)⁹ in separate models, in order to measure the linear (main) effects of each type on the success of new venture creation. The logit models applied to the three types of nascent entrepreneurial capital allow us to identify the strongest predictors of success using only main effects.

In the second step,¹⁰ the logit models bring together the variables (components) retained for each type of nascent entrepreneurial capital in order to test interaction effects, focusing specifically on CC as a moderator of the effects of HC and SC. Specifically, we study the interaction effect of CC with HC while controlling for SC and, separately, the interaction effect of CC with SC, while controlling for HC.

In order to manage the interpretation of the main effects, the predictors were transformed and centred, using grand mean centering. As the predictors were in metric form, the moderating variable and independent variable were centred by taking the deviation of these variables from their respective means (Field, 2013).

Table 5 summarises the interaction terms. The models were defined in the following equation:

$$Y_i(\text{outcome}) = b_0 + b_1 \text{NascentEntrepreneurialCapitalTraits}(NCA)_{i1} + b_2 \text{Moderator}(M)_{i1} + b_3 (NCA.M)$$

The parameters b_1 and b_2 represent the main effects of the independent variable and the moderator on the outcome, respectively. A third parameter (b_3) accounts for the effect of the interaction terms (moderation)—[HC × CC] and [SC × CC]—in addition to the main effects.

⁶ The PCA analyses conducted for HC, SC and CC are summarised in Appendix 1, available from the authors upon request.

⁷ The level of correlation considered worthy of a variable's inclusion is usually $r \geq 0.3$. The correlation matrix was examined for any variable that does not have at least one correlation with another variable where $r \geq 0.3$ (Field, 2013).

⁸ The criteria used are (a) the interpretability criterion, (b) the eigenvalue-one criterion, (c) the proportion of total variance accounted for and (d) the scree plot test. In particular, visual inspection of the scree plots indicates that four components should be retained for HC, six for SC and four for CC. The scree plots are presented in Appendix 2, available from the authors upon request.

⁹ A stepwise selection procedure was used with backward elimination. The procedure starts with a complex model and removes terms sequentially until a further deletion leads to a significantly poorer fit (Field, 2013).

¹⁰ In step 2, a list of possible pairs of variables in the main effects model that have some scientific basis to interact with each other were tested. This consists of all possible pairs. The interaction terms were added one at a time, in the model containing all the main effects.

Table 5 Control variables

Variables	Model (1)	Model (2)
Cognitive persistence	1.274 [.115]	1.328 [.139]
Cognitive confidence	1.416 [.154]	1.509 [.193]
Cognitive style	.718 [.145]	.651 [.184]
Cognitive desire by family	.780 [.081]	.795 [.098]
Cognitive desire by power	1.167 [.079]	1.106 [.102]
Cognitive desire by learning	.707 [.102]	.711 [.124]
Cognitive desire by income	1.377 [.111]	1.300 [.130]
Cognitive expectation by sales	1.658 [.067]	1.687 [.082]
Cognitive expectation by growth	1.379 [.093]	1.248 [.120]
Cognitive desire by family tradition	1.187 [.093]	1.147 [.116]
Cognitive information gathering and processing	.782 [.122]	.801 [.146]
Cognitive satisfaction	1.217 [.110]	1.310 [.136]
Cognitive risk perception	.849 [.098]	.791 [.137]
Controls		
Wealth		***
Industry		*
Team members		**
No. nascent entrepreneurs	816	816
Constant	-3.9*** [.762]	-7.4*** [1.545]
R^2	25%	39%

5 Results

5.1 Main effects

Due to lack of space, we omit the tables containing the direct (main) effects of human and social capital components.¹¹ Table 5 presents the ORs corresponding to the main effects of cognitive capital components. Estimations confirm the significance of various

traits that form the HC, SC and CC constructs, when taken independently, but results are mixed with regard to the magnitudes and directions of the effects. A major pattern in the results is that independent models of human, social and cognitive capital traits (excluding interaction effects) explain relatively little of the outcomes of the new venture creation process. Human and social capital main effects have comparable and limited explanatory power of the variance in outcomes (R^2 values of 25% and 28%, respectively). These results provide only weak support for hypotheses *H1* and *H2*. Cognitive capital main effects explain a significantly greater portion of the variance

¹¹ Logit regression results for human and social capital main effects are presented in Appendix 3, available from the authors upon request.

in nascent entrepreneurship outcomes (R^2 of 39%), providing stronger support for hypothesis *H3*.

5.2 Interactions

The main focus of the interaction models is to examine whether cognitive capital moderates the relationship between the other forms of nascent entrepreneurial capital and entrepreneurial success. Table 6 presents the results concerning the interaction between human and cognitive capital traits. The logit estimates confirm the significance of the effect of the interactions between HC and CC on the outcome of the new venture creation process. The [HC×CC] interaction model generated a significantly better fit (R^2 of 46%) than the main effects only model of HC (R^2 of 25%), suggesting that similar levels of human capital traits will have different impacts on nascent entrepreneurship outcomes for entrepreneurs with different levels of cognitive capital traits. This result supports hypothesis *H4*. The combined effect between human and cognitive capitals is a stronger predictor of nascent entrepreneurship success than the independent, main effects model.

Table 7 presents the results concerning the interaction between social and cognitive capital traits [SC×CC]. The logit estimates reported confirm that the interaction between SC and CC generates a significantly better fit (R^2 of 45%) than the main effects model of SC (R^2 of 28%). Thus, as for the case of human capital, it can be inferred that similar levels of social capital traits will have different impacts on nascent entrepreneurship outcomes for entrepreneurs with different levels of cognitive capital traits. This result supports hypothesis *H5*. The combined effect between social and cognitive capitals is a stronger predictor of nascent entrepreneurship success than the independent, main effects model.

6 Discussion and implications

Our findings indicate that, while nascent entrepreneurs with strong cognitive capital perform best, higher levels of human and social capital seem to have a less significant impact on outcomes when taken independently. Results suggest that higher levels of human and social capital resources do not necessarily lead to better nascent entrepreneurship

outcomes. Their impacts on nascent entrepreneurship success depend on the nascent entrepreneur's cognitive traits.

Our analysis shows that cognitive capital plays a fundamental role in driving the success of the nascent entrepreneurship process both directly and through its interaction with human and social capital traits. Entrepreneurs with superior cognitive capital are more likely to make better use of their endowments of human and social capital resources. Nascent entrepreneurs with relatively low endowments of education and experience, or narrower professional networks, may still be successful if high levels of cognitive capital enable them to better process information and deploy the resources available to them. In contrast, high levels of human and social capital resources may be insufficient if nascent entrepreneurs' cognitive traits are limited.

We advance the research on success probabilities of nascent entrepreneurs with different resource endowments (Schjoedt, et al., 2013) by finding that studies of nascent entrepreneurs' resources focusing solely on the separate impacts of human and social capital components are unlikely to provide a complete picture of the nascent entrepreneurship process. By focusing on the moderating role played by cognitive capital traits of nascent entrepreneurs, this study offers new insights to researchers. Nascent entrepreneurs vary in how they process information available in their surroundings and in how they use their resources. By introducing the cognitive aspect into the analysis of nascent entrepreneurship, this study helps explain why nascent entrepreneurs may register different levels of success despite having accumulated similar endowments of human and social capital components, as well as wealth.

The approach proposed here leads to more theoretical clarity regarding the effects of human, social and cognitive capitals on nascent entrepreneurship outcomes. The findings suggest that nascent entrepreneurs, even those endowed with a strong base of human and social capital components, are more likely to fail if they lack cognitive traits to better coordinate the deployment of those resources. This supports the notion that resources are necessary but not sufficient conditions for success (Gist & Mitchell, 1992). Overreliance on prior knowledge in isolation from other forms of entrepreneurial capital can make nascent entrepreneurs susceptible to narrow or wide frames of

Table 6 Logit estimates for human capital and cognitive capital interactions

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)
Cog. desire by family tradition × training			.798 [.125]									
Cog. persist × training				1.438 [.137]								
Cog. desire by family × general education				0.565 [0.80]								
Cog. information gathering and processing × tech. exp.					.467 [.345]							
Cog. desire by family tradition × start-up exp.						1.54 [.227]						
Cog. persist × general education						1.653 [0.31]						
Cog. desire by income × start-up exp.							-.710 [.238]					
Cog. desire by income × exp. in parents' start-ups								1.346 [.172]				
Cog. persistence × exp. in parents' start-ups								2.94 [.194]				
Cog. style × exp. parents' start-ups								.841 [.235]				
Cog. expectation by growth × managerial exp.									.816 [.115]			
Cog. style × managerial exp.										1.636 [.197]		
Cog. information gathering and processing × supervision exp.											1.239 [.111]	
Cog. desire by family × supervision exp.												1.177 [.064]
Wald χ^2												5.28 6.48
No. nascent entrepreneurs	816	816	816	816	816	816	816	816	816	816	816	816

Table 6 (continued)

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)
Constant	-2.54 [1.64]	-3.47 [2.37]	-4.42* [2.43]	-2.97 [2.45]	-6.75** [2.79]	-3.09 [2.24]	-4.00 [2.43]	-1.82 [2.55]	-3.792 [2.471]	-4.935* [2.359]	-2.244 [2.468]	-2.608 [2.411]
R ²	38%	40%	46%	45%	46%	45%	45%	45%	45%	46%	45%	46%

Model 1: the main effects for [HC] and [CC]

Model 2: the main effects for [SC] and [CC] combined with controls

Models 3–12: interaction effects between [HC×CC]

The complete model (including the individual variables for HC and CC) was estimated for models 3–12, but the coefficients for the individual variables were omitted to make reading the table easier

The numbers in the table are presented as follows:

[1] Exp (B) the ‘odds ratio’ of the individual coefficient; [2] SEs in parentheses

R² statistic: the proportion of the variance in the dependent variable that is explained by the variance in the independent variables

- Odds ratio is a nonlinear transformation of the logit coefficient, so the confidence interval is asymmetric

thinking, underestimating or overestimating internal resources and external conditions.

Cognitive traits enable entrepreneurs to advance, coordinate and integrate knowledge and networks. The lack of cognitive traits is likely to make nascent entrepreneurs susceptible to homogeneity, conformity effects, and instabilities that hinder experimentation and the accumulation of optimum knowledge, and consequently disqualify nascent entrepreneurs from handling the novel conditions and dynamics surrounding the process of creating new ventures (Barnett & McKendrick, 2004).

Formal education, experience, social networks and role models do not work in isolation, but rather interact within specific cognitive conditions to generate a specific knowledge base. Success in the nascent entrepreneurship process can therefore arise from heterogeneous sets of resources (Argote et al., 2003). While cognitive capital may not always succeed in bridging deficits in knowledge resources and networks, it might more quickly expose disconnects between resources and business reality, leading to early withdrawal from the process of new venture creation, reflecting a level rationality rather than failure.

There are also practical implications for nascent and potential entrepreneurs, as well as seed and venture capitalists. Those considering starting a business and those assessing investments in nascent entrepreneurial ventures need to be fully aware of the limitations of analysing the potential for success based on linear assessments of resources. A greater awareness of the nature of interactions among nascent entrepreneurial capital’s components is required, and a more careful assessment of cognitive traits is needed (Brush et al., 2001). Potential entrepreneurs may not want to wait too long before attempting an entrepreneurial endeavour, as accumulating more knowledge, credentials, social contacts and years of experience would not necessarily lead to entrepreneurial success. Accumulating knowledge, skills and experiences in different, non-integrated streams may not be the most effective approach when engaging in a dynamic environment. Assessing investments in new ventures based solely on observable resource endowments and social acquaintances may not lead to greater returns.

Policy-makers seeking information on how to improve entrepreneurial rates of success should be advised to focus on enriching human, social and cognitive capitals of individuals. SME support agencies

Table 7 Logit estimates for social capital and cognitive capital interactions

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Cog. desire by family tradition × social skills			.782 [.128]				
Cog. desire by income × social skills				.747 [.115]			
Cog. risk perception × social skills				.747 [.107]			
Cog. expectation by sales × strong ties					.620 [.217]		
Cog. expectation by growth in employment × social skills						2.162 [.412]	
Cog. style × strong ties							1.541 [.226]
Cog. expectation by growth in employment × strong ties							2.267 [.414]
Controls							
Wealth		***	***	***	***	***	***
Gender			*			*	
Industry		**	**	**	**		**
Team members		**	**	**	**	**	**
Wald χ^2			3.66	3.52	4.87	3.93	3.91
No. nascent entrepreneurs	816	816	816	816	816	816	816
Constant	-2.543 [1.641]	-3.472 [2.372]	-5.801** [2.703]	-2.673 [1.881]	-3.497 [2.366]	-3.505 [2.362]	-3.386 [2.353]
R^2	33%	40%	45%	37%	45%	45%	45%

Model 1: the main effects for [SC] and [CC]

Model 2: the main effects for [SC] and [CC] combined with controls

Models 3–7: interaction effects between [SC × CC]

The complete model (including the individual variables for SC and CC) was estimated for models 3–7, but the coefficients for the individual variables were omitted to make reading the table easier

The numbers in the table are presented as follows:

[1] Exp (B) the ‘odds ratio’ of the individual coefficient; [2] SEs in parentheses

R^2 statistic: the proportion of the variance in the dependent variable that is explained by the variance in the independent variables

Odds ratio is a nonlinear transformation of the logit coefficient, so the CI is asymmetric

should seek to assess nascent entrepreneurs not just based on knowledge, skills and experiences, but also on cognitive traits. The findings of this study suggest that setting policies for support programmes and career counselling fomenting the enhancement of cognitive factors in processing knowledge and information about resources and environmental conditions could contribute to the success of start-up support programmes and provide potential entrepreneurs with the opportunity to assess their prospective entrepreneurial capacity and any potential pitfalls (Baluku et al., 2016). Training programmes focused on

enhancing the ability to develop a mental map of how different combinations create value should help both nascent entrepreneurs and funding agencies.

Our aim here is not to specify a specific set of cognitive abilities to focus on as this can be misleading giving the diversity and complexity of nascent entrepreneurship. Rather, we seek to portray ‘cognitive capital’ as a competence that can be learned. Cognitive ability emerges through the interaction between entrepreneur’s prior knowledge (i.e. human and social capital) and the specific founding environment in which such knowledge is applied. The

relevant cognitive traits are those that connect the entrepreneur with the specific context surrounding the new venture, which include the ability to gather and process information, to form accurate perceptions of risk and avoid the pitfalls of overconfidence. The development of such abilities is associated with experiential learning (e.g. trial-and-error, learning-by-doing), meaning that learning materialises when nascent entrepreneurs are confronted with situations that extend or alter their perceptions. Support schemes including action-based training, team building, reflections on how to organise information, find optimal methods of analysis and dealing with cognitive biases should aid the development of cognitive traits.

7 Limitations of the study

The empirical analysis presented in this study is subject to several limitations that need to be taken into account. Collecting and building a dataset such as the PSED survey is a complex task. The nature and characteristics of the PSED lead to inevitable issues that are discussed at length by Davidsson (2005). In our analysis, we have addressed issues of heterogeneity and representativeness in the sample. Parker and Belghitar (2006) find that attrition from the PSED is non-random, as nascent entrepreneurs who leave the PSED between waves 1 and 2 tend to have significantly lower wealth and invest smaller amounts in their enterprises. They are more likely to be young, single and well educated, which affects their human and social capital resources. We control for attrition using the procedure adopted by Parker and Belghitar (2006) and, like these authors, find that despite its non-random structure, attrition does not seem to affect our estimates of what happens to nascent entrepreneurs, suggesting that valid inferences can be made without worrying about this possible form of bias.

In order to credibly test hypotheses, models should be estimated using only those independent variables whose values are exogenous and are initially observable. By initially observable we mean the variables take values that are observed strictly prior to the nascent entrepreneurs' decisions about whether to launch the business or not. We exploit the panel nature of the PSED data to measure our explanatory variables at the moment nascent entrepreneurs enter the sample, while observing the outcome variable at the end, controlling for when the firm was founded. This allows us to at least

partially avoid the problem of endogeneity, which occurs when some of the explanatory variables are jointly determined with the outcome variable. There are, however, other instances of endogeneity that are harder to avoid. For example, some variables are measured based on subjective opinions and are therefore likely to be correlated with the cognitive characteristics of the nascent entrepreneurs. We expect that the data reduction procedures adopted in our analysis should contribute to limit the impact of this issue on our inference.

While some inference issues are impossible to correct or control for given the nature of the PSED survey, no other source of data offers such detailed and varied measures of nascent entrepreneurs' characteristics. The definition of nascent entrepreneur and the kinds of variables and events collected by the PSED are a benchmark for numerous works on the topic and the survey is regarded as a representative national database on the process of business formation (Wagner, 2006).

Finally, an important limitation is associated with the treatment of entrepreneurial teams in the data collection for the PSED surveys. By focusing on detailed information for only one entrepreneur per nascent venture, the data overlooks the potential contributions of team members. Even if these members are not engaged in leading the nascent venture, their resources may contribute significantly to its chances of reaching operations status. Future studies should extend the scope of the analysis incorporating the collective resources shared among the founding team/partners to explore the effect of team heterogeneity.

8 Conclusion

This study proposes that the interplay between different types of entrepreneurial capital components found in nascent entrepreneurs is indispensable in assessing the factors influencing success in nascent entrepreneurship. We propose a model that incorporates human, social and cognitive components into an integrated construct of nascent entrepreneurship capital. We claim that cognitive traits are likely to play a significant role in moderating the impact of human and social capital resources and endowments on the outcomes of the nascent entrepreneurship process. Hence, differences in cognitive traits should help explain why nascent entrepreneurs with similar stocks of human and social capital

resources, as well as similar levels of wealth, may experience different outcomes and levels of success.

We use data from the Panel Study of Entrepreneurial Dynamics to test our model and hypotheses. We find that models integrating cognitive capital traits as moderating variables of human and social capital traits have a greater explanatory power of nascent entrepreneurship outcomes than models that consider traits of different kinds of nascent entrepreneurial capital in isolation.

The implications of our results are important for researchers, nascent entrepreneurs, venture capitalists and SME support agencies. A greater emphasis on diversifying support s beyond the scope of financial aid and nurturing nascent entrepreneurs with strategies and coping mechanisms that allow them to tap into meaningful complementary sets of resources should lead to better entrepreneurial decisions and investments.

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