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**A Matter of Location: The Role of Regional Social Capital in
Overcoming the Liability of Newness in R&D Acquisition Activities**

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Abstract:

External knowledge acquisition represents a precondition for firms' competitive advantage. However, young firms find it particularly difficult to gain access to external sources of knowledge: young firms suffer from a liability of newness by exhibiting significantly lower propensities to invest in external R&D than their older counterparts. We explore the role of geographically bound social capital in moderating this liability. By employing a Nested Logit approach, our findings show that geographically bound social capital moderates the liability of newness related to R&D acquisition, suggesting that the liability exists only in regions associated with low levels of social capital.

Keywords: Research and development, social capital, liability of newness, geography.

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1. Introduction

Does an abundance of regional social capital counter balance the limitations of young startups with respect to securing knowledge trading agreements with external partners? This is an important question since knowledge has been shown to be essential for the survival of young firms (see e.g. Cefis and Marsili, 2005; Venkataraman, 1997). External knowledge sourcing in particular has been argued to define the survival rates of young firms (Sakar et al., 2001), provide advantages associated with endorsement by exchange partners (Chang, 2004; Stuart et al., 1999), and furnish direct access to complementary resources (Baum and Silverman, 2004; Chung et al., 2000). Indeed, Baum et al. (2000) show that the performance of young firms rests significantly on their ability to establish partnership with universities and other organizations that provide scientific and technological expertise. Identifying contingencies that facilitate access to new ideas is generally argued to be of major importance for entrepreneurs (Venkataraman, 2004). Insight into how regional social capital promotes inter-organizational knowledge exchange may also provide a better understanding of the location choices made by entrepreneurial firms, and government policies regarding young firms' access to technology and knowledge.

Stinchcombe (1965) coined the term *liability of newness* to highlight that young firms are compelled to promote social interactions within their organizations, and with external organizations in order to sustain the additional learning costs involved in new roles and new tasks. The liability of newness may seriously compromise firm growth rates and eventually lead to mortality (Thornhill and Amit, 2003: 505). The challenge for young firms is to find ways to nullify this disadvantage and in this context, Cefis and Marsili (2005) emphasize innovation as an important option for

young firms, stressing that innovation balances the liability of newness by providing a premium which enables them to survive. While acknowledging the value of this finding, we can identify two problems. First, young firms may find it difficult to release resources for highly uncertain in-house research and development (R&D) activities which will restrict their ability to introduce innovations. Young firms must seek alternative ways to innovate, one of which might be to invest in external R&D. Investing in external R&D has been shown to be efficient for achieving high innovative performance (Cassiman and Veugelers, 2006; Jones et al., 2001; Sobrero and Roberts, 2001; Tsai and Wang, 2008).

Second, even if establishing R&D relationships with other actors has been proven to be critical for innovation success, young firms may find it difficult to engage in these kinds of arrangements with other agents/organizations in society (Stinchcombe, 1965). Trust is one of the prerequisites for creating good professional relationships (Nguyen and Rose, 2009) and is a resource that takes effort, time and experience to build. By definition, young firms are disadvantaged when it comes to time and experience. Young firms are required to work to create embedded ties (Hite and Hesterly, 2001) and to create links to the holders of external resources, given their lack of reputation and limited awareness about available resources and opportunities. Young firms, therefore, face substantial barriers in terms of acquiring knowledge from external sources, barriers that constrain their ability to create new knowledge and introduce innovations.

While numerous studies debate strategies that allow firms to escape the liability of newness, to our knowledge, there has been no investigation of the external contingencies that permit firms to overcome this disadvantage: regional social capital may be one such. We follow Putnam's (2000:19) definition of social capital at

regional level as the “connections among individuals, social networks and norms of reciprocity and trustworthiness that arise from them”. We argue that such social capital may moderate the liability of newness by facilitating access to different knowledge sources. Certainly, social structures rich in informal interactions and embedded ties shape the flow of knowledge across organizations’ boundaries and define the possibilities for firms to access external resources (Kono et al., 1998; Sorenson and Stuart, 2001). Social capital not only helps young firms establish professional relationships, it is also instrumental in relational stability (Baron and Markman, 2003; Singh et al., 1986). Our central argument is that geographically bounded social capital eases access to external knowledge since the level of work required to set up these embedded ties is significantly lower with high levels of regional social capital. Thus, when investigating organizations located in high social capital regions as compared to low social capital regions, firm age plays a secondary role in the likelihood of acquiring new knowledge from external partners.

Our empirical analysis is based on original data obtained by merging two Italian datasets that provide information on geographically bound social capital and external R&D acquisition for 4,529 Italian manufacturing firms. We model firms’ R&D activities using a Nested Logit approach, assuming that firms’ engagements in external R&D activities are the result of a two nested structure: first, the individual firm’s choice to engage or not in R&D; second, whether its R&D strictly is performed alone, or R&D partly is bought from outside the firm’s boundaries. After controlling for variables at firm, industry and geographical level, we find that social capital moderates the likelihood that young firms will acquire R&D externally. Indeed, only in provinces with low levels of social capital do we observe newness as a liability in the sense that young firms are less likely than mature firms to acquire R&D externally.

The paper is organized as follows. Section 2 reviews previous findings and contributions on the liability of newness and social capital. Section 3 describes the data used in this paper and describes the method of analysis. Section 4 presents the results and section 5 concludes the paper.

2. Previous Literature

Following Stinchcombe's (1965) seminal contribution, several studies have contributed to our knowledge on the disadvantages of young firms over the older ones: young firms are particularly likely to fail because age is a determinant in the development of high levels of reliability and accountability in firms' performance, internal routines, and structures (Hannan and Freeman, 1977; Nelson and Winter, 1982). Young firms encounter many hazards and their short-track record reduces the possibilities for outsiders to evaluate their potential (Baum et al. 2004). Therefore, the new organizations must resolve the problems related to information asymmetry (Certo et al., 2001), signal the presence of effective monitoring mechanisms (Deutsch and Ross, 2003) and compensate for lack of experience and reputation (Honig et al., 2006).

The underlying premise to our research is that social capital represents an external contingency that moderates the liability of newness. Our expectation is grounded in two theoretical perspectives: the relational view of the firm and social capital theory. The relational view of the firm posits that a firm's critical resources, which are embedded in inter-firm resources and practices, often span firm boundaries (Dyer and Singh, 1998). From an entrepreneurship perspective, social capital is instrumental in obtaining the benefits from social relationships (Greene and Brown, 1997). This literature starts from the assumption that new firms compensate

for deficits in human and financial capital by resorting to social support since friends and acquaintances can spread information about the new firm using their own ties (Bruderl and Preisendorfer, 1998). Indeed, the entrepreneurship literature argues that entrepreneurs tend to rely on their informal ties and pre-existing networks to obtain advice and feedback on ideas (Birley, 1985; Elfring and Hulsink, 2003) in order to increase the likelihood that their ventures will survive (Bruderl and Preisendorfer, 1998). While this is a rich literature and contributes to our understanding of the entrepreneur's social capital, it says little about the role of geographically bounded social capital. However, this is of crucial importance since it is widely recognized that face-to-face contact is required for the transfer of knowledge (Lawson and Lorenz, 1999) and that such contact is facilitated by geographical proximity.

With respect to firm strategies, population ecology theory clearly emphasizes the role of firm context (Aldrich et al., 1989; Hannan and Freeman, 1977). Geographically bound social capital captures aspects of the firm's context that create the opportunities for knowledge exchange (Burt, 1992; Coleman, 1988; Seibert et al., 2001). This approach to social capital was introduced by Putnam et al. (1993) who first looked at social capital as a geographically bound mechanism that promotes knowledge diffusion through informal interactions. Putnam et al. (1993) study the importance of social capital in explaining the differences in economic performance among the Italian regions. Following Putnam's seminal study, much research focused on the relationship between social capital and economic performances (Guiso et al., 2004; Knack and Keefer, 1997; Tappeiner et al., 2008) and numerous contributions claim that social interactions in a geographically bound area facilitate

learning, knowledge diffusion and relationship formation (Festinger et al., 1950; Kono et al., 1998; Park, 1926; Saxenian, 1994; Sorenson and Stuart, 2001).

3. Hypotheses Development

3.1. New firms' liabilities in the search of knowledge

Knowledge is divided and distributed among different groups (Davidsson and Honig, 2003). Therefore, to create new knowledge, firms need to relate to different sources and search for the various opportunities (Nonaka and Takeuchi, 1995; Schumpeter, 1942/87; Tushman and Rosenkopf, 1992). One instrument firms exploit in this search for new opportunities is investment in R&D (Cohen and Levinthal, 1990; Greve and Taylor, 2000). However, firms cannot rely exclusively on internal sourcing, and need to enlarge the search for knowledge beyond their boundaries: the external sources of technical expertise, joined with in-house basic research are fundamental for explaining firms' success (Freeman and Soete, 1997).

New firms may find it difficult to acquire external R&D for many reasons. First, new firms find it difficult to signal to other resource holders their worth in terms of being provided with resources and knowledge, which, in turn, limits the access of startups to additional resources. Second, firm reputation is built over time and resource holders assume some risk in collaborating with new organizations making external partners hesitant about providing resources to new firms. Third, in their search for external partners, firms need to be able to recognize and evaluate external knowledge. As Cohen and Levinthal (1990: 131) point out:

the ability to assimilate information is a function of the richness of the pre-existing knowledge structure: learning is cumulative, and learning performance is greater when the object of learning is related to what is

already known ... diversity of knowledge plays an important role ... a diverse background provides a more robust basis for learning because it increases the prospect that incoming information will relate to what is already known.

However, new firms generally are characterized by a lack of diversified activities and therefore find it more difficult to track down complementary partners. Furthermore, young firms' acceptance represents an essential condition for external knowledge to flow (Rees, 1962) and acceptance develops through repeated interactions. However, acceptance also can arise from "nested power" depending on the possibility of one actor to call upon others' sources of "back-up" power to make their own power effective in case of need (Stinchcombe, 1965). Thus, we argue that the liability of newness in general hampers young firms in their quest to acquire R&D externally. Hence, we posit:

H1: Acquisition of external R&D is positively related to firm age.

3.2. The effects of social capital on the liability of newness

The strategy implemented by the firm can be heavily influenced by the social structure of the context in which the firm is embedded (Burt, 1992; Coleman, 1988; Granovetter, 1973; Uzzi, 1997). Geographically bound social capital is one such context and operates through three related, yet different effects.

First we allude to a *collaboration inducing effect* of regional social capital. As a starting point, both the acquirer and the supplier of external R&D will most often have private knowledge and information about the on-going R&D project and the contract describing the outcome of the R&D may be hard to specify precisely *ex ante* (Pisano, 1990). From one side, the R&D supplier firm may exploit this situation to obtain

economic advantages. For instance, the supplier firm may claim that the R&D it is conducting has become more expensive due to the specifications made by the acquiring firm or the supplier firm may deliver technology that is short of what was demanded from the outset. In these cases, it may often be advantageous for the R&D acquiring firm to accept new — and significantly worse — terms of delivery, when facing the hold-up given that the alternative (cancelling the R&D project that may be connected to internal R&D efforts) could be catastrophic under many circumstances. From the other side, the R&D acquiring firm may not have the ability to specify its demands clearly enough from the outset. In addition, outsourced R&D projects very often require the exchange of knowledge between the acquirer and the supplier of the R&D (Norman, 2004; Osborn et al., 1998). The acquirer therefore supplies knowledge of its specific needs and possibly knowledge of complementary technologies under its control. The acquiring firm may not, however, be competent enough to supply this knowledge in useful form. Such lack of acquirer-competence makes it difficult for the supplier to deliver a successful technology. Add to this the possibility that the acquiring firm may not be able to meet its financial obligations regarding payment for externally performed R&D. It is also possible that the acquiring firm exposes the R&D supplier to a hold-up and refuses to pay the full costs of the R&D activity. In such cases, it may sometimes be advantageous for the R&D supplying firm to accept new and worse terms of the transaction when facing the hold-up, given that the alternative can be to own a technology that has no or little alternative use. The problem for the R&D supplier is that it does not have perfect information about the motives, competencies and resources of the R&D acquirer *ex ante*.

When we add up the uncertainties on behalf of both the R&D supplier and the R&D acquirer, we obtain a dysfunctional market — a market characterized by a low transaction frequency. In this paper, we argue that high levels of social capital in the region may provide supplier and acquiring firms with potential resources and the information and an environment that facilitates risk taking while also reducing the need for formal control (Ouchi, 1980). In the presence of localized social capital, the threat of hold-up is likely to be reduced both because the information level in the both firms is likely to be higher in the presence of more regional social ties and because of trust leading to a lower chance of a hold-up situation created by any of the two firms involved in the transaction.

In defining its strategy for knowledge creation, a firm decides to engage in R&D activities in response to the threats and opportunities within its context (Cohen and Levinthal, 1989). The behavioral theory of the firm emphasizes that organizations choose among available solutions following a process of search and evaluation. Alternative solutions compete for attention (Ocasio, 1997), and the solutions that exist outside the firm are identified through relationships with earlier adopters, consultants, or suppliers. It must be remembered also that the firm context is characterized by diverse and uncertain sets of opportunities. A cooperative context increases the stock of solutions available to the firm, increasing the possibilities to access more fine-grained information about the competencies, needs, and reliability of possible partners (Krackhardt, 1990; Powell et al., 1996). Social capital may help the firm to locate and evaluate opportunities (Elfring and Hulsink, 2003). Moreover, in a geographic area with high levels of social capital, it is more likely that the entrepreneur has some established relationships and some reputation which is able to secure tangible commitments from otherwise skeptical resource holders (Portes

and Sensenbrenner, 1993; Shane and Cable, 2002; Stuart and Sorenson, 2003; Zimmer and Aldrich, 1987), such as suppliers of R&D. We argue that when a regional context presents a variety of social connections, it is easier to obtain information about external partners that can deliver R&D. Furthermore, it is more likely that the entrepreneur has formed pre-establishment relationships and reputations that secure commitments from resource holders, including suppliers of R&D.

Second attention is called to an *appropriability effect*. In general, external actors are more willing to share knowledge when the context is characterized by high level of social capital which facilitates the transmission of more sensitive and richer information (Krackhardt, 1990). In fact, the effectiveness of external knowledge acquisition depends on the willingness of other actors to share useful information and resources (Dyer and Singh, 1998; Yli-Renko et al., 2001). The social capital literature argues that social capital has a positive effect on knowledge transfer, influencing the willingness of individuals to dedicate time and effort to cooperation with others (Coleman, 1988; Granovetter, 1985). Trust provides the confidence that the knowledge shared will not be appropriated or misused (Krackhardt, 1990; McEvily et al., 2003).

Like other firms, young firms acquire knowledge from other firms through “ingoing spillovers”. However, the damaging effects of “outgoing spillovers” must be guarded against (Cassiman and Veugelers, 2002). When a focal firm acquires R&D from another firm, it may have to disclose some of its own knowledge in order to be able to specify the type of technology it wants to develop. The firm providing the R&D may exploit this knowledge and use it for its own ends (and it may also appropriate part of the technology, the firm is paying to develop). For those firms whose new

products are based on new technology or which rely on unique knowledge of their employees, exposure to the external environment may be dangerous or even counter-productive. Young high-tech firms are especially vulnerable to outgoing spillover problems because they rely on just one or very few technologies (Gans and Stern, 2003; Shane, 2005). The threat of competition from incumbents is always present (Gans and Stern, 2003). However, in local environments characterized by high levels of social capital, concern over outgoing spillover may be smaller as accounts of knowledge theft are likely to spread rapidly, as a result of the high degree of social connectedness in that location. As a consequence, breaching an explicit or implicit agreement is very likely to carry heavy penalties from the external regional environment (Gulati, 1995, terms this phenomenon “deterrence-based trust”).

The third mechanism we term the *communication effect*. Sharing the same localized communication codes makes it easier for firms to cooperate over a complex process such as R&D. Regional social capital enables shared language and meanings that facilitate access to information and resources. Gulati (1995) argues that a degree of familiarity with partners promotes cooperation and reciprocal understanding. Contexts characterized by a high levels of social capital increase the probability to be exposed to new information and therefore to perceive external opportunities (Arenius and De Clercq, 2005). Following Nahapiet and Ghoshal (1998), we argue that geographical areas that are rich in social capital are the locus of shared language and norms that facilitate knowledge diffusion. Social capital, favoring relationships that are stable and productive over time, increases relation-specific common knowledge. In turn, this improves knowledge flows by accelerating the sharing of ideas and feedback. Thus, we suggest that the liability of newness in

general hampers young firms in their quests to acquire R&D externally, but that this effect is reduced in geographical contexts with high level of social capital since such environments promote trust and thereby the exchange of information making firm age less important in explaining their acquisition of external knowledge. In sum, the collaboration inducing effect, the appropriability effect, and the communication effect all give support to the following hypotheses:

H2a: Firms operating in settings associated with high levels of regional social capital are more likely to acquire R&D externally than similar firms operating in settings associated with low levels of regional social capital.

H2b: High regional social capital settings moderate the liability of newness by elevating the young firms' propensity to acquire external R&D.

4. Data and Method

4.1. Data

The empirical study draws on several datasets. Analyzing the effect of regional social capital on the liability of new firms requires data that include firm-specific and region-specific variables (in this paper, "regional level" is measured at the Italian provincial level). We build this dataset by merging firm-specific data collected by an Italian Bank Group, Unicredit, on a sample of Italian manufacturing firms, and provincial-specific data collected by the Italian Institute of Statistics (ISTAT). The Unicredit survey consists of a stratified sample of manufacturing firms employing 10-250 people, and a census of manufacturing firms with more than 250 employees. Data refer to the three year period 2004-2006. The response rate was 25 percent and the sample obtained is representative of Italian manufacturing firms across four macro regions (i.e. northwest, northeast, center, and south), Pavitt (1984) sectors

(i.e. supplier dominated, scale intensive, science based, specialized supplier), and firm sizes (11-20, 21-50, 51-250, 251-500, more than 500 employees) (Unicredit Corporate Banking, 2008). We obtained a sample of 4,529 firms after deleting an insignificant number of observations where values were missing for one or more variables.

Additionally, we drawn upon a provincial census dataset collected by ISTAT in 2001. The data were aggregated into 103 provinces corresponding to the Nomenclature of Territorial Units for Statistics level 3 (NUTS 3). We use two separate data sources for our dependent variable and for one of our two main independent variables (regional social capital). The other independent variable is firm age, which is objectively observable. Given this research design we avoid most problems related to common method bias although there might be some related to the control variables and the dependent variables. However, this bias would lead us to underestimate the effects of our two key independent variables. We performed a Harman's one-factor test on the firm-level variables included in the models presented in this paper, to examine whether common method bias might be augmenting the relationships detected. Since we found multiple factors, and since the first factor did not account for the majority of the variance (the first factor accounts for only 0.19% of the variance), common method bias was not indicated by the test (Podsakoff and Organ, 1986).

Dependent Variable: The Unicredit survey provides information on the firm's R&D investments. It asks respondents to indicate whether they invest in R&D activities or not and then how much is invested in internal R&D and how much in external R&D. Using these questions, we constructed a three level dependent variable with the following outcomes (i) *"Do not invest in R&D"*, (ii) *"Exclusively invests internally in*

R&D”, or (iii) “*Invests both internally and externally in R&D*”. We thereby consider investing externally in R&D to be nested in the decision to invest in R&D.

Independent Variables: This paper uses two independent variables. First, we consider firm age as an expressive measure of the liability of newness. Age is measured by the number of years since the firm was founded and is in logarithmic terms assuming an increasing and decreasing effect of firm age. Second, the analysis requires a measure for social capital at the regional level. Different variables have been used to quantify social capital in the context of larger geographical areas. For instance, Guiso et al. (2004) use participation rates in Italian referenda and the level of blood donations across regions as their two measures, while Knack and Keefer (1997) focus on the trust aspect of social capital across countries which is measured based on a questionnaire containing the question “Generally speaking, would you say that most people can be trusted, or that you cannot be too careful in dealing with people?” Ultimately, trust is measured as the percentage of respondents in each country that replied “most people can be trusted”. In this paper, we follow Beugelsdijk and van Schaik (2005) in using a questionnaire-based multidimensional measure of social capital, based mainly on Putnam’s conceptual and empirical work. We propose a measure of social capital that aims to capture elements of the firm’s context that pertain to local participation in social associations (Putnam et al., 1993), local social inclusion (Putnam, 2002) and local enforceable trust (Portes and Sensenbrenner, 1993: 1325). Based on these dimensions, we select a total of five provincial items. Three of these (number of non-profit firms; number of unpaid workers in non-profit organizations; number of employees in non-profit firms) provide a measure of local involvement in social associations. We measure social inclusion based on number of foreign residents. According to Putnam (2002), the presence of

foreign residents represents a source of social capital. Finally, we include a proxy for enforceable trust, since, as explained by Portes and Sensenbrenner (1993), social capital is generated by individual disciplined compliance with group expectations and with respect for contractual terms. We measure enforceable trust as number of legal cases per capita brought over non-recognition of payment obligations for the year 2001. Disagreements arise over exchanges between two parties (a debtor and a creditor). One reason for an action being brought is opportunistic behavior by the debtor who fails to honor all the contractual conditions. Thus the debtor's behavior does not comply with expectations and may be a sign of dearth of social capital in the form of trust. Table 1 presents details on the social capital variables. All the items included in the social capital variables are constrained by geographic space (Italian provinces).

Using the five provincial items, we conducted a factor analysis (FA) estimating the degree to which we could identify a common underlying structure. The analysis suggests the variables are interrelated enabling us to express them in one dimension (Eigenvalue=2.59). This exercise provides a latent variable, which we use as a measure of the provincial social capital. Table 1 exhibits the factor loadings of the FA.

[Insert Table 1 about here]

We aim to measure social capital at the minimum level of aggregation possible with the existing data. This low level of aggregation has the advantage of providing a geographically bound measure of social capital, but limits the number of variables that is possible to select to provide a measure of the phenomenon. In order to test the construct validity of our social capital measure, we estimate an alternative measure using the five regional rather than the provincial items. Region corresponds

to NUTS (Nomenclature of Territorial Units for Statistics) 2 level and represents a higher level of territorial aggregation than province. The regional variables considered refer to social interaction (participation in cultural associations, participation in voluntary associations, participation in non-voluntary organizations, good relationships with friends, and subscriptions to associations), which are seen as being consistent with our theoretical considerations. The latent construct derived from these variables was highly correlated with the provincial level social capital variable ($r=0.7$).

It can be noted that our empirical results are robust to alternating between Italian regional and provincial level social capital variables: the results are strikingly similar. In this paper we present the results obtained using the provincial measure of social capital (results using the Italian regional level alternative are available upon request). Figure 1 shows how our measure of social capital varies within Italy. Social capital is higher in the North of Italy (in particular in the North East), weaker in the center, and very weak in the South. However, even within these areas there is variation.

[Insert Figure 1 about here]

Control Variables: In order to prevent any possibility that our results are due to firm-, industry- or geography-specific differences, we include controls at each level of aggregation.

Firm-specific controls: Large firms are more likely to pursue formalized R&D activities (Cohen and Klepper, 1996; Scherer, 1965). Accordingly we control for *firm size* measured as number of employees. We control for firm innovativeness by including a dummy for whether the firm introduced a new *product innovations* or not. Firms exhibiting innovation capabilities may be more attractive to external partners. Furthermore, the ability to draw on social networks may lead to elevated innovation

performance. Additionally, we control for whether or not the firm is a member of a larger organization or is a single standing unit. This dummy controls for the possibility that organizational features may influence the way that R&D activities are managed.

Industry-specific controls: To account for industry differences in R&D activities, we include industry R&D intensity and four dummies representing the Pavitt (1984) sectors: supplier dominated, scale intensive, science based, specialized suppliers.

Geography-specific controls: We add a set of controls to capture the technological characteristics of the region: regional share of GDP spend on R&D activities and number of regional employees working in R&D activities per 1,000 inhabitants. We control for regional airport infrastructures measured as the number of passengers embarked and disembarked by air per 100 inhabitants. We include a control for provincial human capital, measured as the share of individuals with a diploma/degree, which also controls for local university quality. We also include a measure of provincial firm density measured as number of firms per square kilometer. Finally, we include four geographic dummies to control for differences across the four Italian macro regions (i.e. northwest, northeast, center, and south) which is standard in the geography literature investigating Italian Regions (Boschma and Iammarino, 2009).

4.2. Econometric method

Our dependent variable is a three level, categorical variable. This leads us to consider a number of econometric techniques as candidates for our empirical analysis. Since we consider external R&D investment to be nested in the decision about whether to invest in R&D, we investigate the independent irrelevant alternatives (IIA) assumption. A violation of the IIA assumption would rule out the use

of otherwise relevant econometric techniques that do not assume a nested data structure (a conditional logit approach or a multinomial logit approach). Using the likelihood ratio test we find that this assumption is violated in our data. We therefore employ a nested logit estimation technique splitting the econometric estimation into two nests, thereby grouping alternatives into sub-groups (nests) such that the independence of irrelevant alternatives assumption (IIA) is valid within each subgroup (Train, 2003; Winkelmann and Boes, 2006). Figure 1 provides an overview of the model specification. The figure depicts the asymmetric nature of the data in the sense that the second level outcome is available only if the respondent is confirmed at the first level. We follow Drucker and Puri (2005) in using interaction effects to implement this asymmetric specification. It is important to stress here that the econometric technique does not assume a specific sequential outcome of the firm strategy.

The nested logit technique also requires that we reshape the data observing each firm once, for each of the three possible outcomes in the tree depicted in Figure 1. Accordingly, we use a total of 13,587 (3×4,529) observations in the analysis.

[Insert Figure 2 about here]

To investigate whether the “*liability of newness*” is moderated by social capital, we run the model three times: on the full sample of firms and on two split samples based on the province in which the firm is located. The two sub-samples are defined by the quartiles investigating firms operating in provinces that are among the upper 75 percent in terms of social capital (high social capital) and firms operating in provinces that are among the lower 25 percent in terms of social capital (low social capital).

5. Results

Table 2 reports the descriptive statistics of the variables included in the model as well as the associated Pearson correlations coefficients considering the reshaped data. None of the correlations is alarmingly high, ruling out the possibility of multicollinearity. Table 2 shows that 45 percent of the observations did not invest in R&D at all, 41 percent invested only internally, and only about 14 percent invested both internally and externally.

[Insert Table 2 about here]

Table 3 presents the results of the nested logit regressions. Model I is the model containing the results for the total sample across both low and high social capital provinces. Models II and III respectively exhibit the results for the sample of firms located in regions with high social interaction and low social interaction.

[Insert Table 3 about here]

We find support for Hypothesis 1 (*Acquisition of external R&D is positively related to firm age*). Model I exhibits positive and significant estimates of firm age in explaining firms' external knowledge acquisitions (significant at the 1% level). This result implies that older firms are overrepresented among those investing in R&D externally. We find also that younger firms are less likely to invest only in internal R&D. However, a Wald test reveals that the estimate for external R&D investment is significantly higher than that for internal R&D investment indicating that the liability of newness, is stronger for external compared to internal R&D investment.

We also find a significant effect of the regional social capital variable on R&D investments (but significant on at the 10% level). We do not find any evidence of a significantly larger effect for external R&D compared to internal R&D investment. Nevertheless, the results suggest that geographically bounded social capital

facilitates external R&D acquisition, lending some support to hypothesis H2a: *Firms operating in settings associated with high levels of regional social capital are more likely to acquire R&D externally than similar firms operating in settings associated with low levels of regional social capital.*

Models II and III in Table 3, in combination suggest that young firms suffer from the liability of newness only if they are located in a province with low social capital. Age does not seem to play a role for firms operating in provinces characterized by high levels of social capital. Thus, social capital acts as a moderator and supports Hypothesis 2b that: *High regional social capital settings moderate the liability of newness by elevating the young firms' propensity to acquire external R&D.* The magnitude of the liability of newness for internal R&D investment is estimated to be lower than for external R&D investment in the low social capital setting: not only is the parameter for internal R&D investment insignificant; a Wald test also reveals that the two parameters in Model III are significantly different.

6. Discussion

This paper shows that geographically bounded social capital shapes young firms' tendencies to acquire R&D externally. Specifically, we argued that it is difficult for young firms (compared to older firms) to establish relationships with key resource holders and to access external sources of knowledge, and that geographically bound social capital moderates the liability of newness by generating the trust, reputation and linkages that promote successful search for formal business relationships. In other words, we find that social capital represents a contextual variable that increases the likelihood that young firms will exploit external sources of R&D, thereby compensating for the liability of newness. Theoretically, these empirical

findings could be argued to be due to a collaboration inducing effect, a communication effect, and an appropriability effect.

Our findings have significant implications for the entrepreneurship literature. Following Stinchcombe's (1965) analysis of the liability of newness, researchers have tried to identify factors that influence the survival or death of young organizations. Our study makes a contribution by providing empirical evidence supporting the importance of social capital as an external contingency that affects young firms' acquisition of external knowledge and hence their strategies. From a population and market selection perspective, the overrepresentation of old firms among the group of companies that collaborates with external R&D partners, may be attributable to an above average mortality rate among young firms that do not invest externally in R&D, which reduces the number of older firms that do not invest in external R&D. Our study suggest that this effect only operates strongly in low social capital settings while is less pronounced in high social capital regions. Our analysis therefore provides a clear explanation for discrepancies across geographic areas with regard to the higher proportion of older firms in external R&D relationships.

The result are consistent with the economic geography literature which points to the importance of location for firm competitiveness in relation to industrial districts, and territorial innovation systems, etc. (e.g., Brusco, 1982; Romanelli and Khessina, 2005; Venkataraman, 2004). Indeed, assuming a close relation between investment in external R&D and survival of young firms suggests that the formation of clusters and establishment of industrial districts will be more likely in regions with high social capital.

Our study also enriches the social capital literature in several ways. Our findings provide empirical support for the two main arguments put forward by social capital

scholars. First, social capital refers to the social structure of a community and, therefore, resides in people's relationships (Coleman, 1988; Nahapiet and Ghoshal, 1998; Putnam, 2000). Second, since social capital is co-owned by the partners in a relationship, it facilitates individuals' actions within the social structure (Burt, 1992; Nahapiet and Ghoshal, 1998). We also make a contribution by operationalizing social capital using a measure that synthesizes different dimensions of the social structure of province in which the firm is located. Finally, linking firm strategies to social capital, our study illustrates the value of integrating concepts from the social capital and entrepreneurship literatures.

This research has some practical implications for both managers and entrepreneurs. Consistent with the arguments in Sorenson and Audia (2000) and Shane and Cable (2002), our results imply that the contextual setting, in terms of level of social capital, needs to be taken into account when managers and entrepreneurs are planning their strategies. Given the importance of knowledge for the survival of young firms, and provided that social capital facilitates access to external knowledge as shown in this paper, new firms, if able to choose, will locate in geographic areas with high levels of social capital.

This study has some limitations. We focus on the positive net effects of social capital, but it should be remembered that social capital can also have negative effects if the underlying networks become too dense. Prominent social capital theorists, such as Coleman (1988), stress the importance of dense networks as a prerequisite for the creation of social capital. However, dense networks may also be penalizing in terms of the exclusion of outsiders, excess claims on group members, restrictions on individual freedoms, and downward leveling norms (Portes, 1998). The measure of social capital proposed in this paper is based on the combination of

strong and weak ties, but we acknowledge that it is not possible to separate these types of ties empirically. Although more research that could achieve this might be of great value, the analysis would be extremely difficult at the relatively high level of aggregation of the Italian province.

Greater emphasis on how geographically bounded social capital enables and constrains behavior in young organization would appear to be a fruitful area for future research. In this paper, we focus on R&D activity — a central activity for many young firms, but regional social capital might influence the effectiveness of other of the entrepreneurial firm's external relations. The insights from research along these lines would inform the decisions made by entrepreneurial firms about how to work with external partners.

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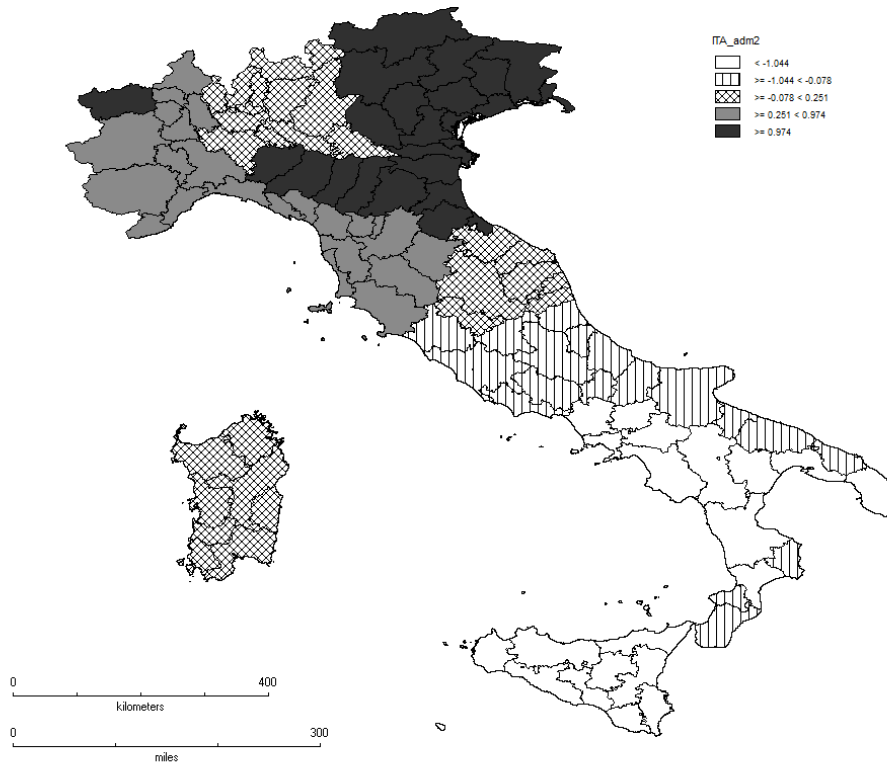


Figure 1: The level of social capital across Italian provinces

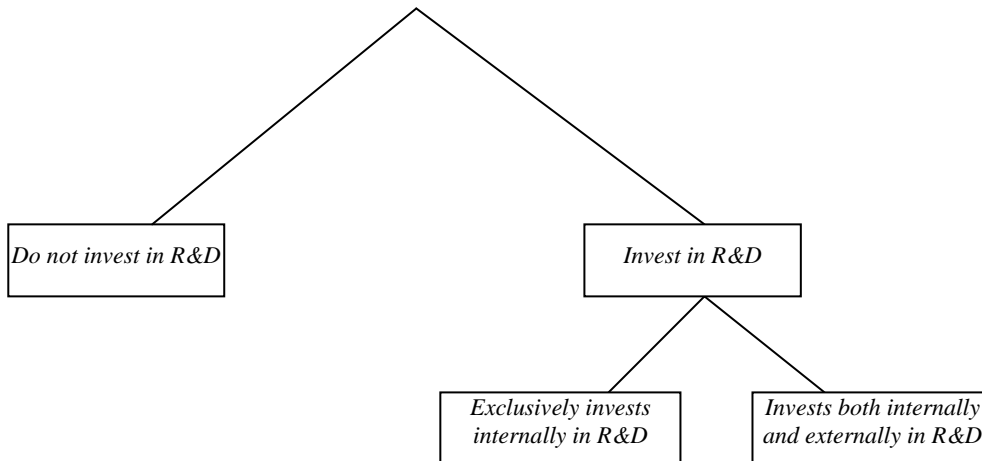


Figure 2: Nesting Structure of the implemented strategy

Table 1. Description of the variables included in the Principal Component Analysis
-Provincial level-

Variables	Description of the variables	Factor Loading
<i>Not-profit firms</i>	Number of non-profit organizations over the population	0.873
<i>Number of unpaid workers in not-profit</i>	Number of unpaid workers in non-profit firms over the population	0.750
<i>Number employees of not-profit firms</i>	Number of employees of not-profit firms over the population	0.685
<i>Protests</i>	Per capita legal protests for the lack of payment of obligations	-0.704
<i>Foreign Residents</i>	Number of foreign residents in the province in 2001	0.547

Table 2: Descriptive Statistics and Correlation Matrix

Variables	Mean	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
[1] No R&D	0.45													
[2] Strictly Internal R&D	0.41	-0.73												
[3] Both Internal and External R&D	0.14	-0.38	-0.35											
[4] Social Capital \times External	0.08	-0.02	0.02	0.00										
[5] Social Capital \times Internal	0.08	-0.02	0.02	0.00	-0.02									
[6] Firm age \times External	1.04	-0.02	0.02	0.01	0.21	-0.10								
[7] Firm age \times Internal	1.04	-0.02	0.02	0.01	-0.10	0.21	-0.46							
[8] Firm Size	88.45	-0.05	0.05	0.00	0.00	0.00	0.02	0.02						
[9] Product Innovative	0.13	-0.16	0.09	0.09	0.02	0.02	0.01	0.01	0.11					
[10] Industry R&D Intensity	2.19	-0.00	0.00	0.01	-0.02	-0.02	-0.00	-0.00	0.02	0.00				
[11] Scale Intensive Industry	0.19	-0.02	0.00	0.02	-0.04	-0.04	0.00	0.00	0.03	0.00	-0.04			
[12] Specialized Supplier Industry	0.27	-0.02	0.01	0.00	0.03	0.03	0.00	0.00	0.03	0.04	-0.01	-0.29		
[13] Science-Based Industry	0.05	-0.02	0.02	0.01	-0.02	-0.02	0.00	0.00	0.02	0.04	0.30	-0.11	-0.13	
[14] Regional Innovation Intensity	0.62	-0.01	-0.00	0.02	0.06	0.06	0.02	0.02	0.00	0.00	0.01	-0.02	0.11	0.07
[15] Regional Share of Employees in R&D	2.74	-0.01	-0.00	0.02	-0.07	-0.07	0.02	0.02	0.00	0.00	0.03	0.03	0.03	0.06
[16] Airport Infrastructure	145.23	0.00	-0.02	0.02	-0.14	-0.14	0.01	0.01	0.00	0.02	0.04	0.08	0.02	0.08
[17] Human Capital in Province	0.30	-0.01	0.03	-0.02	-0.08	-0.08	-0.00	-0.00	0.06	-0.02	0.04	0.04	-0.02	0.07
[18] Number of firms in Province	21.65	0.01	0.01	-0.02	0.13	0.13	-0.00	-0.00	0.04	-0.01	0.01	0.06	0.02	0.03
[19] North East Italy	0.29	0.00	0.02	-0.03	0.35	0.35	-0.00	-0.00	0.02	0.01	-0.02	-0.07	0.05	-0.05
[20] Central Italy	0.16	-0.05	0.01	0.05	-0.09	-0.09	-0.01	-0.01	-0.01	0.01	0.00	0.03	-0.09	-0.01
[21] South Italy	0.12	0.05	-0.02	-0.04	-0.25	-0.25	-0.02	-0.02	-0.01	-0.02	0.01	0.04	-0.09	-0.03
Variable	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]						
[15] Regional Share of Employees in R&D	0.53													
[16] Airport Infrastructure	0.24	0.50												
[17] Human Capital in Province	-0.02	0.12	0.10											
[18] Number of firms in Province	0.09	-0.06	0.10	0.19										
[19] North East Italy	-0.21	-0.41	-0.31	-0.04	0.18									
[20] Central Italy	-0.39	0.05	-0.11	0.16	-0.08	-0.28								
[21] South Italy	-0.41	-0.42	-0.27	-0.02	-0.07	-0.23	-0.16							

Correlation coefficients above 0.015 are significant at a 5% level

Table 3: Determinants of R& D activities. Results of Nested Logit regressions

	Model I	Model II	Model III
	Total Sample	High Social Capital	Low Social Capital
<u>Make or Buy Equation</u>			
Social Capital \times External	0.275** [0.125]		
Social Capital \times Internal	0.112* [0.064]		
Firm age \times External	0.927*** [0.156]	0.836 [0.594]	1.135*** [0.411]
Firm age \times Internal	0.161*** [0.056]	0.016 [0.225]	0.142 [0.154]
<u>Invest in R&D Equation</u>			
Firm Size	0.000 [0.000]	0.001 [0.000]	-0.000 [0.000]
Product Innovative	0.969*** [0.104]	0.867*** [0.213]	1.382*** [0.286]
Industry R&D Intensity	-0.000 [0.008]	0.001 [0.018]	-0.007 [0.015]
Scale Intensive Industry	0.067 [0.084]	0.007 [0.191]	0.268 [0.197]
Specialized Supplier Industry	0.104 [0.074]	0.020 [0.150]	-0.367* [0.204]
Science-Based Industry	0.220 [0.164]	1.071** [0.485]	0.961** [0.472]
Regional Innovation Intensity	-0.012 [0.172]	-0.157 [0.334]	1.609** [0.662]
Regional Share of Employees in R&D	-0.028 [0.037]	-0.071 [0.149]	0.224** [0.108]
Airport Infrastructure	-0.000 [0.000]	0.000 [0.002]	-0.003** [0.001]
Human Capital in Province	1.546 [1.043]	4.642 [3.307]	-2.335 [2.856]
Number of firms in Province	-0.002 [0.001]	-0.000 [0.002]	0.001 [0.004]
North East Italy	-0.166 [0.130]	-0.414 [0.489]	-0.235 [0.924]
Central Italy	0.305** [0.149]		0.728 [0.464]
South Italy	-0.029 [0.190]		0.659 [0.476]
Constant	-2.510*** [0.609]	-2.475 [2.328]	-3.091** [1.543]
Observations	13587	3069	2337
Firms Observed	4529	1023	779
Log-Likelihood	-4445.497	-1005.670	-737.727
χ^2	209.863***	52.961***	68.759***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, Standard errors in parentheses