The impact of intellectual capital on start-up expectations

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Abstract

Purpose – According to an emerging research trend, which seeks to apply the concept of intellectual capital (IC) to the field of entrepreneurship, the purpose of this paper is to test whether IC can affect the start-up expectations of aspiring entrepreneurs.

Design/methodology/approach – Binary logistic regression models, based on empirical data derived from the Global Entrepreneurship Monitor website and referring to Italy over the years 2005-2010, are used to test the influence of IC (comprising human, structural and relational capital) on start-up expectations.

Findings – Binary logistic regression models reveal robust results. Human, structural and relational capitals affect start-up expectations in Italy. Only in 2010 did structural capital fail to do so.

Research limitations/implications – This study has three main limitations. The first concerns the need for further research to confirm the influence of IC on start-up expectations. The second concerns in-depth, more exhaustive analyses that cannot be carried out due to the use of second- hand data. The third deals with the reference only to Italy, over a limited time-span (2005-2010).

Originality/value – To the best knowledge of the author, this is one of the first empirical studies that investigate whether IC can affect start-up expectations. Results revealed by the regression models might steer other scholars' interest toward this research path (linking IC and entrepreneurship) that has not yet been properly considered.

Keywords Structural capital, Intellectual capital, Human capital, Relational capital, Binary logistic model, Start-up expectations

Paper type Research paper

1. Introduction

Intellectual capital (IC), defined as the set of intangible assets from which ventures can derive their competitive advantage, enhance profit and create value, continues to attract widespread attention (Bontis, 1996, 1998, 2001; Sveiby, 1997; Petty and Guthrie, 2000; Hormiga *et al.*, 2011). Most scholars investigate IC from a managerial perspective, i.e. in reference to established ventures that, by definition, compete in the markets in order to grow and develop.

The growing interest that policy makers are showing toward start-ups, which are expected to underpin social and economic development (Audretsch, 2004), is leading some scholars to apply the concept of IC to entrepreneurial studies as well. Attention has partly focussed on the role of IC in reference to science parks (Schiavone *et al.*, 2014) and business incubators (Calza *et al.*, 2014). Other scholars have investigated IC with reference to start-up success (Peña, 2002; Hayton, 2005; Hormiga *et al.*, 2011; Link and Ruhm, 2011; Musteen and Ahsan, 2013). From the above, it clearly emerges that a new field of research, linking IC to entrepreneurship, is slowly unfolding.

Against this background, this paper seeks to broaden and enrich the analysis of the effect that IC can have on entrepreneurship. In particular, the research question posed here sets out to investigate the extent to which IC is relevant for aspiring entrepreneurs, i.e. individuals who aim to launch a new venture but have not yet created it. In the author's opinion, if IC is relevant for established companies and for start-ups, as shown by the contributions cited above, then IC might also be important for aspiring

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entrepreneurs. Indeed, even before new ventures are created, aspiring entrepreneurs might need to leverage on their intangible assets, which are embodied in IC, in order to launch new start-ups.

With a view to testing whether IC might affect start-up expectations, the paper is structured as follows. In Section 2, the specialist literature is reviewed in order to define the concept of IC. After defining the dependent variable of the theoretical model (start-up expectations), IC is applied to entrepreneurial studies. The reference is not risk-free since managerial concepts need to be turned into entrepreneurial ones. At the end of this section, three research propositions (related to human, structural and relational capital, the three main components of IC) are proposed and then tested. In Section 3, the research methodology (binary logistic regression model) and the research design are defined. In order to carry out the empirical part, use was made of second-hand data obtained from the Global Entrepreneurship Monitor (GEM) website for Italy over the years 2005-2010. In Section 4, the findings are presented and discussed. Finally, in Section 5, conclusions are drawn by presenting the managerial implications related to the study, underlining its limitations and suggesting some highlights for future research.

2. Literature review and research hypotheses

Since 1969, when Galbraith introduced the concept of IC by assuming that it stood for an intellectual contribution offered by individuals in order to ensure the success of knowledge-intensive ventures (Khalique *et al.*, 2015), management scholars have always been interested in it. Even if the concept of IC can be applied to several disciplines, from corporate strategies to the production of measurement tools (Petty and Guthrie, 2000), there is general agreement on the fact that IC is instrumental in the creation of value by knowledge-intensive ventures. Khalique *et al.* (2015) clearly express this by assuming that IC is made up of intangible resources. These resources need to be combined and effectively managed in order to create value and attain a sustainable competitive advantage.

In order to test whether and to what extent IC can contribute to the above aims, managerial scholars have proposed different models for measurement purposes. The Organization for Economic Co-operation and Development (1999) considers only structural and human capital. Structural capital refers to software systems used in knowledge-intensive ventures and networks developed around them. Human capital, instead, concerns resources both within ventures (generally meaning all the staff) and outside them (such as customers and suppliers). Despite the importance of the OECD, another classification is more widely agreed upon, according to which it is appropriate to consider external (customer-related), internal (structural) and human capital (Sveiby, 1997; Roos *et al.*, 1997; Stewart, 1997; Bontis *et al.*, 2000). In subsequent proposals, some managerial scholars (McElroy, 2002) replaced customer capital with social capital. As time passes, others propose different new classifications. According to Brooking (1996), IC comprises market, human, intellectual and infrastructural capital. Finally, Khalique *et al.* (2011, 2015) propose a model incorporating six components of IC: human, customer, structural, social, technological and spiritual capital.

Of course, it is a tall order to state which of the above classifications is right or wrong. For this reason, in the present paper, the most commonly used classification of IC, according to which it is appropriate to investigate three sub-components of IC (human, structural and relational capital), is shared and embraced (Sullivan, 1999; Brennan and Connell, 2000; Petty and Guthrie, 2000; Sanchez *et al.*, 2000; Roos *et al.*, 2001; Peña, 2002; Kaufmann and Schneider, 2004; Boedker *et al.*, 2005; Hormiga *et al.*, 2011; Musteen and Ahsan, 2013).

2.1 Start-up expectations

As stated above, the research question posed here aims to investigate the extent to which IC is relevant to aspiring entrepreneurs. For this reason, it is of primary importance to define the dependent variable included in the theoretical model, namely, the expectation to start up, i.e. the propensity that aspiring entrepreneurs show toward launching new ventures.

Over the years, entrepreneurship scholars have become increasingly interested in inclination or propensity toward entrepreneurship (Bird, 1988; Ajzen, 1991; Shaver and Scott, 1991; Kolvereid, 1996; Krueger *et al.*, 2000; Baron, 2004; Lee and Wong, 2004). From the above contributions, it clearly emerges that entrepreneurs and non-entrepreneurs mainly differ in reference to their propensity toward entrepreneurship. Of course, entrepreneurs show a stronger inclination while non-entrepreneurs display a weaker inclination or even none at all. Start-up expectations can be assumed as a proxy of inclination toward entrepreneurship. Accordingly, start-up expectations are assumed as the dependent variable of the theoretical model.

2.2 Human capital

According to several scholars, human capital lies at the heart of IC (Bontis, 1998; Bontis *et al.*, 1999, 2000; Subramaniam and Youndt, 2005; Montequin *et al.*, 2006; Tovstiga and Tulugurova, 2007; Wu *et al.*, 2008; Hsu and Fang, 2009). By definition, human capital entails competences (knowledge and personal capabilities), attitudes (motivation and leadership) and intellectual agility (originality or flexibility) of all the staff employed in knowledge-intensive ventures (Khalique *et al.*, 2015). In the current economic context, where intangible assets are more important than tangibles – like capital and labor (Penrose, 1955; Solow, 1956) – it is easy to perceive the importance of human capital for management scholars.

At the same time, several entrepreneurship scholars have unconsciously sought to underline the relevance of human capital to entrepreneurship as well (Vesper, 1990; Stuart and Abetti, 1990; Gaglio, 1997). It is argued by the above scholars that knowledge and personal capabilities, i.e. human capital, can differentiate entrepreneurs from non-entrepreneurs. Individuals who can leverage on previously developed knowledge and on personal capabilities seem to be more inclined toward entrepreneurship (MacMillan, 1986; Low and MacMillan, 1988; Birley and Westhead, 1993; McGrath and MacMillan, 2000; Ucbasaran *et al.*, 2003, 2006; Westhead *et al.*, 2005). In particular, as argued by MacMillan (1986) in his seminal work, through experience individuals can apprehend the "technology of entrepreneurship." In other words, previous experiences and mistakes are useful to entrepreneurs who can develop a better, in-depth knowledge of entrepreneurial matters and improve their capabilities (Ripsas, 1998; Shepherd *et al.*, 2000). According to the above analysis, human capital might affect start-up expectations.

2.3 Structural capital

Structural capital refers to the knowledge that ventures possess in their own right and that does not depend on each employee (Sveiby, 1997; Bontis *et al.*, 2000; Subramaniam and Youndt, 2005; Cabrita and Bontis, 2008; Wu *et al.*, 2008; Hsu and Fang, 2009; Hormiga *et al.*, 2011). In other words, by structural capital scholars mean the internal components of ventures, such as patents, functioning, organization and shared culture. As argued by Hormiga *et al.* (2011), this kind of capital is the most complex to evaluate

since it emerges when ventures transform human and relational capital into new knowledge, after creating a climate in which knowledge can be exchanged and enriched, for example, through routines (Nelson and Winter, 1982) or by improving the internal dynamic capabilities (Teece *et al.*, 1997). Internal staff does not possess this new knowledge; only the venture as a whole holds it. In order to clarify the concept of structural capital, it is appropriate to think of the shared culture within ventures (which favors knowledge exchange and enrichment) and the introduction of new products or processes (which derives from sharing the same culture).

If structural capital is difficult to evaluate in reference to management studies, because it stands for new knowledge that ventures create and that cannot be departed from them, it is even more difficult in reference to entrepreneurship studies. Exchange and enrichment of knowledge, which does not take place through routines or dynamic capabilities since these are not yet set up in start-ups, can lead to the creation of new knowledge in the form of new entrepreneurial opportunities. This happens through acts of recognition, discovery or creation (Sarasvathy *et al.*, 2005; Alvarez and Barney, 2008). Each act depends on a different relationship between aspiring entrepreneurs (to be precise, their knowledge and capabilities) and the external (economic, social or technological) context as shown in Table I.

In Table I there is a case in which new entrepreneurial opportunities are not identified. This happens when aspiring entrepreneurs do not have specific capabilities and they are not connected to the external context where new entrepreneurial opportunities could lie. Since this case is not relevant to entrepreneurship studies, attention is going to be focussed on the three remaining cases.

The act of recognition is rooted in the neoclassical view of entrepreneurship (Schumpeter, 1911). Aspiring entrepreneurs, who are not supposed to have specific capabilities, can look for new entrepreneurial opportunities in external contexts – mainly technological and social contexts – where profound changes always take place. Aspiring entrepreneurs aim to pool resources in order to recognize entrepreneurial opportunities from the environment. This means that entrepreneurs and opportunities are linked by a dualistic relationship. Opportunities exist by themselves and prevail over entrepreneurs who just have to recognize them through systematic research.

The act of discovery, instead, is rooted in the Austrian view of entrepreneurship (Kirzner, 1973). In line with the neoclassical view, entrepreneurial opportunities already exist in the economic context – temporary gaps occurring in the market – but now entrepreneurs need to have specific capabilities to discover them, an example is Kirznerian alertness (Kirzner, 1973). Again, the relationship between entrepreneurs and opportunities is dualistic but now entrepreneurs play a more important role since they are required to have some capabilities to discover new entrepreneurial opportunities.

The act of creation, then, is the most recent one and is rooted in the structuration view (Sarasvathy *et al.*, 2005; Sarason *et al.*, 2006). In this case, since the external

	Possible connection to external context	No connection to external context
Relevance of individual capabilities	Discovery	Creation
No specific individual capability	Recognition	No entrepreneurial opportunities

Source: Adaptation by Matricano (2015)

Table I.
A classification of the ways in which entrepreneurial opportunities can be identified

context changes quickly and unexpectedly, entrepreneurs create entrepreneurial opportunities that otherwise would not even exist. The relationship between entrepreneurs and opportunities is no longer dualistic but it is now based on dependency since entrepreneurs create opportunities.

According to the above analysis, aspiring entrepreneurs try to fit their knowledge with the external context (in this case attention must be paid over the acts of recognition or discovery) or they try to predict the external context (in this case attention must be paid to the act of creation) in order to generate new knowledge that proves to constitute entrepreneurial opportunities. The traditional view of entrepreneurial opportunities (Shane and Venkataraman, 2000) and the individual-opportunity nexus (Shane, 2003) have been recently criticized and a new proposal has been advanced, distinguishing between external enablers, or aggregate-level circumstances, new venture ideas, which represent imagined future ventures, and opportunity confidences, or subjective evaluation of stimuli, and assuming that opportunity confidence refers to individuals' evaluation of external enablers and new venture ideas (Davidsson, 2015). That said, wholesale adoption of this new proposal on the part of the research community is not expected to take place in the short run. The scholar behind this new theory – in fact – hopes that his proposal can create a new avenue for entrepreneurial research once it is shared and embraced by researchers, reviewers, editors and practitioners (Davidsson, 2015, pp. 689-690). In the meantime, the traditional view of entrepreneurial opportunities and the individual-opportunity nexus are still of central importance in entrepreneurial studies (McMullen and Shepherd, 2006; Alvarez and Barney, 2007; Casson and Wadeson, 2007; Plummer *et al.*, 2007; Short *et al.*, 2010; Dimov, 2011; Wiklund *et al.*, 2011; Shane, 2012; Alvarez *et al.*, 2013; Eckhardt and Shane, 2013; McMullen and Dimov, 2013). Thus it is assumed here that when new entrepreneurial opportunities are identified, they depend neither on the aspiring entrepreneur nor on the context: they are a third-person opportunity (McMullen and Shepherd, 2006), i.e. a possible opportunity for someone (registered patents represent a clear example). This means that they represent the structural capital of aspiring entrepreneurs and, as such, they might affect start-up expectations.

2.4 Relational capital

Relational capital represents the value of all the relationship established with stakeholders (Bontis, 2001; Montequin *et al.*, 2006; Cabrita and Bontis, 2008; Wu *et al.*, 2008; Hsu and Fang, 2009). In the field of managerial studies, the idea that ventures are social entities that necessarily interact with other subjects is widely shared (Granovetter, 1985). Interactions are important because through them ventures can obtain missing resources (in the knowledge economy much attention is paid to the possibility to absorb missing or new knowledge) able to attain and sustain competitive advantage positions. This research topic has been extensively investigated by the network theory in respect of established firms (Powell, 1990; Burt, 1992; Uzzi, 1997; Matricano, 2011).

Of course, not only established ventures but also entrepreneurs create valuable relationships, for example, through the creation of entrepreneurial networks (Birley, 1985; Aldrich and Zimmer, 1986; Johannisson, 1986, 1988; Starr and MacMillan, 1990; Matricano, 2015). These networks represent a set of relationships implemented and managed by entrepreneurs who, by definition, assume the central position (Greve, 1995; Johannisson, 1998). The reason why entrepreneurs create their own networks is to acquire the necessary resources at different stages. Through their networks, entrepreneurs can obtain specific resources in the short term by implementing a planned or intended strategy, or they can build relationships through which they can

obtain additional (and as yet unknown) resources in the long term by implementing an unintended strategy (Galkina, 2013). In order to achieve both intended and unintended strategies, entrepreneurs act as architects, lead operators and caretakers (Snow *et al.*, 1992) within their networks. As architects, they try to design their networks in order to satisfy their needs and then they select eligible partners. As lead operators, they try to facilitate co-operation among selected partners. As caretakers, they check whether selected partners cooperate and thus whether the established network works as expected. If this should not happen, entrepreneurs start again acting like architects, lead operators and caretakers. Of course, in order to make the network work as expected, much time may be required. For this reason, entrepreneurs very often try to involve in their network a relative, a friend or a previous employer (Greve, 1995; Greve and Salaff, 2003) because of the trust-based relationship existing between them (Johannisson, 1988; Larson and Starr, 1993; Greve, 1995; Smith and Lohrke, 2008). These actors share their experience in the entrepreneurial field and steer the new entrepreneurial activity toward easier, more feasible choices.

According to the above analysis, the concept of relational capital, referring to the creation of an entrepreneurial network able to support entrepreneurs, might affect the start-up expectations of aspiring entrepreneurs.

2.5 Research hypotheses

As already stated, the aim of this paper is to test the influence that IC might have on start-up expectations. According to the above analysis, three research hypotheses linking human, structural and relational capital to start-up expectations are proposed.

In order to test the relevance of human capital to start-up expectations, the amount of knowledge, skills and expertise held by aspiring entrepreneurs can be considered as a proxy of human capital, and thus it seems possible to hypothesize that:

H1. The more aspiring entrepreneurs can leverage on their human capital (i.e. the amount of knowledge, skills and expertise they hold), the higher their start-up expectations are.

In order to test the relevance of structural capital to start-up expectations, identification of new entrepreneurial opportunities can be considered as a proxy of structural capital and therefore it seems possible to hypothesize that:

H2. The more aspiring entrepreneurs can leverage on their structural capital (i.e. new entrepreneurial opportunities that are identified), the higher their start-up expectations are.

Finally, in order to test the relevance of relational capital to start-up expectations, the chance to know someone who has already launched and managed a venture can be considered as a proxy of relational capital. Thus it seems possible to hypothesize that:

H3. The more aspiring entrepreneurs can leverage on their relational capital (by knowing other people who have a previous entrepreneurial experience), the higher their start-up expectations are.

3. Research methodology and design

This study is based on a longitudinal survey design (from 2005 to 2010) and refers to Italy. The last data available on the GEM website in 2015 refer to the year 2011, but Italy is not included in this last survey.

The decision to focus only on Italy is due to some recent data, published in February by UnionCamere (2016) (the official network of the Italian Chambers of Commerce), which show that the total number of firms operative in Italy in 2015 is 6,057,000 (45,181 new firms). According to data published by UnionCamere, the growth rate of new ventures in Italy is similar to that registered in 2007, before the worldwide economic crisis. Thus in Italy entrepreneurs appear not to have been discouraged and entrepreneurial culture seems well rooted and widespread. Starting from this, it seems appropriate to test whether and to what extent IC influences start-up expectations of aspiring entrepreneurs.

As for the methodology, a binomial logistic regression model is estimated for each year. The choice of a binomial logistic regression model is not arbitrary but due to the fact that start-up expectations is a binary dependent variable. Thus, it is sought to estimate the probability of this event taking place.

According to the research design above, all the variables included in the framework are measured as binary variables. The dependent variable, namely, start-up expectations, is measured as a binary variable coded 0 if individuals do not have this expectation at the time of the survey and coded 1 if they do. The same imputation process is used in reference to the independent variables. Human, structural and relational capital are measured as binary variables coded 0 if individuals do not leverage on this kind of capital and coded 1 if they do. More specifically, respondents are asked whether they leverage on their human capital, i.e. knowledge, skills and experience (NO = 0; YES = 1); whether they leverage on their structural capital by identifying new entrepreneurial opportunities (NO = 0; YES = 1) and whether they leverage on relational capital by knowing someone personally who has previous entrepreneurial experience (NO = 0; YES = 1) in order to start a new firm.

As already stated, the present paper relies on second-hand data obtained from the GEM website. The decision to use these data entails both advantages and drawbacks. In terms of advantages, it is appropriate to underline the composition and size of the sample. As for composition, the respondents to the GEM survey are both male and female, aged between 18 and 64. All of them are linked, more or less directly, to entrepreneurial processes. Indeed, they are nascent entrepreneurs, owner-managers of new or established firms. The size of the sample interviewed in Italy for each year (as shown in Table II) represents the second advantage of using GEM data. This large sample allows statistically robust results to be achieved.

As stated above, the decision to use GEM data also results in drawbacks. The first and foremost weakness concerns missing data, especially item non-response (i.e. when interviewees do not provide specific responses). According to Kalton and Kasprzyk (1982), this problem can be solved by an imputation procedure: estimated values, if properly

Table II. Samples of respondents to the GEM survey in Italy per year

Year	Sample size
2005	2.001
2006	1.999
2007	2.000
2008	3.000
2009	3.000
2010	3.000

Source: Global Entrepreneurship Monitor (GEM) (2015)

inferred from the original database, can replace missing responses. Starting from the criterion that individuals who do not leverage on IC answer NO = 0, otherwise they answer YES = 1, it is possible to deduce that missing responses are closer to the answer NO since they reveal a scant interest in responding to the question. In line with this, each item non-response is replaced with NO = 0. The second weakness concerns adaptation of the data. Since data were obtained from the GEM website, they are far-reaching and complete. However, they cannot be used to carry out additional investigations and thus further reflections or conjectures cannot be easily derived.

After obtaining all the necessary data and before proceeding with estimations of binary logistic regression models, it is necessary to test whether there is collinearity among independent variables, i.e. predictors. In order to do this, the collinearity diagnostics are considered and, in particular, attention is focussed on the variance inflation factor (VIF). The mean VIF are shown at the bottom of each regression model. As a rule, values associated to VIF should be < 2. All the tests show values below this limit. This means that there is no collinearity among diagnostics and hence it is possible to proceed with logistic regression.

The basic model (Model 1) used to estimate the binomial logistic regression models is:

$$\log\left(P_i/1-P_i\right) = \beta + \beta_1 \mathrm{HC} + \beta_2 \mathrm{SC} + \beta_3 \mathrm{RC}$$

where β_i ($i = 0, \ldots, 3$) are the coefficients and the independent variable is log (P_i/1−P_i), i.e. the logarithm of the ratio between the probability that aspiring entrepreneurs are going to start up in the next three years and the probability of not starting up over the same time period. In order to show robustness of achieved results, other five models are used. In these models descriptive and control variables are added and, at the same time, endogeneity is avoided. In the second regression model, the descriptive variable "gender" is added while, in the third, the variable "gender" and two control variables, "market competition" and "newness of product," are included. As is well known, control variables are related to the dependent variable but from a different perspective (in this case the competition in the market and the newness of the products which undoubtedly affect the start-up expectations of aspiring entrepreneurs are considered), which helps to test robustness of results. In the fourth model the descriptive variable "age" is considered while, in the fifth, "age" and both the control variables, "market competition" and "newness of product," are included. In the last model, the sixth, human, structural and relational capital plus "gender," "age," "market competition" and "newness of product" are included. It is thus possible to verify if there are substantial differences among the several models.

For statistical calculations a forward Wald approach is used (Tables III-VIII). Statistically significant results are written in italics.

4. Results and discussion

The results of regression models for each year show that IC does indeed affect the start-up expectations of aspiring entrepreneurs in Italy. However, in order to present the findings more clearly it is appropriate to proceed by considering each of the six models.

In Model 1, only independent variables standing for human, structural and relational capital are entered. Over the years 2005-2009 they always affect start-up expectations. However, this result does not hold for 2010, for which structural capital is not statistically significant. Before commenting on this result, it is appropriate to test whether or not it is verified by the following specifications of the model.

In Model 2, the "gender" variable (0 = female and 1 = male) is added and very interesting results emerge. Human, structural and relational capital are still significant

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intellectual capital						
Human capital – HC: knowledge, skills and experience	*3,238*	*3,238*	*2,592*	*3,575*	*2,813*	*2,813*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Structural capital – SC: identification of opportunities	*2,223*	*2,223*	*1,950*	*2,203*	*2,014*	*2,014*
	0.000	*0.000*	*0.000*	*0.000*	*0.003*	*0.003*
Relational capital – RC: know someone with entrepreneurial experience	*4,776*	*4,776*	*5,144*	*3,900*	*4,235*	*4,253*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Demographic characteristics						
Gender		0.252	0.501			0.394
		0.616	0.479			0.000
Age				*0.948*	*0.951*	*0.951*
				0.000	*0.000*	*0.000*
Control variables						
Market competition			*3,699*		*4,030*	*4,030*
			0.000		*0.000*	*0.000*
Offering a new product to customers			*5,223*		*3,109*	*3,109*
			0.000		*0.033*	*0.033*
Models diagnostics						
Constant	*0.024*	*0.024*	*0.022*	*0.209*	*0.180*	*0.180*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Number of cases	2.001	2.001	2.001	2.001	2.001	2.001
Percentage of correct predictions	92.4	92.4	92.4	92.4	92.4	92.4
$\chi^2$of Omnibus test	*218,022*	*218,022*	*250,176*	*274,517*	*300,488*	*300,488*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Omnibus test – degree of freedom	3	3	5	4	6	6
Nagelkerke R^2 (pseudo R^2)	0.248	0.248	0.283	0.308	0.335	0.335
Mean VIF	1,284	1,229	1,207	1,232	1,207	1,190

Table III.
Estimated Logit models of intellectual capital affecting start up expectations in Italy in 2005

(again structural capital is not significant in 2010) while the significance of the variable "gender" varies over the years. From 2005 to 2007, gender is not significant. By contrast, from 2008 to 2010 it is. In particular, the 2008-2010 coefficients reveal that males are almost 1.4/1.5 times more likely to start up than females.

Model 3, in which the variable "gender" and two control variables are considered, namely, "market competition" and "newness of product" (respectively coded 0 if there is no market competition and 1 if there is, and coded 0 if the product is not new and 1 otherwise), confirms the results of Model 2. Only for 2009 do regression models show that by entering "market competition" and "newness of product" gender is no longer statistically significant.

In Model 4 the "age" variable is added to human, structural and relational capital. The variable was transformed from continuous to binomial according to its median value (lower values are coded as 0, while higher values are coded as 1). Statistical elaborations show that young individuals are more likely to start up than their elders (the coefficient is less than 1).

Model 5, in which "age" and both the control variables are considered, namely, "market competition" and "newness of product," confirms the results of Model 4. This means that start-up expectations increase when young aspiring entrepreneurs leverage on human, structural and relational capital.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intellectual capital						
Human capital – HC: knowledge, skills and experience	*3,284* *0.000*	*3,284* *0.000*	*2,721* *0.000*	*3,732* *0.000*	*3,108* *0.000*	*3,108* *0.000*
Structural capital – SC: identification of opportunities	*1,917* *0.002*	*1,917* *0.000*	*1,800* *0.007*	*2,314* *0.000*	*2,180* *0.001*	*2,180* *0.001*
Relational capital – RC: know someone with entrepreneurial experience	*4,408* *0.000*	*4,408* *0.000*	*4,431* *0.000*	*3,473* *0.000*	*3,584* *0.000*	*3,584* *0.000*
Demographic characteristics						
Gender		0.011 0.917	0.039 0.843			0.009 0.925
Age				*0.940* *0.000*	*0.943* *0.000*	*0.943* *0.000*
Control variables						
Market competition			*6,999* *0.000*		*7,261* *0.001*	*7,261* *0.001*
Offering a new product to customers			*5,662* *0.001*		*4,201* *0.008*	*4,201* *0.008*
Models diagnostics						
Constant	*0.024* *0.000*	*0.024* *0.000*	*0.023* *0.000*	*0.312* *0.000*	*0.259* *0.000*	*0.259* *0.000*
Number of cases	1.999	1.999	1.999	1.999	1.999	1.999
Percentage of correct predictions	92.4	92.4	92.4	92.4	92.4	92.4
χ^2 of Omnibus test	*193,747* *0.000*	*193,747* *0.000*	*246,383* *0.000*	*263,147* *0.000*	*303,776* *0.000*	*303,776* *0.000*
Omnibus test – degree of freedom	3	3	5	4	6	6
Nagelkerke R^2 (pseudo R^2)	0.222	0.222	0.279	0.305	0.349	0.349
Mean VIF	1,189	1,150	1,278	1,155	1,286	1,250

Table IV. Estimated Logit models of intellectual capital affecting start up expectations in Italy in 2006

Finally, Model 6 (in which human, structural and relational capital plus "gender," "age," "market competition" and "newness of product" are included) confirms the above results. Human, structural and relational capital (except in 2010 when structural capital is not statistically significant) and age (young individuals are more prone to create start-ups) affect start-up expectations. In particular, focussing attention on the coefficients of Model 6, it results that aspiring entrepreneurs leveraging on human capital are between 2.8 and 5.6 times more likely to launch a start-up than those who do not. Aspiring entrepreneurs who leverage on structural capital are between 1.5 and 2.1 times more likely to launch a start-up than those who do not (again, it is appropriate to underline that in 2010 structural capital does not affect start-up expectations). Finally, aspiring entrepreneurs who leverage on relational capital are between 1.7 and 4.2 times more likely to launch a start-up than those who do not.

Despite the differences among the above coefficients, statistical elaborations confirm the relevance of IC to start-up expectations. At this juncture, in order to be as clear as possible, it is appropriate to comment on each of the sub-categories in IC: human, structural and relational capital.

Human capital is always relevant to entrepreneurship. Knowledge, skills, competences and expertise positively affect the start-up expectations of aspiring entrepreneurs. This result confirms the idea that by carrying out entrepreneurial

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intellectual capital						
Human capital – HC: knowledge, skills and experience	*6,065*	*6,065*	*5,514*	*6,125*	*5,635*	*5,635*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Structural capital – SC: identification of opportunities	*1,817*	*1,817*	*1,754*	*1,642*	*1,568*	*1,568*
	0.001	*0.001*	*0.002*	*0.007*	*0.018*	*0.018*
Relational capital – RC: know someone with entrepreneurial experience	*2,186*	*2,186*	*2,084*	*1,895*	*1,799*	*1,799*
	0.000	*0.000*	*0.000*	*0.000*	*0.002*	*0.002*
Demographic characteristics						
Gender		0.636	0.241			0.312
		0.426	0.623			0.577
Age				*0.951*	*0.952*	*0.952*
				0.000	*0.000*	*0.000*
Control variables						
Market competition			0.107		0.363	0.363
			0.743		0.547	0.547
Offering a new product to customers			*18,526*		*16,407*	*16,407*
			0.000		*0.000*	*0.000*
Models diagnostics						
Constant	*0.023*	*0.023*	*0.022*	*0.198*	*0.178*	*0.178*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Number of cases	2.000	2.000	2.000	2.000	2.000	2.000
Percentage of correct predictions	91.1	91.1	91.1	91.1	91.1	91.1
χ^2 of Omnibus test	*204,769*	*204,769*	*263,925*	*254,640*	*307,533*	*307,533*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Omnibus test – degree of freedom	3	3	4	4	5	5
Nagelkerke R^2 (pseudo R^2)	0.216	0.216	0.274	0.265	0.316	0.316
Mean VIF	1,172	1,152	1,164	1,144	1,160	1,150

Table V.
Estimated Logit models of intellectual capital affecting start up expectations in Italy in 2007

processes individuals can learn the so-called "technology of entrepreneurship" (MacMillan, 1986) and improve their skills and capabilities (Ripsas, 1998; Shepherd *et al.*, 2000). For this reason, in recent years, entrepreneurial scholars have underlined that entrepreneurship is a process (McMullen and Dimov, 2013) that individuals need to manage properly in order to achieve the expected results. Knowledge, skills and capabilities, whether naturally possessed or nurtured, are a halfway result, ultimately leading to the creation of new ventures.

Structural capital gives unexpected results. Over the years 2005-2009 it is statistically significant and it positively affects start-up expectations. In 2010, instead, according to all the logistic regression models (from 1 to 6), it never affects start-up expectations. The contrasting result emerging for 2010 calls for a measured comment. On the one hand, it could be due to several possible causes that cannot be hypothesized since the results depend on second-hand data (this point will be considered later on in Section 5 among the limitations). On the other, the finding could indicate a different approach adopted by individuals toward entrepreneurship. The fact that opportunity identification does not seem to affect start-up expectations recalls the structuration view (Sarasvathy *et al.*, 2005). Indeed, identification of entrepreneurial opportunities may be irrelevant because opportunities can be created (see Table I). In knowledge-intensive markets it is not possible to predict either the evolution of the market or the

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intellectual capital						
Human capital – HC: knowledge, skills and experience	*4,871*	*4,728*	*4,522*	*5,714*	*5,410*	*5,410*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Structural capital – SC: identification of opportunities	*2,215*	*2,207*	*2,112*	*2,114*	*2,033*	*2,033*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Relational capital – RC: know someone with entrepreneurial experience	*4,056*	*3,998*	*3,743*	*3,260*	*3,046*	*3,046*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Demographic characteristics						
Gender		*1,493*	*1,422*			3,232
		0.015	*0.035*			0.072
Age				*0.933*	*0.933*	*0.933*
				0.000	*0.000*	*0.000*
Control variables						
Market competition			0.978		0.524	0.524
			0.323		0.469	0.469
Offering a new product to customers			*3,669*		*3,557*	*3,557*
			0.000		*0.000*	*0.000*
Models diagnostics						
Constant	*0.014*	*0.012*	*0.012*	*0.230*	*0.234*	*0.234*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Number of cases	3.000	3.000	3.000	3.000	3.000	3.000
Percentage of correct predictions	93.4	93.4	93.4	93.4	93.4	93.4
χ^2 of Omnibus test	*296,579*	*302,608*	*317,226*	*396,928*	*409,398*	*409,398*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Omnibus test – degree of freedom	3	4	5	4	5	5
Nagelkerke R^2 (pseudo R^2)	0.245	0.250	0.261	0.325	0.334	0.334
Mean VIF	1,135	1,108	1,181	1,120	1,195	1,171

Table VI. Estimated Logit models of intellectual capital affecting start up expectations in Italy in 2008

emerging needs of customers. For this reason, entrepreneurial opportunities are created *ex nihilo*. They depend on aspiring entrepreneurs who try to predict, according to their knowledge, skills and capabilities, whether and how the market could evolve in the future and anticipate possible emerging needs. Of course, the reference to the structuration view is just a hypothesis that could explain the results achieved for structural capital, and so further research is called for.

Lastly, relational capital confirms its importance. Start-up expectations increase if aspiring entrepreneurs can leverage on a network (in the above case an informal network formed by an individual with previous experience in entrepreneurship was tested). The robustness of results, however, confirms that entrepreneurial networks matter and that aspiring entrepreneurs leverage on them when they aim to launch new start-ups (Johannisson, 1986, 1988; Starr and MacMillan, 1990). According to the above results, aspiring entrepreneurs need to obtain resources they lack (knowledge and experience) in a short space of time. For this reason, by establishing trust-based relationships (Johannisson, 1988) they can implement the intended strategy (Galkina, 2013).

5. Conclusions

This paper presents one of the first attempts at achieving improved understanding of the importance of IC in reference to start-up expectations. The results, obtained through

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intellectual capital						
Human capital – HC: knowledge, skills and experience	*3,537*	*3,428*	*3,329*	*3,705*	*3,500*	*3,500*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Structural capital – SC: identification of opportunities	*2,081*	*2,017*	*1,984*	*2,095*	*2,015*	*2,015*
	0.000	*0.001*	*0.001*	*0.000*	*0.001*	*0.001*
Relational capital – RC: know someone with entrepreneurial experience	*3,952*	*3,904*	*3,889*	*3,491*	*3,399*	*3,399*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Demographic characteristics						
Gender		*1,489*	3,226			3,016
		0.041	0.072			0.082
Age				*0.939*	*0.939*	*0.939*
				0.000	*0.000*	*0.000*
Control variables						
Market competition			1,420		0.568	0.568
			0.233		0.451	0.451
Offering a new product to customers			*3,027*		*2,921*	*2,921*
			0.006		*0.010*	*0.010*
Models diagnostics						
Constant	*0.014*	*0.011*	*0.014*	*0.168*	*0.171*	*0.171*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Number of cases	3.000	3.000	3.000	3.000	3.000	3.000
Percentage of correct predictions	95.6	95.6	95.6	95.5	95.5	95.5
χ^2 of Omnibus test	*172,190*	*176,445*	*178,916*	*230,708*	*236,765*	*236,765*
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Omnibus test – degree of freedom	3	4	4	4	5	5
Nagelkerke R^2 (pseudo R^2)	0.184	0.189	0.191	0.246	0.253	0.253
Mean VIF	1,148	1,116	1,116	1,118	1,117	1,105

Table VII.
Estimated Logit models of intellectual capital affecting start up expectations in Italy in 2009

the use of logistic regression models and referring to Italy over the years 2005-2010, show that IC does affect the start-up expectations of aspiring entrepreneurs. In other words, IC (comprising human, structural and relational capital) is relevant to the creation of new ventures as well.

Since it is one of the first studies focussing on this topic, it is not possible to compare achieved results with previous findings. However, the results might encourage other scholars to investigate and test IC in reference to entrepreneurship in order to confirm or reject them.

5.1 Limitations

Despite the results achieved, some limitations of the work need to be underlined. The first concerns the fact that this study is an exploratory study about the relevance of IC to entrepreneurship. Accordingly, carrying out further research linking IC and entrepreneurship could develop this research field.

Another limitation concerns the use of second-hand data downloaded from the GEM website. These data, despite their unquestionable relevance, do not allow a more in-depth, exhaustive analysis to be carried out. Some insights, for example, in reference to structural capital, necessarily remain unexplored.

A further limitation is linked to the fact that the empirical analysis refers only to Italy and considers only the time-span 2005-2010. The decision to focus on only one

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intellectual capital						
Human capital – HC: knowledge, skills and experience	*3,613* *0.000*	*3,483* *0.000*	*3,155* *0.000*	*3,829* *0.000*	*3,450* *0.000*	*3,450* *0.000*
Structural capital – SC: identification of opportunities	0.022 0.882	0.001 0.980	0.013 0.910	0.389 0.533	0.176 0.675	0.176 0.675
Relational capital – RC: know someone with entrepreneurial experience	*2,688* *0.000*	*2,586* *0.000*	*2,659* *0.000*	*2,092* *0.000*	*2,130* *0.000*	*2,130* *0.000*
Demographic characteristics						
Gender		*1,541* *0.026*	*1,473* *0.048*			0.184 0.668
Age				*0.941* *0.000*	*0.939* *0.000*	*0.939* *0.000*
Control variables						
Market competition			*4,740* *0.000*		*4,750* *0.000*	*4,750* *0.000*
Offering a new product to customers			*3,201* *0.023*		*4,366* *0.004*	*4,366* *0.004*
Models diagnostics						
Constant	*0.014* *0.000*	*0.012* *0.000*	*0.012* *0.000*	*0.151* *0.000*	*0.156* *0.000*	*0.156* *0.000*
Number of cases	3.000	3.000	3.000	3.000	3.000	3.000
Percentage of correct predictions	95.8	95.8	95.8	95.7	95.7	95.7
χ^2 of Omnibus test	*88,196* *0.000*	*93,297* *0.000*	*109,379* *0.000*	*144,907* *0.000*	*162,551* *0.000*	*162,551* *0.000*
Omnibus test – degree of freedom	2	3	5	3	5	5
Nagelkerke R^2 (pseudo R^2)	0.098	0.104	0.121	0.160	0.179	0.179
Mean VIF	1,073	1,067	1,054	1,074	1,058	1,078

Table VIII. Estimated Logit models of intellectual capital affecting start up expectations in Italy in 2010

country made it easier to carry out the analysis: environmental differences (typical of cross-national analyses) were not considered and hence achieved results did not depend on the country effect. Furthermore, the decision to limit the study to a six-year period was due to the availability of second-hand data. Despite the above limitations, the choices about the country and the time-span to be considered seem appropriate for the exploratory nature of this study.

5.2 Implications for aspiring entrepreneurs

Achieved results have major implications in terms of suggestions for forthcoming aspiring entrepreneurs. Such aspiring entrepreneurs should be aware that IC is relevant to the creation of new ventures. They should strive to develop entrepreneurial knowledge, skills, competences and expertise. In order to do this, they might be involved in entrepreneurial processes, acting and thinking entrepreneurially. Through positive (successful cases) and negative experiences (mistakes or failures), they should aim to develop their human capital. At the same time, forthcoming aspiring entrepreneurs should try to identify new entrepreneurial opportunities that might be pursued at a later stage through the creation of new ventures. Whatever the act of identification (recognition, discovery or creation), they should always try to develop

their structural capital. Finally, forthcoming aspiring entrepreneurs should leverage on the competences of others. Since they might lack previous entrepreneurial experience in creating new ventures, they should try to develop their relational capital.

In sum, forthcoming aspiring entrepreneurs should try to develop their IC by leveraging on all its three components, namely, human, structural and relational capital. Since they all are relevant to start-up expectations, none can be underestimated or ignored.

5.3 Implications for policy makers

The results have major implications for policy makers as well. The latter should aim to support aspiring entrepreneurs by helping them develop their human, structural and relational capital. In other words, when policy makers define and implement tools and actions able to foster entrepreneurial phenomena, they should focus on IC and they should think about the way aspiring entrepreneurs could improve it. Thus, dedicated tools and actions might improve aspiring entrepreneurs' abilities to develop knowledge, skills and competences (human capital), to identify new entrepreneurial opportunities (structural capital) and to implement and manage their network (relational capital).

Policy makers should try to facilitate active involvement by aspiring entrepreneurs in processes and actions through which they can develop entrepreneurial knowledge, skills, competences and expertise (human capital). Entrepreneurial education and training might then be useful levers through which aspiring entrepreneurs might develop in-depth, more comprehensive knowledge about entrepreneurship (Matricano, 2014).

At the same time, policy makers should aim to create conditions and situations that let aspiring entrepreneurs recognize, discover or create new entrepreneurial opportunities to be pursued (structural capital). High schools, universities, private and public incubators should offer dedicated courses on entrepreneurship, where creativity can be nurtured, and specific courses through which entrepreneurial profiles can be improved. Tools and actions like these might lead aspiring entrepreneurs closer to identifying new entrepreneurial opportunities.

Finally, policy makers should support the creation of dedicated networks that might help aspiring entrepreneurs to overcome difficulties related to the start-up phase by providing both material and immaterial resources (relational capital). In particular, if policy makers can foster co-operation with established ventures or collaboration with experienced entrepreneurs, owners or managers of new and established firms, then aspiring entrepreneurs might become part of a network in which suppliers and customers and any other business partners might easily be identified.

Of course, this is just a short overview of the potential tools and actions that policy makers might define and implement in order to develop IC of aspiring entrepreneurs in Italy in order to increase their start-up expectations.

5.4 Implications for IC researchers

As in any other research endeavour, the present study would benefit from further improvements. As already stated, it represents one of the first tests that exemplify the effect that IC (comprising human, structural and relational capital) can have on start-up expectations. Despite this, the results achieved might open up new research paths.

First, entrepreneurship researchers might extend the considered time-span or they might refer to a larger sample of Italian aspiring entrepreneurs. New insights might be revealed about the impact that IC can have on start-up expectations in Italy.

Second, entrepreneurial researchers might replicate the same research in different contexts. This could help to verify whether the environment, at national or regional level, can affect start-up expectations (in such cases, environmental differences typical of cross-national analyses should be duly considered). In both the above cases, researchers might offer new insights about the impact that IC can have on start-up expectations in Italy, albeit still constrained by the use of second-hand data.

Third, entrepreneurship scholars might start a national or cross-national survey to collect specific new data about the same items considered herein (i.e. in reference to IC comprising human, structural and relational capital). In this case, the limitations deriving from the use of second-hand data could be eliminated and hence more robust results about the influence of IC upon start-up expectations might be disclosed. Fourthly, further investigations might be undertaken to include different, more specific items related to human, structural and relational capital. Other individual characteristics might be considered such as motivation and leadership or originality or flexibility that are increasingly considered in reference to knowledge-intensive ventures (Khalique *et al.*, 2015). If the above-cited view of the disaggregation of business ideas from entrepreneurial opportunities (Davidsson, 2015) were to be embraced and shared by entrepreneurial scholars, then other proxies of structural capital might be considered. Eventually, in reference to entrepreneurial networks, which are always changing and evolving, new and different variables – linked to material and immaterial, financial or knowledge-related resources – might be considered (Matricano and Sorrentino, 2015). By carrying out further analyses, the academic literature on IC could be enriched by new, statistically robust insights about the potential impact of IC upon start-up expectations. Of course, this could have a greater impact both on classes (where entrepreneurship is taught) and on the real world (the stage for forthcoming aspiring entrepreneurs).

All the possible paths cited above represent interesting alternatives since they can add something to the present work that was not in a position to offer a complete and exhaustive analysis of the impact of IC on start-up expectation but – hopefully – has opened up an interesting new and intriguing research path that merits further development.

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