

Technology-based Competitive Advantages of Young Entrepreneurial Firms: Conceptual Development and Empirical Exploration

1. Introduction

The central interest of this study is to explore the origins of *technology-based competitive advantages* of young entrepreneurial firms. To the extent that competitive advantages derive from scarce, valuable, and durable resources, competencies and capabilities (Wernerfelt 1984; Barney 1991), firms should dedicate efforts to develop distinctive resources. Among policymakers it is widely assumed that R&D investments and innovative products trigger firms' growth and translates into competitive advantages (Manjon and Remero-Merino 2012). Academics give support to this assumption by linking the benefits of technology, for example, to higher returns (Wernerfelt 1984), generation of new products (Deeds, DeCarolis and Coombs 2000), innovativeness of products/services (Sullivan and Marvel 2011), and creation of shareholder value (Kelm, Narayanan and Pinches 1995). As a consequences, it starts to be widely accepted that building *technological distinctiveness* –the extent to which a firm has a technological edge over its competitors and emphasizes R&D in its operations (Autio, Kanninen, and Gustafsson 2008; Rannikko 2012; Yli-Renko 1999; Yli-Renko et al. 2001) –is a potential mean for young entrepreneurial firms to achieve competitive advantages (Kapoor and Furr 2015; Toh and Kim 2013; Porter 1998).

While the previous insights on the role of resources and especially technology for the prosperity of firms are not new, they focus on the performance *consequences* of technological distinctiveness. Indeed, in this tradition the technological focus of a firm generally appears as an independent variable (or as a control variable), which potentially leads to diverse (positive) performance outcomes in young entrepreneurial firms (e.g. Li and Atuahene-Gima 2001; McCann 1991; Voudouris, Lioukas, Iatrelli & Caloghirou 2012; Zahra 1996), or more mature

firms (Wang, Chen, Wang, and Ning, 2014). These ideas are well in line with the central premises of the Resource-based view (RBV) according to which a firm's competitive advantage derives from scarce, valuable, and durable resources, competencies and capabilities (Wernerfelt 1984; Barney 1991). However, echoing earlier literature (e.g. Saemundsson and Candi 2014; McCann 1991), surprisingly little is known about the *origins* of technology-based competitive advantages. That is, we do not know why some young firms emphasize technology as a source of its competitive advantage while others choose to leverage other means to pursue similar ends. A product or service differentiation, for example, can be achieved using different means such as through technology or design and craftsmanship (Gabrielson, et al. 2008). Because firms are heterogeneous and specialized in varying degrees (Amit and Schoemaker, 1993; Keupp, Palmié and Gassman 2012), it is not automatic that all young entrepreneurial firms choose to develop competitive advantages through building technological distinctiveness, especially when we know that such strategy is a high-risk and resource consuming activity (Li and Atuahene-Gima 2001).

These previous points have been taken as a motivation for this study to investigate the concept of technology distinctiveness in young entrepreneurial firms. To this end, the central objective of this study is to explore the factors that contribute to technological distinctiveness to understand better the origins of technology-based competitive advantages in young entrepreneurial firms. By pursuing this objective this study responds to calls to clarify how competitive advantages can be built in general (Bowman and Collier 2006), and especially how firms create and adapt their resource basis for innovation (Keupp et al. 2012). Also, the context of young firms offers an interesting arena to study the origins of technology-based competitive advantages because the technology bases of firms are either just been formed or still in the process of being formed. While the RBV holds that the resource bases of a firm are directly related to the past activities of the firm (Lim, Stratopoulos and Wirjanto 2011; Lockett,

Thompson and Morgenstern 2009), by focusing on *young* firms, this study hopes to get a more accurate picture about the factors that contribute to the origins of technology-based competitive advantages compared to studying more mature firms.

This study makes original contributions to the current understanding of how competitive advantages are formed in SMEs. While the theorizing efforts in this study lean on the RBV, two interesting contingencies will be introduced in this study that set some conditions under which the prescriptions of RBV hold. First, entrepreneurs have a distinctive impact on the orientations and operations of their firms. Entrepreneurs are *expected* to make things happen, to take risks and innovate through technologies (e.g. Hall, Bachor, and Matos, 2014). To this end, building technological distinctiveness requires the acceptance of uncertainties. Leaning on this contingency, this study provides evidence that a young firm's technological distinctiveness is partly the result of entrepreneurs' orientation towards uncertainty. That is, the RBV prescription that a firm should focus on technological distinctiveness to build idiosyncratic resource bases is valid under the condition that entrepreneurs' tolerance of uncertainty is high.

Second, responding to calls to take the context of the firm into account in RBV studies (Kraaijenbrink et al. 2009), environmental contingency factor is integrated to the conceptual model. In this effort this study-contribute to the literature that propose a linkage between firm's *location* and competitive strategy, but with the difference that in this study the focus is not in explaining location choices (e.g. Galbraith et al. 2008; Lafuente, Vaillant, and Serarols, 2010) but how location influences a firm's decisions concerning competitive strategy (e.g. Patterson and Anderson 2003). Indeed, earlier research has suggested that, for example, firms in urban locations (big cities) have a higher performance and higher innovation rates (Covin and Slevin 1998; Keeble 1997; 2013; Ritsilä 1999) than firms in rural locations (areas outside big cities). These studies support prevailing resource munificence, knowledge spillover, and regional competitive

advantage assumptions. In this study, however, it is demonstrated that location choices are linked to the origins of technology-based competitive advantages.

2. Theoretical Development

As pointed out in the Introduction section, according to the RBV, a firm's competitive advantage derives from scarce, valuable, and durable resources, competencies and capabilities (Wernerfelt 1984; Barney 1991). More than fifty years ago, seminal advance in understanding the importance of a firm's internal resources was provided by Penrose (1959). However, it was not until the 1990s that RBV contributed strongly to entrepreneurship and performance discussion, when Barney (1991) highlighted the influence of resources on firms' growth performance and Heene and Sanchez (1997) found that the maintenance and development of a firm's resources to be important for sustainable development. The starting point of the so-called fundamental theory of resources is recognition of firms' continuous need to regenerate resources by exploiting changing circumstances. Building competitive advantage means both *possessing* and *developing* distinctive resources –physical, human, organizational. Several studies (Barney 1991; Chatterjee and Wernerfelt 1991; Powell 1992) highlight that optimal firm growth requires (inter alia) equilibrium between the utilization of existing resources and the creation/development of new resources by exploiting changing circumstances.

To this end, technology –the sum of a firm's knowledge and skills (Zahra and Bogner 1999) – provides one prominent mean for firms to build distinctive resources and gain competitive advantages (Grant 1996; Grimpe and Keiser 2010; Voudouris et al. 2012). As a part of a firm's physical capital (Barney 1991), a firm's technology becomes an essential ingredient in its overall competitive strategy if it has a role in determining relative cost position or differentiation, or changing the other drivers of cost or uniqueness (Porter 2007). In essence, technology “*determines the ability of new ventures to offer the products (services), gain market*

acceptance, survive, and achieve financial success” (Zahra and Bogner 1999: 136). Recent studies based on the RBV have observed that a young firm’s performance is dependent on technology resources especially after their start-up stage (Li and Chen 2009; Haeussler et al. 2012). As such, for entrepreneurial young firms, one of the central means to competitive advantage is represented by investments in technology and related capabilities.

When a firm competes through technological means, it translates, for example, into investments in R&D activities and promotion of novel products. The methods by which organizations utilize technology is regarded the technology basis of competitive advantage (Schumann, Prestwood, Tong and Vanston 1994). To follow this tradition, and as pointed out earlier, in this study technological distinctiveness refers to the extent to which a firm has a technological edge over its competitors and its competitive advantage is based on technology (Yli-Renko 1999; Yli-Renko et al. 2001; Rannikko 2012). Other similar labels, which make reference to technological distinctiveness include, among others, technical or technological specialization (e.g. Haeussler et al. 2012; Toh and Kim 2013), significant technology investment (e.g. Voudouris et al. 2012), and in more general firm-specific knowledge resource (e.g. Grimpe and Kaiser 2010).

While the RBV has been reviewed several times (e.g. Acedo, Barroso and Galan 2006; Armstrong and Shimizu 2007; Newbert 2007; Lockett et al. 2009; Kraaijenbrink, Spender and Groen 2009), and despite the long success RBV has gained among scholars and practitioners, the creation of resource-based competitive advantages has gained little attention (Bowman and Collier 2006; Lockett et al. 2009). Inspired by these central premises of the RBV, two interesting accounts about the antecedents of technology-based competitive advantages can be identified, namely the behavioral and environmental perspectives. The decision to focus on these two classical explanations for managerial behavior is based on of their clear prescriptions. Indeed,

managerial choice (e.g. Andrews 1971; Child 1972) explains how firms adopt certain strategies, while the environmental perspective introduce context/location as a potential constrain for managers (e.g. Carroll 1985). As a result, in the following sections three different hypotheses are put forward to explain how and why young entrepreneurial firms seek competitive advantages through technological distinctiveness.

2.1 Behavioral Perspective and Technological Distinctiveness (H1)

The theorizing efforts of this study start with the argument that the technological distinctiveness in a firm, i.e. the choice to seek competitive advantage through technological means, depends largely upon entrepreneurs and their choices. This overall argument is based on the managerial choice perspective (e.g. Andrews 1971; Child 1972). More specifically, this study focuses on entrepreneurs' tolerance of uncertainty. While risk-taking is in general treated essential to innovation and success (March and Shapira 1987), entrepreneurs in particular have been associated with risk-taking in uncertain environments (Cantillon 1931; Knight 1921). Indeed, managing risk should start with a consideration of uncertainty (Ilevbare, Probert, and Phaal, 2014). Echoing these ideas this study claims that those entrepreneurs, who exhibit higher *tolerance of uncertainty*, develop their firm's technological base as the key competitive advantage of their firm.

To see this association it is first reminded that entrepreneurship may be conceptualized as the creation of new products or processes, entry into new markets or as the creation of new ventures (Schumpeter 1934). Common for all conceptualizations is uncertainty and risk involved with the action (McMullen and Shepherd 2006). While entering new markets with old products involves less uncertainty (market risk only), developing new products for new markets involves more uncertainty (technology risk in addition to market risk). For explaining how uncertainty discriminates those who decide to act entrepreneurially from those who do not, there are two

streams of thought (McMullen and Shepherd 2006). The first focuses on the amount of uncertainty perceived due to differences in knowledge. The other, directly related to this study's approach, focuses on the willingness to bear uncertainty due to differences in risk-propensity (McMullen and Shepherd 2006).

Between two entrepreneurs that perceive uncertainty similarly, the one with higher tolerance of uncertainty is more likely to engage in entrepreneurial act such as developing technology in order to take advantage of emergent opportunities. More specifically, uncertainty in the context of action contributes to the sense of doubt that blocks or delays action differently because it is subjective (Lipshitz and Strauss 1997). There is variance in how it blocks action because of individual differences in approaching risk (Khilstrom and Laffont 1979). In specific doubt prevents action by undermining prospective actor's beliefs regarding (1) whether an environmental stimulus presents an opportunity for someone in the market place, (2) whether this opportunity could feasibly be enacted by the actor and (3) whether successful exploitation of the opportunity would adequately fulfill some personal desire (McMullen and Shepherd 2006).

Thus, in this study it is claimed that entrepreneurs' orientation towards uncertainty defines the conditions under which firms choose to develop their technological resource-bases to achieve competitive advantages. Entrepreneurs, who have higher tolerance of uncertainty, are able to make the necessary investments in resources to build technological distinctiveness, even though technology development involves risks (Hall et al. 2014), and the returns in such resource investments are uncertain, not immediate, and often negative (e.g. March 1991). And vice versa: entrepreneurs, who exhibit low level of tolerance of uncertainty, will prefer to invest in other types of resources and prefer keeping the technological level of their firm low or moderate. They prefer to compete with less novel products and low or moderate level of technological investments, i.e. refinement and extension of existing technologies where the return are positive,

proximate, and more predictable (March 1991). As such, this study claims that the orientation towards uncertainty explains when a firm adopts a technology-based competitive strategy. These arguments lead to the following hypothesis:

Hypothesis 1. Entrepreneur's tolerance of uncertainty contributes positively to the technological distinctiveness of a young entrepreneurial firm.

2.2 Environmental Perspective and Technological Distinctiveness (H2)

The theorizing efforts are continued by pointing out that the context of a firm also dictates, or sets conditions (e.g. Carroll 1985), whether the firm has to invest in technologies or not. Along this line of reasoning, this study argues that environmental context influences (c.f. Welter and Smallbone, 2016), to certain extent, the choices entrepreneurs have in regards of building competitive advantages for their young entrepreneurial firms.

To start with, it is well acknowledged that there is no best way to manage a firm, and that the possible managerial actions of a firm are dependent upon internal and external situations of the firm (Scott 1981; Lawrence and Lorsch 1967; Thompson 1967). One such external situation is related to the *location*, which is thought of having an influence on the competitive strategy of a firm. At the regional level, it is believed that urban areas (big cities) have higher performance and more original innovations than peripheral regions (areas located outside big cities) (Covin and Slevin 1998; Keeble 1997; Ritsilä 1999), which could indicate differences in technological distinctiveness between different locations. Moreover, according to North and Smallbone (1995), urban-rural differences could be explained by the different strategies adopted by entrepreneurs in responding to the various opportunities and constraints existing in different locations. As an example, Patterson and Anderson (2003) observed that in rural locations manufacturing firms followed a production-cost-oriented export strategy, while in urban location they used reputation-based competitive advantage. Also, Keeble (1997) observed among manufacturing and service

SMEs in Britain that peripheral firms stress different competitive advantages –such as speed of service, low price and costs –than firms in more favorable locations, which seem to stress specialized expertise and product design.

The literature concerning location and its effects on the technological distinctiveness of young entrepreneurial firms (e.g. Acs and Feldman 1994; Saxenian 1994; Vaessen and Keeble 1995; Teece and Pisano 1994) informs us that young entrepreneurial firms are usually more vulnerable to the external conditions than their established rivals (also Zahra and Bogner 1999). Furthermore, especially in certain environments where firms are grouped together geographically, munificent environment may provide a firm several different specialized resources to achieve technological distinctiveness. That is, in resource munificent locations, firms have an improved access to labor, other specialized human resources, knowledge stocks and spillovers (Acs and Feldman 1994; Arundel and Geuna, 2004; Saxenian 1994; Li, Veliyath, and Tan, 2013), all which can be used as bases for developing technological distinctiveness.

As such, in resource munificent locations, firms have many options through which they can try to enhance the technological distinctiveness of their firm. The situation of firms is different, on the contrary, in rural areas (non-favorable location). Rural areas are by definitions characterized by the lack of opportunities related to access to labor or other specialized human resources (e.g. Vaessen and Keeble 1995), markets, proximity with other actors, and the like. Therefore, local resource base is bound to restrict the choices entrepreneurs have over means to achieve competitive advantages. This restrictive access to resources could, in turn, indicate that young entrepreneurial firms in non-favorable locations would have to invest in other means to compete to compensate the unfavorable environmental conditions. For example, relational view (Dyer and Singh 1998) posits that firms can achieve competitive advantage through close relationships with other actors in the industry value chain. In those circumstances entrepreneurs

can choose not to develop internal resources but to rely on those of their partner firms/suppliers through outsourcing and therefore divide technological risks (e.g. Grimpe and Kaiser, 2010).

As a step towards this direction, this study claims that because firms in non-favorable location are constrained by the access to limited resources, they would have less means to develop their technological distinctiveness. Firms in favorable locations, on the other hand, follow “resource-based strategy” of accumulating valuable technology assets (e.g. Teece and Pisano 1994) as their choice for achieving competitive advantage. As a result of this discussion, it would be expected that the location to have an influence on technological distinctiveness of a young entrepreneurial firm in the sense that young entrepreneurial firms in resource munificent locations would invest in technological distinctiveness more than similar firms in non-favorable locations. These arguments lead to the following hypothesis:

Hypothesis 2. Location contributes to the technological distinctiveness of a young entrepreneurial firm: firms in resource munificent locations focus on building technological distinctiveness more than firms in non-favorable locations.

2.3 Behavioral and Environmental Interaction and Technological Distinctiveness (H3)

Rather than juxtaposing the two previous perspectives –in reality things always seem to end up being connected to each other in multiple ways –and echoing Hrebiniak and Joyce (1985), this study proposes that behavioral and environmental perspectives interact to the extent that location moderates the impact of tolerance of uncertainty on technological distinctiveness.

While the first hypothesis proposes that tolerance of uncertainty has an influence on technological distinctiveness, this argument seems to hold especially in locations characterized by low environmental resource munificence (i.e. non-favorable location). While the managerial control over and selection of the means by which competitive advantages can be achieved exist in highly constraints environments (e.g. Hrebiniak and Joyce 1985), they are severely limited.

Indeed, in non-favorable location entrepreneurs do not have an easy access to specialized resources. If an entrepreneur wants to compete through technological distinctiveness in this kind of location, it requires certain amount of tolerance of uncertainty. Entrepreneurs choose technology as a source for their competitive advantage when they can bear the uncertainty inherent in this mean.

On the contrary, and as already mentioned, favorable environment provides entrepreneurs multiple specialized resources to increase technological distinctiveness. In this kind of situation, the means to achieve technological distinctiveness are widely available, and therefore would introduce fewer uncertainties. That is, even entrepreneurs with low tolerance of uncertainty can choose competing through technological distinctiveness in favorable locations because this mean would not represent a lot of uncertainties. As a direct consequence, the tolerance of uncertainty have no, or minimal, effects on the technological distinctiveness of a young entrepreneurial firm in favorable locations due to the easiness in accessing specialized resources.

As a sum, it is stated that location moderates the relationship between tolerance of uncertainty and technological distinctiveness in young entrepreneurial firms. In favorable location, entrepreneurs' tolerance of uncertainty does not impact the technology distinctiveness of firms. This is because the development of technological distinctiveness does not represent a lot of uncertainties when access to specialized resources is good. Tolerance of uncertainty, on the contrary, impacts technological distinctiveness of firms in non-favorable locations. That is, firms will not develop high distinctive technology in non-favorable locations if entrepreneurs' tolerance of uncertainty is low because it represents an uncertain act due to poor access to specialized resources. As such, these arguments lead to the following final hypothesis:

Hypothesis 3. The direct effects of tolerance of uncertainty on the technological distinctiveness are moderated by location in young entrepreneurial firms. In unfavorable

locations uncertainty tolerance is positively associated with technological distinctiveness whereas in favorable locations there is no positive association between tolerance of uncertainty and technological distinctiveness.

3. Methodology

3.1 Sample

In the empirical part of the study, the focus is on young entrepreneurial firms. While there is no automatic system that would list such firms, it is widely acknowledged that in Finland they are likely to be customers of the Finnish Funding Agency for Technology and Innovation (TEKES). Thus, in order to identify young entrepreneurial firms with technological focus, we looked at the customer database of TEKES, and constructed a unique longitudinal dataset through that.

Construction of the research database started by receiving a list of firm names and identification codes from TEKES on firms that had received R&D subsidies in 2002, 2004 or 2007. After the firm identification information was received, financial information (sales and the number of employees) was collected through private financial database called Voitto+ which is maintained by Suomen Asiakastieto Oy. Occasionally, missing values were found from the National Patent and Registry Office or from the firms themselves by emailing or by telephone.

The second step in data collection was to conduct surveys, as a part of the longitudinal research project of young innovative firms, in such a way that all firms first received a base survey in year 2007 and then annual follow-up surveys. All surveys were conducted on-line through the Webropol Internet-based research tool. Base surveys and follow-up surveys differ from each other depending on the focus of a particular survey round. New questions were added to later surveys and not all questions have been used in all surveys. While for the purpose of this study we applied only few items, in aggregate there were 182 items across the questions.

Questions can be broadly classified into the following areas: (1) the firm and its products and services; (2) the firm's resources, organisation and competences; (3) strategic goals and growth strategies; (4) internationalization, (5) product features and operating environment; and (6) TEKES services.

For the purposes of this study a sample of 107 young entrepreneurial firms was constructed by restricting analysis to technology based firms that were founded after year 2001 and were dealing with development, manufacture or commercialization of technology. Thus, for example management consultancies or real estate management firms were left outside of the sample. In this way, as the measures we use, represent years 2008, 2009, 2010 and 2011 firms are at the time of measurement between five and ten years old. In our analysis we use 51 firms' data from year 2008, 27 firms' data from year 2009, 17 firms' data from year 2010 and 12 firms' data from year 2011. Average establishment year of a firm in our sample is 2006, and all firms were founded between 2002 and 2010 as follows: 2002 (1%), 2003 (8%), 2004 (14%), 2005 (18%), 2006 (17%), 2007 (20%), 2008 (15%), 2009 (4%), 2010 (3%).

Insert Table 1 about here

3.2 Variables

Operationalization of the dependent variable, *Technological distinctiveness* (TD) is slightly modified version from Yli-Renko et. al (2001) in which the variable was designed based on Wernerfelt (1984) and Conner (1991). The dependent variable of this study is made of three items: "We are known for our technology"; "Our technology is better than competitors' technology"; and "Our competitive advantage is based on our technology". The modification compared to Yli-Renko et al. (2001) in this study is to replace the original item "We invest very heavily in R&D" with the item "We are known for our technology". The dependent variable has

good reliability (Cronbach's alpha of 0.88) and the mean value of 5.32 (see Table 1). Thus, on average firms believe that they are operating with superior technology on which their competitive advantage is based on. As external validation for technological distinctiveness Yli-Renko et. al (2001) studied the relationship between technological distinctiveness and patents as well as between technological distinctiveness and internet visibility in a sample of young entrepreneurial firms. They found surprisingly high positive correlations in both relationships and thus provided external validation for the construct.

The independent variable of *Location* is operationalized through a firm's geographic location. In our model big cities represent favorable context in which different resources are in geographical proximity whereas rural areas and small cities represent somewhat unfavorable contexts that do not have the same benefits as big cities. Principally this approach is similar to what has been suggested by the European Commission (European Commission, 1997) to distinguish between urban and rural communities based on population density and what was applied for example in the study of Lafuente, Vaillant and Serarols (2010) on location decisions of knowledge-based entrepreneurs. Additional feature in our approach is that the cities that we chose to represent favorable contexts also host a major university and have strong industrial base in information technology,, which should be especially important for technology based innovative firms. If a firm is located in one of the five largest cities (Helsinki (incl. suburb areas), Tampere, Turku, Jyväskylä, Oulu) in Finland, value one is attributed and zero otherwise. From 107 sample firms 22 operate outside of five largest cities in Finland while the rest (85) operate within five largest cities.

The second independent variable, *Tolerance of uncertainty* is a new variable. It is measured by using three items: Entrepreneur's preferences towards risk-taking; Need for bold actions; and Pro-activeness. The variable has good reliability (Cronbach's alpha of 0.85) and the mean value

of 5.61 (see Table 1). This reveals that on average sample firm exhibit high tolerance for uncertainty.

In order to control for effects that might otherwise influence the technological level of young firms, firm size, firm age and firm industry were controlled. Firm size is measured as the log of sales level in year that measurement was performed. The firms in the sample are quite small: average sales level in 2008 was k480€ and at maximum k4377€ while average number of employees is 1 and at maximum it is 77. Because opportunities for firms to build businesses around novel technologies is likely to differ across industries (Eckhardt and Shane 2011), industry is controlled by a dummy variable of whether a firm operates in an high technology industry (value 1) or other industries (value 0). As high technology sectors we considered those sectors that belong to high technology manufacturing or knowledge intensive high technology services (defined by Eurostat¹). In the sample 63 firms belong to these high tech industries while the rest were other than high tech. Regarding operating areas, the highest representation were from software design and production (27%), technology development (4%) and biotechnical research (3%).

3.3 Analytical Method

As statistical method hierarchical regression analysis was used. Through the data collection process that continued over few years it was possible to use measures of independent variables that were measured one year before the measurement of the dependent variable. This temporal separation between the measurement of the independent and outcome variables allows one to make inferences about the potential causal relationships between them.

3.4 Common Method Variance

¹ Eurostat indicators on High-tech industry and Knowledge - intensive services:
http://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf

To evaluate the possibility of common method bias the Harman's single-factor test has been suggested. In this test both the measures for independent variables and dependent variables are loaded into an exploratory factor analysis and unrotated factor solution is used to determine the number of factors that are necessary to account for the variance in the variables (Podsakoff, MacKenzie and Podsakoff 2003). Harman's test assumes that if a significant amount of common method variance is present one factor will come out of the factor analysis (or one factor accounts for the majority of the variance among measures).

Loading three items of the dependent variable 'Technological distinctiveness' and three items of the independent variable 'Tolerance of uncertainty' into a factor analysis results in two factors with eigenvalue over one. The result that two factors emerge suggests that common method variance should not be a major problem. One should bear in mind, though, that this procedure does nothing to statistically control for the common method effect; it is merely a diagnostic technique (Podsakoff, et al. 2003: 889). To further analyze this issue a structural equation model was estimated: a new latent variable was introduced in such a way that all manifest variables were related to it, in addition to their theoretically assigned latent variables (technological distinctiveness and risk tolerance). In the model the common method variance was 24%, which was estimated as the square of each path from the new latent variable to manifest variables before standardization. This, together with the fact that in the model lagged versions of predictor variable were used, provide further support that common method bias is not present.

4. Results

The hypotheses were tested using hierarchical regression analysis. First, correlations between variables of the model were analyzed. As table 2 shows no overly high and significant correlations can be found. The highest statistically significant being the correlation between size

and foundation year. In addition to bivariate correlations variance inflation factors were calculated which were between 1.07 and 1.23. Based on these it could be-assumed that multicollinearity is not an issue for-analysis.

Insert Table 2 about here

Table 3 displays the results of regression analysis: Model 1 presents the control model, Model 2 adds the independent variables, and Model 3 adds the interaction term. F-statistics for models two and three suggest that the entire set of variables is a good fit for the data. Moreover, according to Wald-test adding predictor variables of location and uncertainty tolerance to control variable model increases fit significantly ($p < 0.001$) and adding the moderator term over these provides an additional increase in fit ($p < 0.01$). Adjusted r squared statistics reveal that also the explained variance increases as new variables are added to the model. At highest in the Model 3 17% of variance is explained.

Insert Table 3 about here

Regarding control variables, none of them seem to be associated with *Technological distinctiveness* in any of the three models.

All three hypotheses receive empirical support. First, *Tolerance of uncertainty* has statistically significant ($p < 0.01$) positive impact on *Technological distinctiveness* (see Model 2). This observation suggests that the more tolerance an entrepreneur has for uncertainty, the more distinctive the technology of the firm will become. As such, Hypothesis 1 is not rejected.

Second, *Location* has statistically significant ($p < .05$) positive impact on *Technological distinctiveness* (see Model 2). This observation suggests that locating in big cities leads to more distinctive technologies in young entrepreneurial firms. As such, Hypothesis 2 is not rejected.

Third, the interaction term *Location x Tolerance of uncertainty* has statistically significant ($p < .01$) positive impact on *Technological distinctiveness* (see Model 3). In order to confirm this interaction, the interaction effects were plotted. As can be seen from the Figure 1, *Location* moderates the relationship between *Tolerance of uncertainty* and *Technological distinctiveness* such that for firms outside large cities there is a positive linear association between technological distinctiveness and uncertainty tolerance whereas for firms in large cities this relationship does not exist. This observation suggests that the impact of entrepreneurs' tolerance of uncertainty on the technological distinctiveness of the firm depends on the location, i.e. locating outside large cities leads to stronger association between uncertainty tolerance and technological distinctiveness than in the largest cities. As such, Hypothesis 3 is not rejected.

Insert Figure 1 about here

5. Discussion

In this study the objective was to explore the factors that contribute to the technological distinctiveness to understand better the *origins* of technology-based competitive advantages in young entrepreneurial firms. Theorizing efforts in this study lead to propose a model where behavioral and environmental perspectives together explain the technological distinctiveness in young entrepreneurial firms. In this study empirical support were founded for these core ideas. As such the study contributes to the scant literature about the antecedents of technological-based competitive advantages of young entrepreneurial firms. Indeed, prior to this study, the *creation* of resource-based competitive advantages in general has gained little attention (Bowman and Collier 2006; Lockett et al. 2009).

While according to the analysis in this study both tolerance of uncertainty and location are connected independently to the degree of technological distinctiveness, the most interesting result

of this study is related to the fact that the effects of entrepreneurs' orientation (towards uncertainty) on technological distinctiveness of young entrepreneurial firms is conditioned by location. That is, the impact of entrepreneurs' tolerance of uncertainty on the technological distinctiveness of their firms seems to be much stronger in non-favorable locations (i.e. outside big cities) than in resource munificence locations (i.e. big cities). This observation is similar to the existing understanding of the moderating role of environment between risk attitudes and implementation of diverse strategies (Covin and Slevin 1998; Covin, Slevin, and Heeley 1999), and responds to calls to take the context of the firm into account in RBV studies (Kraaijenbrink et al. 2009). Moreover, in entrepreneurship research it has been suggested that it is necessary for our approaches and methodologies to incorporate the role of social context if variations in the nature and extent of entrepreneurship development and the behavioral characteristics of entrepreneurs are to be understood (Welter and Smallbone, 2011). Essentially, our study participates this topical discussion.

5.1 Implications to Theory

The empirical observations of the study can inform theory in important ways. First, this study increases in-depth understanding of the fit between technology-based competitive advantage and behavioral/environmental contingency factors (Fry and Smith 1987), and contributes to the understanding about why and under what conditions young firms choose to compete with technology. Indeed, the empirical observations of the study suggest that individuals, who have a certain degree of tolerance for uncertainty, especially in non-favorable locations, create technology-based competitive advantages. Thus, the behavioral explanation that organizational outcomes are the result of managers' choices (e.g. Andrews 1971; Child 1972), seem to hold explanatory power especially in non-favorable locations. The role of managers' choices in young entrepreneurial firms is, however, less valid in resource munificent locations

according to our key observations. The theoretical contribution of these observations is that the behavioral explanation does not have universal explanatory power, at least not in the studied empirical context. Instead, the managerial choice perspective is conditioned by environmental perspective. Future scholarly work is encouraged to take into account not only the behavioral explanations of why firms behave certain ways, but complement this perspective with external control perspective: It seems that we can best understand firm behavior by investigating the interaction of these two forces.

Second, the key observations of this study can be taken as an indication that technology-based competitive advantages are not built in similar ways in different contexts. In other words, the classical prescriptions of the RBV should be moderated based on the specific context where technology-based competitive advantages are been built. It seems that the antecedents of distinctive resources (i.e. technologies) are not the same in resource munificent and poor locations. This observation is very interesting because it gives us new ideas about how to develop technology-based competitive advantages based on one's location. To this end, this study echoes earlier studies by demonstrating how location influences a firm's decision concerning competitive strategy (e.g. Patterson and Anderson 2003). Indeed, in resource munificent locations entrepreneurs' tolerance for uncertainty contributes little to technology-based competitive advantages among young entrepreneurial firms. Moreover, scholars are encouraged to explore more the origins of technology-based competitive advantages in resource munificent locations.

5.2 Implications to Practice

The empirical observations of this study can inform practice in important ways. RBV has been criticized for lacking any meaningful practitioner prescriptions (Priem and Butler 2001; Bowman and Collier 2006). As a small step towards this direction, this study observations clarify how entrepreneurs can create and adapt their technology resource basis for innovation (e.g.

Keupp et al. 2012), and also give insights how technology resource advantages can be built by entrepreneurs in particular circumstances (e.g. Bowman and Collier 2006). Especially the fact that entrepreneurs operating outside big cities must possess some degree of tolerance for uncertainty, to start with, than their counterparts in big cities ought to be of great interest to entrepreneurs seeking for technology-based competitive advantages. This requirement to possess a certain degree of tolerance for uncertainty may seem to be born out from the fact that available means for developing technology distinctiveness are rare outside big cities. To counterbalance this handicap, and to seek technology-based competitive advantages in relatively poor contexts, entrepreneurs should develop their ability to seek uncertain means for the development of their firms' technological distinctiveness. This is in line with the observation of Block, Sandner and, Spiegel (2015) concerning risk-attitude and creativity. They find namely, that entrepreneurs that are motivated by a high level of creativity are found to be more risk tolerant relative to other entrepreneurs. On the contrary, if an entrepreneur acknowledges his/her low tolerance of uncertainty, he/she should perhaps be located in more favorable environment in order to access a larger pallet of specialized resources, and then use them to build competitive advantages through technological distinctiveness.

5.3 Implications to policy

The role of new firms in technology entrepreneurship policy has recently been under discussion (Tether, 2000; Brown and Mason, 2014). This study provides a couple of interesting additions to discussion. First, the result that resource munificent contexts, that is, large cities with research universities, are associated with technological distinctiveness supports the knowledge spillover theory as discussed previously. From policy viewpoint this would mean that especially in these regions such conditions should be created, maintained and developed which encourage entrepreneurship if one aims to receive firms that compete with technology based competitive

advantages. In this it is implicitly assumed that it is the research sector to which new the technology-based firms are especially associated to. However, as pointed out by Brown and Mason (2014), the most technology based new firms are not associated with university, as opposed to common belief, but are driven by end-user and customer led innovation. Consequently, in creating, maintaining and developing encouraging conditions in munificent areas, not only the research-based firms should be focused but technology based firms more generally. Moreover, according to our results it is possible to compete with technology based competitive advantages also from non-munificent locations if the propensity to bear uncertainty is high. Thus, whereas the emphasis in policy making concerning technology entrepreneurship might need to be in resource munificent locations one should ensure that also those risk-tolerant technology entrepreneurs that operate from non-munificent locations have fair treatment. In practice this could mean for example increasing the awareness of rural technology based entrepreneurs concerning R&D or growth support programs or facilitating their access to research and venturing programs governed by higher-education institutes. And echoing Brown and Mason (2014) it might be that it is exactly the rural technology entrepreneurs for which the fostering of ‘connective capacity’ would be important, as it is likely that high share from rural technology firms are those that derive their technology based advantages from end-user and customer relationships.

5.4 Limitations

While this study contributes to what is known about the factors affecting the technology-based competitive advantages of young entrepreneurial firms, the following limitations may hinder the contribution. When discussing the limitations, advices are offered for scholars interested in this line of inquiry to improve upon it in future studies.

Regarding the choice of the theoretical perspectives, this study adopted behavioral and environmental approaches, which lead one to consider uncertainties and location as key variables. It is acknowledged that focusing only on few explanatory variables might reduce the complexity of the reality too much. While the empirical model of this study has explanatory power only with few key variables, scholars are encouraged to complement the explanation offered in this study with alternative variables related to behavioral and/or environmental perspectives, or adopting completely new perspectives to explain origins of technology-based competitive advantages. For example, instead of looking only at physical location, future scholarly work could complement the model by also looking at level of interaction and networks of local actors (c.f. Presutti, Boari, Majocchi, 2011; Li et al., 2013).

Regarding the operationalization of a resource munificence location, which was measured as a firm being located in one of the five largest cities in Finland, the operationalization is rather rudimentary, rather than a precise measure of favorable or non-favorable location for entrepreneurial activities. This measure was used because it is relatively objective compared to an entrepreneur's perception of the environmental munificence. Future studies are encouraged to verify the key observations of this study using more fine-tuned measures to operationalize resource munificence and non-favorable locations. In similar fashion, technological distinctiveness was measured by referring to technology in general (e.g. "we are known for our technology"). It would be interesting to explore whether a more nuanced picture of technological distinctiveness could lead more fine-grained results. Echoing Smith and Sharif (2007), future studies could separate more traditional "hard" investments in technologies (e.g. R&D investments) from more "soft" technological investments (e.g. humanware, technoware, etc.).

While entrepreneurial behavior was conceptualized using only one construct (i.e. tolerance of uncertainty), interesting empirical evidence was found about its significance for building

technology-based competitive advantages in young entrepreneurial firms. Further studies could enlarge the pallet of potential behavioral concepts, such as Entrepreneurial Orientation, and investigate their relationship with the degree of technological distinctiveness.

Regarding the sampling strategy of this study, the database of TEKES was used purposefully. While the TEKES database does not represent all the potential entrepreneurial firms in Finland, it is nevertheless the best source of such young firms in Finland. Future studies are encouraged to use complementary sampling strategies to confirm ~~our~~ observations of the study, and to generalize them beyond the Finnish startups and entrepreneurial firms.

As Markman and his colleagues (2001) emphasized, firm performance is not so much based on technological breakthroughs or getting technology to market, but on succeeding in the competitive market place. This study did not, however, shed light on any performance implications of building technological distinctiveness. For example, while a recent study seems to indicate that greater technological distinctiveness (i.e. R&D novelty) seems to impact innovative outputs but not sales growth among more established firms (Wang et al., 2014). Brown and Mason (2014) point out based on their qualitative case studies that today many high-tech firms build competitive advantages based on open innovation sources, rather than develop them internally. So, do young entrepreneurial firms have better performance because of more distinctive technology compared to leveraging open innovation sources? Moreover, does technological distinctiveness lead to innovativeness and/or differentiation, and is this mean better than other means to achieve these ends (e.g. design)? Do young entrepreneurial firms perform better when the technological distinctiveness is high as a result of necessity or managerial choice? Future scholarly work could focus on these issues to investigate the importance of the development of technological distinctiveness in young entrepreneurial firms.

5.5 Conclusion

This study provides theoretical arguments and empirical support for the antecedents of technological distinctiveness in young entrepreneurial firms. Indeed, tolerance of uncertainty, location, and their interaction seem to be important antecedents of technological distinctiveness. These findings can inform our collective understanding of the factors affecting the technology-based competitive advantages of young entrepreneurial firms. At the very least, this study hopes to have added richness to the ongoing discussion regarding the importance of technology as a source of competitive advantage in the context of young entrepreneurial firms.

References

- Acedo, F. J., C. Barroso, and J. L. Galan (2006). "The Resource-Based Theory: Dissemination and Main Trends," *Strategic Management Journal* 27, 621-636.
- Acs, Z. D., and P. Feldman (1994). "R&D Spillovers and Recipient Firm Size," *Review of Economics and Statistics* 76, 336-340.
- Andrews, K. R. (1971). *The Concept of Corporate Strategy*. Homewood, IL: Dow Jones Irwin.
- Armstrong, C. E., and K. Shimizu (2007). "A Review of Approaches to Empirical Research on the Resource-Based View of the Firm," *Journal of Management* 33, 959-986.
- Arundel, A., and A. Geuna (2004). "Proximity and the Use of Public Science by Innovative European Firms," *Economics of Innovation and New Technology* 13, 559-580.
- Barney, J. (1991). "Firm Resources and Sustained Competitive Advantage," *Journal of Management* 17(1), 99-120.
- Block, J., P. Sandner, and F. Spiegel (2015). "How Do Risk-Attitudes Differ between Within a Group of Entrepreneurs? The Role of Motivation and Procedural Utility," *Journal of Small Business Management* 53(1), 183-206.
- Brown, R., and C. Mason (2014). Inside the High-Tech Black Box: A Critique of Technology Entrepreneurship Policy," *Technovation*, 34(12), 773-784.
- Cantillon, R. (1931). *Essai sur la nature du commerce en general*. London, MacMillan.
- Carroll, G. R. (1985). "Concentration and Specialization: Dynamics of Niche within in Populations of Organizations," *American Journal of Sociology* 90(6), 1262-1283.
- Chattarjee, S., and B. Wernerfelt (1991). "The Link Between Resources and Type of Diversification: Theory and Evidence," *Strategic Management Journal* 12, 33-48.
- Child, J. (1972). "Organizational Structure, Environment and Performance: The Role of Strategic Choice," *Sociology* 6, 1-22.
- Conner K.R. (1991). "A Historical Comparison of Resource Based Theory and Five Schools of Thought Within Industrial Organization Economics: Do We Have a New Theory of the Firm?," *Journal of Management* 17, 121-154
- Covin, J. G., and D. P. Slevin (1998). "Adherence to Plans, Risk Taking and Environment as Predictors of Firm Growth," *The Journal of High Technology Management Research* 9(2), 207-237.
- Covin, J. G., D. P. Slevin, and M. B. Heeley (1999). "Pioneers and Followers: Competitive Tactics, Environment and Firm Growth," *Journal of Business Venturing* 15, 175-210.
- Davidsson, P. (1991). "Continued Entrepreneurship: Ability, Need, and Opportunity as Determinants of Small Firm Growth," *Journal of Business Venturing* 6(6), 405-429.
- Deeds, D. L., D. DeCarolis, and J. Coombs (2000). "Dynamic Capabilities and New Product Development in High Technology Ventures: An Empirical Analysis of New Biotechnology Firms," *Journal of Business venturing* 15 (3), 211-229.
- Dyer, J. H., and H. Singh (1998). "The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage," *Academy of Management Review* 23(4), 660-679.
- Eckhardt, J. T., and S. A. Shane (2011). "Industry Changes in Technology and Complementary Assets and the Creation of High-growth Firms," *Journal of Business Venturing* 26, 412-430.
- European Commission (1997). *Agenda 2000, for a stronger and wider Union*. Bulletin of the European Union, Supplement 5/97.
- Fry, L.W. and D. A. Smith (1987). "Congruence, contingency and theory building," *Academy of Management Review* 12(1),117-132.

- Gabrielsson, M., V. H. Kirpalani, P. Dimitratos, C. A. Solberg, and A. Zucchella (2008). "Born Globals: Propositions to Advance the Theory," *International Business Review* 17(4), 385–401.
- Galbraith, C. S., C. I. Rodriguez, and A. F. DeNoble (2008). "SME Competitive Strategy and Location Behavior: An Exploratory Study of High-technology Manufacturing," *Journal of Small Business Management* 46(2), 183-202.
- Grant, R.M. (1996). "Towards a Knowledge-Based Theory of the Firm," *Strategic Management Journal* 17, 109-122.
- Grimpe, C. & U. Kaiser (2010). "Balancing Internal and External Knowledge Acquisition: The Gains and Pains from R&D Outsourcing," *Journal of Management Studies* 47(8), 1483-1509.
- Hall, J., V. Bachor, and S. Matos (2014). "The Impact of Stakeholder Heterogeneity on Risk Perceptions in Technological Innovation," *Technovation* 34, 410-419.
- Haeussler, C., H. Patzelt, and S. A. Zahra (2012). "Strategic Alliances and Product Development in High-Technology New Firms: The Moderating Effect of Technological Capabilities," *Journal of Business Venturing* 27(2), 217-233.
- Heene, A., and R. Sanchez (1997). *Competence-based strategic management*. New York: John Wiley & Sons Ltd.
- Hrebiniak, L.G., and W. F. Joyce (1985). "Organizational Adaptation: Strategic Choice and Environmental Determinism," *Administrative Science Quarterly* 30(3), 336-349.
- Ilievbar, I.M., D. Probert, and R. Phaal (2014). "Towards Risk-Aware Roadmapping: Influencing Factors and Practical Measures," *Technovation* 34, 399-409.
- Kapoor, R., and N.R. Furr (2015). "Complementarities and Competition: Unpacking the Drivers of Entrants' Technology Choices in the Solar Photovoltaic Industry," *Strategic Management Journal* 36(3), 416-436.
- Keeble, D. (1997). "Small Firms, Innovation and Regional Development in Britain in the 1990s," *Regional Studies* 31(3), 281-293.
- Kelm, K. M., V. K. Narayanan, and G. E. Pinches (1995). "Shareholder Value Creation During R&D Innovation and Commercialization Stages," *Academy of Management Journal* 38(3), 770-786.
- Keupp, M. M., M. Palmié, and O. Gassmann (2012). "The Strategic Management of Innovation: A Systematic Review and Paths for Future Research," *International Journal of Management Reviews* 14(4), 367-390.
- Khilstrom, R., and J. Laffont (1979). "A General Equilibrium Entrepreneurial Theory of Firm Formation based on Risk Aversion," *Journal of Political Economy* 87, 719-748.
- Knight, F. H. (1921). *Risk, Uncertainty, and Profit*. Hart, Schaffner & Marx: Boston: Houghton Mifflin Company, The Riverside Press, Cambridge.
- Kraaijenbrink, J., J. C. Spender, & A. Groen (2009). "The Resource-Based View: A Review and Assessment of Its Critiques," *Journal of Management* 36(1), 349-372.
- Lafuente, E., Vaillant, Y., Serarols, C. (2010). "Location Decisions of Knowledge-Based Entrepreneurs: Why Some Catalan KISAs Choose to be Rural?," *Technovation* 30, 11–12.
- Lawrence, P., and J. Lorsch (1967). "Differentiation and Integration in Complex Organizations," *Administrative Science Quarterly* 12(1), 1-47.
- Li, H., and K. Atuahene-Gima (2001). "Product Innovation Strategy and the Performance of New Technology Ventures in China," *Academy of Management Journal* 44(6), 1123-1134.

- Li, Y-R, and Y. Chen (2009). "Opportunity, Embeddedness, Endogenous Resources, and Performance of Technology Ventures in Taiwan's Incubator Centers," *Technovation* 29, 35-44.
- Li, W., R. Veliyath, and J. Tan (2013). "Network Characteristics and Firm Performance: An Examination of the Relationships in the Context of a Cluster," *Journal of Small Business Management* 51(1), 1-22.
- Lim, J-H, T.C. Stratopoulos, & T.S. Wirjanto (2011). "Path Dependence of Dynamic Information Technology Capability: An Empirical Investigation," *Journal of Management Information Systems* 28(3), 45-84.
- Lipshitz, R., and O. Strauss (1997). "Coping with Uncertainty: A Naturalistic Decision-making Analysis," *Organizational Behavior and Human Decision Processes* 69, 149-163.
- Lockett, A., S. Thompson, & U. Morgenstern (2009). "The Development of the Resource-Based View of the Firm: A Critical Appraisal," *International Journal of Management Reviews*, 11, 9-28.
- Manjon, J. V., and M. E. Romero-Merino (2012). "Research, Development, and Firm Growth. Empirical Evidence from European Top R&D Spending Firms," *Research Policy* 41(6), 1084-1092.
- March, J. G. (1991). "Exploration and Exploitation in Organizational Learning," *Organization Science* 2(1), 71-87.
- March, J. G., and Z. Shapira (1987). "Managerial Perspectives on Risk and Risk Taking," *Management Science* 33(11), 1404-1418.
- Markman, G. D., D. B. Baldin, and L. Schjoedt (2001). "Governing the Innovation Process in Entrepreneurial Firms," *The Journal of High Technology Management Research* 12(2), 273-293.
- McCann, J. E. (1991). "Patterns of Growth, Competitive Technology, and Financial Strategies in Young Ventures," *Journal of Business Venturing* 6(3), 189-208.
- McMullen, J., and D. Shepherd (2006). "Entrepreneurial Action and the Role of Uncertainty in the Theory of the Entrepreneur," *Academy of Management Review* 31(1), 132-152.
- Newbert, S. L. (2007). "Empirical Research on the Resource-Based View of the Firm: An Assessment and Suggestions for Future Research," *Strategic Management Journal* 28, 121-146.
- North, D., and D. Smallbone (1995). "The Employment Generation Potential of Mature SMEs in Different Geographical Environments," *Urban Studies* 32(9), 1517-1534.
- Patterson, H., and Anderson, D. (2003). "What Is Really Different about Rural and Urban Firms? Some Evidence from Northern Ireland," *Journal of Rural Studies* 19(4), 477-490.
- Penrose, E. (1959). *The Theory of the Growth of the Firm.*, 1st edition, Oxford, Oxford University Press.
- Persutti, M., C. Boari, and A. Majocchi (2011). "The Importance of Proximity for the Start-Ups' Knowledge Acquisition and Exploitation," *Journal of Small Business Management* 49(3), 361-389.
- Podsakoff, P., S. MacKenzie, J. Lee, and N. Podsakoff (2003). "Common Method Variance in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* 88, 879-903
- Porter, M. E. (1998). *Competitive Advantage –Creating and Sustaining Superior Performance.* New York, NY: The Free Press.
- Porter, M. E. (2007). "Technology and Competitive Advantage," in *Competitive Advantage: Creating and Sustaining Superior Performance*, Ed. M. E. Porter. The Free Press.

- Powell, T. C. (1992). "Total Quality Management as Competitive Advantage: A Review and Empirical Study," *Strategic Management Journal* 16, 15-37.
- Priem, R., J. Butler (2001). "Is the Resource-Based 'View' a Useful Perspective for Strategic Management Research?," *Academy of Management Review* 26, 22-40.
- Rannikko, H. (2012). *Early Development of New Technology-based Firms*, Ph.D. dissertation, Hanken School of Economics, Nr 240.
- Saemundsson, R.J., & M. Candi (2014). "Antecedents of Innovation Strategies in New Technology-Based Firms: Interactions Between the Environment and Founder Team Composition," *Journal of Product Innovation Management* 31(5), 939-955.
- Saxenian, A. (1994). *A regional advantage: Culture and competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.
- Schumann, P. A., D. C. L. Prestwood, H. A. Tong, and J. H. Vanston (1994). *Innovate: Straight path to quality and competitive advantage*, New York, Mc Graw-Hill.
- Schumpeter, J. A. (1934). "The Theory of Economic Development, An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle," trans. R. Opie, Cambridge, Mass: Harvard University Press, pp. 65-94.
- Scott, W. R. (1981). *Organizations: Rational, natural and open systems*. Englewood Cliffs NJ, Prentice Hall Inc.
- Smith, R., and N. Sharif (2007). "Understanding and Acquiring Technology Assets," *Technovation* 27 (11), 643-649.
- Sullivan, D. M., and M. R. Marvel (2011). "Knowledge Acquisition, Network Reliance, and Early-Stage Technology Venture Outcomes," *Journal of Management* 48(6), 1169-1193.
- Teece, D., and G. Pisano (1994). *The dynamic capabilities of firms: An introduction*. Working paper-94-103, International Institute for Applied Systems Analysis.
- Tether, B. (2000). "Small Firms, Innovation and Employment Creation in Britain and Europe: A Question of Expectations," *Technovation* 20, 109-113.
- Thompson, J. D. (1967). *Organizations in action*. New York, McGraw-Hill.
- Toh, P.K, and T. Kim (2013). "Why Put All Eggs in One Basket: A Competition-Based View of How Technological Uncertainty Affects a Firm's Technological Sophistication," *Organization Science* 24(4), 1214-1236.
- Vaessen, P., and D. Keeble (1995). "Growth-Oriented SMEs in Unfavourable Regional Environments." *Regional Studies* 29(6), 489-505.
- Voudouris, I., S. Lioukas, M. Iatrelli, & Y. Caloghirou (2012). "Effectiveness of Technology Investment: Impact of Internal Technological Capability, Networking and Investment's Strategic Importance," *Technovation* 32(6), 400-414.
- Wang, F., J. Chen, Y. Wang, and L. Ning (2014). "The Effect of R&D Novelty and Openness Decisions on Firms' Catch-Up Performance: Empirical Evidence from China," *Technovation* 34(1), 21-30.
- Welter, F., D. Smallbone (2011). "Institutional Perspectives on Entrepreneurial Behavior in Challenging Environments," *Journal of Small Business Management* 49(1), 107-125.
- Wernerfelt, B. (1984). "A Resource-Based View of the Firm," *Strategic Management Journal* 5(2), 171-180.
- Yli-Renko, H. (1999). *Dependence, Social Capital, and Learning in Key Customer Relationships: Effects on the Performance of the Technology Based New Firms*, Ph.D. dissertation, Helsinki University of Technology, Industrial Management and Business Management Series, No. 5.

- Yli-Renko, H., E. Autio, and H. J. Sapienza (2001). "Social Capital, Knowledge Acquisition, and Knowledge Exploitation in Young Technology-based Firms," *Strategic Management Journal* 22, 587-613.
- Zahra, S. A. (1996). "Technology Strategy and Financial Performance: Examining the Moderating Role of the Firm's Competitive Environment," *Journal of Business venturing* 11(3), 189-219.
- Zahra, S. A., and W. C. Bogner (1999). "Technology Strategy and Software Ventures' Performance: Exploring the Moderating Effect of the Competitive Environment," *Journal of Business Venturing* 15, 135-173.

Table 1: Descriptive statistics.

	N	Mean	Min	Max
Technological distinctiveness	107	5.32	1	7
Firm age (year founded)	107	2006	2002	2010
Firm size (employees in 2010)	60	10	1	77
Firm size (sales level in 2008)	93	480	0	t4377€
Industry (dummy, high tech=1)	107	0.58	0	1
Context (dummy, big city=1)	107	0.79	0	1
Tolerance of uncertainty	107	5.61	1.66	7

Table 2: Correlation table.

	1	2	3	4	5	6
1. Technological distinctiveness	1					
2. Firm age (year founded)	0.00	1				
3. Firm size (sales level in 2008)	-0.06	-0.36 ***	1			
4. Industry (dummy, high tech=1)	0.09	0.12	0.06	1		
5. Context (dummy, big city=1)	0.23 *	0.20 *	-0.05	0.18	1	
6. Tolerance of uncertainty	0.30 **	0.16	-0.18	-0.06	0.13	1

Table 3: Regression table.

	Model 1		Model 2		Model 3	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Firm age (foundation year)	-0.03	.07	-.08	.07	-.04	.06
Size (log of sales level)	-0.06	.07	-.03	.07	-.03	.06
Firm industry (high tech= 1)	0.28	.25	.26	.24	.11	.24
Location (big city = 1)			.61*	.30	4.14**	1.27
Tolerance of uncertainty			.32**	.10	.79***	.19
Location * Tolerance of uncertainty					-.65**	.22
Constant	68.62	149.60	168.96	143.14	99.94	140.48
R-sq	0.02		0.15		0.22	
Adj. R-sq	-0.01		0.11		0.17	
F value	0.59		3.57		4.53	
Prob>F	0.625		0.005		0.000	
Number of observations	107		107		107	

***p=0,001 ** p=0,01, * p=0,05 (two-tailed)