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# Characteristics of Innovative Entrepreneurs: An Analysis at the Level of the Individual, the Firm, and the Business Environment

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Innovative entrepreneurship has been a subject of significant discursive research. Much of this research, however, is quite disparate and tends to scrutinize narrow aspects of entrepreneurial firms. This paper conducts a broad literature review to derive the overall conclusions in the study of entrepreneurial research. These areas include the psychological characteristics of innovative entrepreneurs, the organizational characteristics of innovative entrepreneurial firms, and the characteristics of a business environment conducive to innovative entrepreneurship. Individual entrepreneurs have high levels of need achievement and a great propensity for risk-taking. Innovative ventures tend to have an organic organizational structure, which are often spin-offs from larger companies. Finally, high spending in research and development, access to business services and a skilled labor force, and a collaborative culture foster innovative entrepreneurial economic sectors. This research enables policymakers and practitioners to determine the best ways to facilitate and cultivate entrepreneurial business environments. Future research should examine the influence of environmental factors on entrepreneurship and innovation.

## **Introduction**

There is currently widespread agreement among economists from a variety of different schools of thought that innovation is extremely important to the economic growth of developed nations. It is believed to account for between 64% and 72% of the total growth in the gross domestic product of these countries (Cooke, Uranga, and Etxebarria 1998, p.1564). How best to stimulate innovation is therefore an important question for policy makers in developed countries.

Much of the literature on innovation has focused on the effects of firm size on the amount of innovation a firm can generate. There is some evidence suggesting larger firms will generally focus more on research and development than smaller firms, but it is undeniable some of the most significant innovations in recent years have come from small entrepreneurial firms (Pepall, Richards, and Norman 2008, pp. 585- 587). One example is the small firm Genentech, which helped create the field of recombinant DNA (Pepall et al

2008, p. 586). Other examples are the extremely successful websites of e-Bay and Amazon (Pepall et al. 2008, p. 586). More rigorous evidence of this trend is provided by the work of van Praag and Versloot (2007). They conduct a literature review of 57 separate studies relating to the various benefits of entrepreneurship (van Praag and Versloot 2008, p. 355). Their conclusion is larger firms typically generate more innovation overall but smaller firms tend to generate higher quality innovations (van Praag and Versloot 2007, p. 377). Quality is defined as the number of times a given patent is cited (van Praag and Versloot 2007,

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p. 377). There is also some evidence larger firms innovate more in absolute terms but smaller entrepreneurial firms innovate more on a per employee basis (van Praag and Versloot 2007, p. 337).

This trend has led to the theory that smaller entrepreneurial firms will often provide initial major technological breakthroughs which larger firms then build upon (Pepall et al. 2008, p. 586). It is also true larger firms may be less willing to generate new innovation since doing so might harm their existing product lines (Pepall et al. 2008, p. 586). So, small entrepreneurial firms do seem to play an important role in the innovation process.

Intuitively, then, it would seem increasing entrepreneurship would lead to an increase in the level of innovation in a given society. Unfortunately, the reality is somewhat more complex. Specifically, if an entrepreneur is defined as any new entrant in a market, then not all of the entrepreneurial firms will generate new innovation (van Praag and Versloot 2007, pp. 353- 354). The reason for this is there are essentially two different types of entrepreneurship. The first is Schumpeter's conception of entrepreneurship as a process through which the means of production in a given society are combined in newer and more efficient ways (1961, p. 74). Under Schumpeter's theory, all entrepreneurs necessarily generate innovation (Schumpeter 1961, p. 89). Schumpeter (2003) would later call this process of continuous innovation "creative destruction", as older methods and ideas inexorably gave way to newer ones (p. 83).

However, Kirzner (2009) points out many entrepreneurs are driven not by a desire to innovate but by the potential to make a profit from previously unrecognized price differentials (p. 147). Examples of this could include someone realizing they could use an existing but relatively unknown process to produce a given good at a price below the existing market price or someone buying goods to be sold at a higher price in the future (Kirzner 2009, pp. 147-148). This second class of entrepreneurs does not produce technological innovation as such.

Therefore, since not all those opening new businesses will be innovative, merely encouraging the formation of new businesses for its own sake is not an effective way to promote innovation. Malizia and Feser (2005) argue economic development strategies for new businesses in general should be very different from entrepreneurial business development strategies geared towards innovative entrepreneurs (pp. 202- 204). In addition, Johnson (1990) criticizes some of the research on entrepreneurship for treating all entrepreneurs and entrepreneurial firms as if they are exactly the same (p. 48). The goal of this paper is to review relevant literature in order to determine what factors specifically drive the formation of small businesses that will produce innovation so in the future research and policies can focus on encouraging innovation and economic growth. This is an issue which most existing theories of entrepreneurship do not properly address (Malizia and Feser 2005, p. 212).

This paper's analysis is divided into three broad categories: psychological characteristics of individual innovative entrepreneurs, specific organizational characteristics of new innovative firms, and characteristics of the broader business environment in which innovative new firms could be expected to develop. These categories are consistent with Johnson's argument that entrepreneurship should in the future be analyzed at the levels of the individual, the firm, and the external environment of the firm (1990, p. 48).

This analysis has several practical implications for policy-makers. The analysis of to what extent individual psychological factors motivate innovative entrepreneurs will give policy-makers a better sense of how much effect government policies could have on the level of entrepreneurship in a region. The analysis at the level of the firm will allow policy-makers to better identify and target firms which are more entrepreneurial. The analysis of the environment the firm exists in will help them determine which specific investments they should make to promote a business environment conducive to entrepreneurship.

## **Psychological Characteristics of Innovative Entrepreneurs**

Understanding the extent to which individual psychological traits motivate innovative entrepreneurs is an important topic. First, understanding this subject creates a fuller picture of the nature of entrepreneurship. Second, this knowledge will allow policy makers to determine whether to focus on policies specifically designed to boost the level of innovative entrepreneurship in a given society. If innovative entrepreneurship is purely a function of the psychological characteristics of members of a society, then government policy should not be expected to significantly increase or decrease it. Determining the extent to which individual psychology influences innovative entrepreneurship is an endeavor with significant practical and academic implications.

Schumpeter was the first person to propose that the chief determinant of innovative entrepreneurship was individual psychology. Schumpeter (1961) argued that after an entrepreneur successfully developed a new innovation other businesses would quickly imitate it (p. 131). This would inevitably reduce the profits of the initial entrepreneur back to what they were before the innovation (Schumpeter 1961, p. 132). Schumpeter points out entrepreneurs were often in a precarious financial situation and could expect social backlash from introducing new ideas (1961, pp. 89-90). For these reasons, entrepreneurs in Schumpeter's theory were unlikely to be motivated solely by the economically rational pursuit of profit (1961, p. 92). Instead, Schumpeter argued entrepreneurs were driven mainly by a desire to create new ideas and show they were superior to others (1961, pp. 93-94).

Some more evidence on the relationship between entrepreneurship and the desire for achievement is provided by the work of McClelland (1965). He explores the effect a high level of need achievement has on an individual's decision to pursue an entrepreneurial occupation (McClelland 1965, pp. 389- 390). Need achievement is defined as the desire to meet an internal standard of accomplishment (Coon 2009, p. 380). McClelland (1965) explores this relationship by conducting a longitudinal study in which he first measures the need achievement of 55 college students at Wesleyan University in 1947 (p. 390). He then examines the occupation each of these students was in 14 years later (1965, p. 390). McClelland (1965) uses this method to eliminate the possibility of reverse causality resulting from being in an entrepreneurial position increasing an individual's need achievement (p. 390). He finds 83% of students with a high need achievement level were in entrepreneurial occupations (McClelland 1965, p. 391). In contrast, 79% of students with a low need achievement level were in non-entrepreneurial occupations (McClelland 1965, p. 391). There are, however, some potential issues with these results. The first is the sample might be unrepresentative of the population as a whole since all students in the sample attended the same university (McClelland 1965, p. 390). The second is McClelland (1965) defines an entrepreneurial occupation as any occupation that entails a high level of individual responsibility, a relatively large amount of risk, and some form of objective feedback on job performance (1965, p. 390). As a result, this category includes a large number of careers which would not involve actually starting a new company. In addition, McClelland (1965) does not distinguish between innovative entrepreneurship and other forms of entrepreneurship. Intuitively, one would assume innovative entrepreneurs were more motivated by need achievement than other entrepreneurs. This intuition is elaborated on more fully below. While this article supports the view that innovative entrepreneurs are influenced to a significant degree by psychological factors, its conclusions should be viewed with some doubt.

Since McClelland's (1965) work, a great deal more research has been done on the effect need achievement has on entrepreneurship (Johnson 1990, p. 39). This research is summarized in the work of Johnson (1990), who reviews a total of 23 studies on the subject (p. 47). Johnson (1990) first points out there is very little statistical correlation between the different measures of need achievement used in the research (p. 41). This indicates either many of the measures are inaccurate or this is a result of uncertainty over whether need achievement is a conscious or unconscious motivator (Johnson 1990, p. 41). Either way, this issue casts some doubt on the validity of much of the research exploring the link between need achievement and entrepreneurship (Johnson 1990, p. 41). Johnson (1990) also points out definitions of

entrepreneurship have varied greatly from one study to the next, which casts further doubt on any broad conclusions drawn from the research (p. 48). Despite this lack of consistency, Johnson (1990) finds that in 20 out of the 23 studies he reviews there is found to be some sort of positive relationship between the measure of need achievement and the measure of entrepreneurship used in the study (p. 47). This leads Johnson (1990) to state there is most likely a relationship between need achievement and entrepreneurship (p. 50). However, he does caution this is impossible to definitively conclude due to the issues surrounding the methodology of the existing empirical research (Johnson 1990, p. 50). Significantly for this paper, one of the studies Johnson (1990) cites found entrepreneurs who founded rapidly growing high-tech companies had significantly higher levels of need achievement than non-entrepreneurs and entrepreneurs who had founded companies with a smaller degree of growth (p. 45). The sample used in this case consisted of 134 high-tech company owners and managers (Johnson 1990, p. 45). This result appears to confirm the intuition innovative entrepreneurs would have higher levels of need achievement than other entrepreneurs.

More recent research into the psychology of entrepreneurs is provided by the work of Schindehutte, Morris, and Allen (2006). Schindehutte et al. (2006) are interested in determining how entrepreneurs respond to challenging events they encounter while running their business (pp. 355- 356). To explore this topic, they conduct interviews with 140 entrepreneurs from the United States (Schindehutte et al. 2006, p. 357). Crucially, 70 of these entrepreneurs were from innovative firms seeking to achieve a high level of growth while the other 70 were from less innovative firms with a lower level of growth (Schindehutte et al. 2006, pp. 356- 357). The interviews themselves consisted of both qualitative and quantitative questions (Schindehutte et al. 2006, p. 356). The quantitative questions consisted of statements to which respondents could give one of five responses ranging from strong agreement to strong disagreement (Schindehutte et al. 2006, p. 356). Schindehutte et al. (2006) find entrepreneurs in general tend to experience very positive emotions when successfully dealing with a challenging situation, and these positive emotions are often what helps to motivate entrepreneurs (pp. 364- 365). They also find entrepreneurs involved in innovative companies with a high level of growth tend to experience even more of these strong positive emotions (Schindehutte et al. 2006, p. 363). This adds further support to the view that psychological factors have a significant influence on innovative entrepreneurs.

The work of Stewart, Watson, Carland, and Carland (1999) provides some research on more general personality differences between innovative entrepreneurs, regular entrepreneurs, and non-entrepreneurs. The authors' goal is to compare the personalities of entrepreneurs with those of non-entrepreneurial corporate managers to better determine the psychological traits that characterize entrepreneurs (Stewart et al. 1999, pp. 190- 191). The three specific personality traits on which Stewart et al. (1999) compare entrepreneurs and corporate managers are achievement motivation, the degree to which an individual is willing to take risks, and an individual's preference for innovation (p. 192). Achievement motivation is essentially equivalent to need achievement (Stewart et al. 1999, p. 192). Stewart et al. (1999) focus on these three traits because they are the ones most commonly associated with entrepreneurs in the literature (p. 192). The initial data set Stewart et al. (1999) used for their research consisted of survey data from 767 individuals in the United States (p. 199). These individuals were first divided into non-entrepreneurial corporate managers and those who owned their own business (Stewart et al. 1999, p. 200). 342 individuals were assigned to the former category and 428 individuals to the latter (Stewart et al. 1999, p. 200). Individuals who had provided too little information to be assigned to a category were excluded from the analysis (Stewart et al. 1999, p. 200). Stewart et al. (1999) next took the 428 business owners and further classified them as either entrepreneurs or small business owners (p. 200). There were 101 individuals assigned to the former category and 324 individuals assigned to the latter, with three individuals being excluded from the analysis due to a lack of information (Stewart et al. 1999, p. 200). The authors' categories of entrepreneurs and small business owners correspond well to the respective classifications of innovative and non-innovative entrepreneurs, especially since the authors conclude entrepreneurs have a significantly higher preference for innovation than small business owners (Stewart et al. 1999, pp.

191 & 203). The authors also find entrepreneurs tend to have higher achievement motivation and a higher propensity for risk than both non-entrepreneurial corporate managers and small business owners (1999, pp. 202- 203).

These results are supported by Kreiser et al. (2002), who claim two of the three characteristics which should be used to evaluate how entrepreneurial an individual is are how risk averse they are and how innovative they are (pp. 74-8). Kreiser et al. (2002) run a confirmatory factor analysis on a data set consisting of the survey responses of 1,067 owners or CEO's of small to medium sized firms in Australia, Finland, Mexico, the Netherlands, Norway, and Sweden (pp. 81-82). This analysis supports their view that someone's entrepreneurial orientation is best evaluated along the three dimensions they specify (Kreiser et al. 2002, pp. 85-86). Kreiser et al. (2002) ask eight questions in their survey, all of them relating to either how much the company is focused on innovation (both in terms of products and in how the company operates), how proactively the company engages competitors, or how comfortable the company is with risk (p. 94). These questions are used fairly commonly in the literature on entrepreneurial innovation (Kreiser et al., 2002, p. 83). There is therefore solid evidence that entrepreneurial individuals have a higher preference for innovation and tolerance of risk than others.

There is a good deal of evidence suggesting certain psychological traits influence an individual's decision to become an innovative entrepreneur. These traits and the literature on them are summarized below in Table 1.

**Table 1. Summary of Psychological Traits of Innovative Entrepreneurs**

<b>Psychological Trait</b>	<b>Empirical Evidence</b>	<b>Relevant Literature</b>
Preference for innovation	Survey data from a variety of countries indicates entrepreneurial individuals tend to be extremely innovative.	Schumpeter (1961); Stewart, Watson, Carland, and Carland (1999); Kreiser, Marino, and Weaver (2002)
Need Achievement	Despite some measurement and definitional issues, vast majority of studies find evidence of positive relationship between need achievement and entrepreneurship	McClelland (1965); Johnson (1990); Stewart, Watson, Carland, and Carland (1999)
Positive Emotional Response to Successfully Handling Challenging Situation	Schindehutte et al. (2006) find this is significantly higher for entrepreneurs than non-entrepreneurs	Schindehutte, Morris, and Allen (2006)
Higher Propensity for Risk	Survey data from a variety of countries indicates entrepreneurs tend to be less risk averse than non-entrepreneurs.	Stewart, Watson, Carland, and Carland (1999); Kreiser, Marino, and Weaver (2002)

While the methodology behind some of the earlier research on the subject is not overly rigorous, it does seem likely that innovative entrepreneurs tend to have higher levels of need achievement and a higher propensity for risk-taking. This does not, however, imply psychological factors are the only determinants of innovative entrepreneurship. Schindehutte et al. (2006) point out innovative entrepreneurship arises from a mixture of rational decision-making and emotional elements (p. 365). This rational decision-making would presumably be affected by external factors. This is supported by Johnson (1990), who explicitly states any analysis of entrepreneurship should consider both psychological factors and external factors such as the business environment surrounding an entrepreneurial venture (p. 48). While psychological factors do seem to have a significant amount of influence over innovative entrepreneurship, they are not its sole determinants. This is important because it implies there is significant scope for policy-makers to have an impact on the level of entrepreneurship in a given region. While individuals may wish to become entrepreneurs due to certain innate psychological characteristics,

they will only act on this desire and found a company if policies that promote entrepreneurship are in place. To gain further insight into innovative entrepreneurship, external characteristics such as common characteristics among entrepreneurial firms must also be considered.

### **Characteristics of Innovative New Firms**

The work of Carland, Hoy, Boulton, and Carland (1984) argues entrepreneurial firms tend to be qualitatively different entities than non-entrepreneurial small firms (p. 357). If entrepreneurial firms are distinct from other small businesses, then it is logical to assume they should have certain unique characteristics. An understanding of these characteristics could be used to more effectively formulate policies that stimulate innovation by helping to identify and support innovative new firms. It would also allow academic researchers to better distinguish between entrepreneurial and non-entrepreneurial small firms, thereby improving the quality of empirical research relating to entrepreneurship (Carland et al. 1984, p. 357). An in-depth examination of these characteristics is an important undertaking.

Evidence on some of the basic characteristics of innovative entrepreneurs comes from the work of Glancey (1998). Glancey (1998) examines the factors that determine the growth and profitability of small Scottish manufacturing firms (p. 18). Glancey (1998) first points out some entrepreneurs tend to be focused on aggressively expanding their business while others are content to just let their business remain at a certain size (p. 19). This corresponds roughly to the distinction Malizia and Feser (2005) make between entrepreneurs and small businesses (pp. 202-204). Glancey (1998) pays special attention to the effects this distinction has on the characteristics of firms (pp. 19-20) He argues some of the existing research on the characteristics of entrepreneurial firms could have been improved by taking this difference into consideration (Glancey 1998, pp. 19- 20). His data set consists of firm level data for 38 individual small firms (Glancey 1998, p. 22). The relatively small sample size is the result of lenient financial reporting standards for small Scottish firms (Glancey 1998, p. 22). He finds strong statistical evidence that quickly growing firms tend to be younger than other small firms (Glancey 1998, pp. 23- 26). The fact younger firms grow faster than older firms is interesting, because it could imply the experience and reputation of existing firms do not give them a sufficient advantage when they compete with innovative new firms (Glancey 1998, p. 25). Of course, it might also be a result of smaller firms having more opportunity to grow. This would be an interesting question for future research.

This trend of smaller firms growing more rapidly is not limited to Scotland. Calvo (2006) finds evidence of a negative correlation between the age of a firm and how rapidly the firm expands (pp. 118-120). His dataset consists of data on 1,272 Spanish firms during the period from 1990 to 2000 (Calvo 2006, pp. 118-120). Similarly, Goedhuys and Sleuwaegen (2010) find an inverse relationship between the age of a firm and the pace of its growth (p. 46). They use data from 947 African firms in 11 different countries (Goedhuys and Sleuwaegen 2010, p. 36). The presence of this trend in a variety of locations indicates the benefits of innovation could generally be expected to outweigh the benefits of reputation and experience. This is important for policy-makers because it indicates focusing on policies that benefit younger and less experienced firms would be an effective way to promote entrepreneurship. One way to do this might be to ensure entrepreneurs have access to business services (such as advice on marketing or logistical support) either through the free market or government provision since inexperienced entrepreneurs may have some difficulty initially running a business. This will be discussed in greater detail in the next section.

Another characteristic common of most entrepreneurial firms is their organizational structure. An example of this is the computer firm Apple, whose success as an entrepreneurial venture is widely believed to stem at least in part from the flexible and non-hierarchical structure of its organization (Covin and Slevin 1988, p. 218). Statistical evidence supporting this view is provided by the work of Covin and Slevin (1988). They are interested in determining the impact of an interaction effect between the organizational structure of a firm and how entrepreneurial

the firm is on the financial performance of the firm (Covin and Slevin 1988, p. 218). The data set Covin and Slevin (1988) use consists of survey data from 80 U.S. firms regarding how entrepreneurial the management of the firm is, how organic or mechanistic the structure of the firm was, and the firm's performance (pp. 223- 224). An organic organizational structure is one that has flexible administrative relations, is relatively informal, and in which authority is often allocated based on the degree of a knowledge an individual had in a given field (Covin and Slevin 1988, p. 219). A mechanistic organizational structure, in contrast, has rigid administrative relations, is highly formalized, and adheres tightly to bureaucratic values (Covin and Slevin 1988, p. 219). Covin and Slevin (1998) used three different regressions in their linear analysis (p. 226). The first of these featured the degree of entrepreneurial management in a firm as the only independent variable (Covin and Slevin 1988, p. 226). The second used both entrepreneurial management style and how organic a firm was as independent variables (Covin and Slevin 1988, p. 226). The final regression used both of these terms and an interaction term consisting of the product of the other two terms as independent variables (Covin and Slevin 1988, p. 226). The dependent variable in each case was firm performance (Covin and Slevin 1988, p. 226). Additionally, Covin and Slevin (1988) divided the sample into four groups consisting of entrepreneurial and organic firms, non-entrepreneurial and non-organic firms, entrepreneurial and non-organic firms, and non-entrepreneurial and organic firms (p. 227). They then used t-tests to compare the average performance of the firms in each category (Covin and Slevin 1988, p. 227). Performance was measured by asking various managers at the company Likert scale questions relating to how satisfied they were with different aspects of the organization's performance over the previous three years (Covin and Slevin 1988, pp. 225-226). As a validity check, Covin and Slevin (1988) gathered data on average sales growth for the previous three years for 20 of their firms and determined the correlation between their measure of firm performance and average sales growth was 0.82 and statistically significant (p. 226). Their regression analysis supports the view entrepreneurial firms perform better with an organic structure (Covin and Slevin 1988, pp. 227- 228). The t-tests support the view organic firms perform better with entrepreneurial managers and mechanistic firms perform better with non-entrepreneurial managers (Covin and Slevin 1988, pp. 227- 228). In a competitive economy, then, entrepreneurial firms without an organic structure would be expected to either become more organic or be driven out of the market due to competition from more organic entrepreneurial ventures. This will result in a general tendency for entrepreneurial firms to have an organic structure.

This tendency of entrepreneurial firms to have organic structures is supported by Balabanis and Katsikea (2003), who find evidence firms with an organic structure are likely to be more entrepreneurial than firms with a mechanistic structure (p. 246). They use survey data collected from 82 British export firms (Balabanis and Katsikea 2003, p. 240). The key lesson for policy-makers in this is to consider the degree to which firms have an organic organizational structure when determining which firms should receive grants to promote entrepreneurship such as Small business Innovation Research (SBIR) awards. SBIR awards are grants given out by the Small Business Administration to small firms that engage in R&D with potential for commercialization to specifically further innovation and entrepreneurship (Small Business Administration 2013). Knowing which type of organizational structure would make entrepreneurial firms more successful could help policy-makers distribute SBIR awards more effectively.

The work of Niosi and Zhegu (2010) provides evidence of a characteristic common to many innovative entrepreneurial firms. Their goal is to shed more light on the characteristics of anchor firms (Niosi and Zhegu 2010, p. 264). They define anchor firms as large, research oriented organizations that play a major role in helping to form a cluster of related firms in a given area (Niosi and Zhegu 2010, p. 267). Of interest for this work is one of the main ways they believe anchor firms contribute to the growth of a cluster is by allowing their employees to separate from them and form small firms known as spin-offs (Niosi and Zhegu 2010, p. 267). These spin-offs are typically characterized as being highly innovative, and as such should be considered to be innovative entrepreneurial firms (Niosi and Zhegu 2010, p. 282). To test their hypotheses on anchor firms, Niosi and Zhegu (2010) examine data from the U.S. aircraft industry (p.268). Their



main data set consists of data on 26,533 U.S. patents listing the “Aeronautics and Astronautics” category as their main technological domain (Niosi and Zhegu 2010, pp. 268). This data ranged from the year 1900 to the year 2004 (Niosi & Zhegu 2010, p. 275). They supplement this data with information from other sources such as U.S. government bodies, trade associations for the aircraft industry, and several private publications on technical matters relating to the aircraft industry such as Mondey and Taylor’s *The New Illustrated Encyclopaedia of Aircraft* (Niosi and Zhegu 2010, p. 268). They do not actually perform any statistical analysis on their data, instead simply examining it directly. They find the number of innovative firms in a given cluster usually increased in the decade after a major anchor firm became established in that cluster (Niosi and Zhegu 2010, p. 274). For instance, in the decade after the relatively large firm known as the Douglas Aircraft Company came to a cluster of aircraft related firms in California roughly 30 other innovative firms appeared in that cluster (Niosi and Zhegu 2010, p. 274). Similarly, the decade after the large Curtiss-Wright Corporation established a presence in a cluster of firms related to the aircraft industry in New York saw the total number of innovative firms in that region increase from 17 to 42 (Niosi and Zhegu 2010, p. 274 & 277). This trend can be seen as an example of agglomeration economies, in which firms experience additional benefits when clustering together in a region (Malizia and Feser 2005, pp. 95-96). While it is true not necessarily all of these innovative firms spun off from the anchor firms, Niosi and Zhegu (2010) nevertheless conclude spinning off companies is an important way in which anchor firms increase the total number of innovative firms in a given area (p. 282). For the purposes of this analysis, this implies that while not all innovative entrepreneurs will be spin-offs, virtually all spin-offs will be innovative entrepreneurs.

These results do not only hold for the aircraft industry. For instance, the large pharmaceutical company Glaxo Wellcome (now known as GlaxoSmithKline) spun out several innovative entrepreneurial firms in the late 1980’s (Malizia and Feser 2005, p. 207). This trend continues to the present day, with the entrepreneurial venture Oriel Therapeutics being spun out of GlaxoSmithKline in 2002 and the company Convergence Pharmaceuticals Ltd. being spun out in 2010 (Teotten Diagnostics, Inc., n.d.) (Gormley 2010). This suggests the trend of spin-off companies being relatively innovative is true over a wide range of industries. It is important to note in cases where firms spin off from publically traded companies the shareholders of the parent company will have equity in the spin-off (Bragg 2002, p. 485).

More rigorous empirical evidence for this trend is provided by the work of Xue and Klein (2010). They seek to both create an index variable measuring the level of entrepreneurship in a region and then determine which factors affect this variable (Xue and Klein 2010, p. 292). Their data set consists of state level data relating to the biotechnology and information communication technology industries in a given state (Xue and Klein 2010, p. 297). They construct their index variable for entrepreneurship by running a confirmatory factor analysis on four variables they believe reflect the level of entrepreneurship in a state (Xue and Klein 2010, p. 297). These variables are the number of technology patents produced in that state, the number of SBIR awards awarded to firms in that state, the level of venture capital investment in that state, and the number of existing technology establishments in that state (Xue and Klein 2010, p. 297). Xue and Klein’s (2010) data is drawn from the time period between 2000 and 2004, but the data is cross-sectional with values for a variable from multiple years being averaged together (pp. 298-299). They then use the results of their confirmatory factor analysis to derive the formula they use to assign each state a score for their entrepreneurship index variable (Xue and Klein 2010, p. 300). They next run three ordinary least squares regressions, the first featuring their index variable for entrepreneurship as the dependent variable (Xue and Klein 2010, pp. 304-305). The second uses the log transformation of this variable as the dependent variable, and the third uses the log transformation of this variable as the dependent variable with a more restricted set of independent variables (Xue and Klein 2010, pp. 304-305). Significantly, these regressions indicate the presence of an anchor firm in a region will increase the level of entrepreneurship in that region (p. 305). Because the authors’ measure of entrepreneurship is focused heavily on innovative entrepreneurship, this finding suggests entrepreneurial ventures which spin off from larger anchor firms will tend to be quite innovative in a variety of industries. An important point

for policy-makers that stems from this discussion is to ensure the regulatory environment is such that individuals are able to spin off firms relatively easily. One way to do this might be to post online an informational guide on what spinning off from a larger company entails.

In conclusion, entrepreneurial firms will tend to be larger and younger than other small businesses. These characteristics can be seen as a reflection of the desire for entrepreneurial firms to grow and innovate. Entrepreneurial firms will also face strong market pressure to adopt an organic organizational structure, as this structure will optimize their both their performance and ability to innovate (Covin and Slevin 1988, pp. 219 & 229). Finally, entrepreneurial firms will often be spin-offs from larger anchor firms which have set up branches in a given region. Table 2 provides a summary of these results. These results will allow policy-makers to better target promising entrepreneurial firms for grants such as the SBIR awards mentioned above. They will also allow policy-makers to better ensure the environment in a given region is suitable for entrepreneurial firms. The latter is discussed in detail below.

**Table 2. Summary of Organizational Characteristics of Entrepreneurial Firms**

<b>Organizational Characteristic</b>	<b>Empirical Evidence</b>	<b>Relevant Literature</b>
Entrepreneurial firms tend to be younger and larger than non-entrepreneurial firms	Evidence for this can be found among Scottish, Spanish, and African firms.	Glancey (1988); Calvo (2006); Goedhuys and Sleuwaegen (2010)
Entrepreneurial firms tend to have a more organic structure (implying greater flexibility and informality) than non-entrepreneurial firms	Support for this can be found in data from U.S. firms and British export firms.	Covin and Slevin (1998); Balabanis and Katsikea (2003)
Firms that spin-off from larger businesses in a region are quite often entrepreneurial	Strong evidence for this can be found in sectors of the U.S. economy ranging from aircraft manufacturing to biotechnology.	Xue and Klein (2010); Niosi and Zhegu (2010)

**Environmental Characteristics Conductive to Entrepreneurship**

Xue and Klein (2010) note there is currently a substantial body of literature pointing out entrepreneurial activities tend to cluster in certain regions, and this trend is especially pronounced for innovative entrepreneurs (p. 292). This implies these areas have specific characteristics which can foster innovative entrepreneurship. Identifying these characteristics is important from a practical standpoint because doing so will allow economic developers to better create place-oriented strategies for economic growth, which are often believed to be one of the most effective ways to boost entrepreneurship (Malizia and Feser 2005, p. 208). Determining which regional characteristics generate innovative entrepreneurship is important intellectually because doing so gives a more complete analysis of innovative entrepreneurial firms (Johnson 1990, p. 48).

One of the regional characteristics that plays a significant role in boosting entrepreneurship is the presence of an educated and skilled workforce. Niosi and Zhegu (2010) find evidence of this in their analysis of clusters in the U.S. aircraft industry from 1900 to 2004 (p. 269). They find the reason so many aircraft manufacturing clusters were located in the northeastern region of the U.S. in the first decades of the 1900's was because that region's workforce had the necessary skills for aircraft manufacturing (Niosi and Zhegu 2010, p. 275). Given how intertwined aircraft manufacturing clusters are with high levels of innovative entrepreneurship, this supports the idea of a skilled workforce being important for innovative entrepreneurship.

This idea is further supported by evidence from U.S. biotechnology firms. Bagchi-sen and Smith (2008) point out that in a U.S. survey of 94 small to medium sized enterprises in the biotechnology industry, the degree of skill possessed by the local workforce is viewed as the

most important reason for being located in a given area by 60.5% of research-oriented firms (pp. 10, 13 & 22). Research-oriented firms are defined as firms with either no products or only a single product on the market, as their main focus is typically on research and development instead of bringing products to market (Bagchi-sen and Smith 2008, pp. 2 & 11). These research-oriented firms are typically relatively new start-ups, and as such fit into the category of innovative entrepreneurs (Bagchi-sen and Smith 2008, p. 2). This represents a broad base of evidence supporting the conclusion that a skilled and educated workforce is important to the development of innovative entrepreneurship.

This suggests policy-makers should have creating an educated and well-trained workforce in a given region as a top priority. One way to do this might be to increase funding for local universities. Bramwell, Nelles, and Wolfe (2008) find the majority of firms in the ICT cluster in Waterloo, Canada cite the presence of a skilled workforce created by the University of Waterloo to be the main reason why they located to the region (p. 104). Increasing university funding would allow universities to create a larger and better educated workforce. This would draw more entrepreneurial firms to the region.

Another important contributing factor to the development of innovative entrepreneurship is the presence of a network of business services that can aid entrepreneurs (Malizia and Feser 2005, p. 208). Business services are essentially services which help entrepreneurs manage the technical, legal, financial, and marketing issues inherent in running a business (Malizia and Feser 2005, p. 201). The importance of these business services is underscored by the work of Waxell (2009), who examines the role business services, which he labels complementary agents, play in the Swedish biotechnology cluster at Uppsala (pp. 1606- 1607). Waxell (2009) both examines the number of business services offered in this cluster and interviews employees at biotechnology firms and business service firms located there (pp. 1616-1617). He concludes business services are especially important to innovative start-up companies because these are often too small to permanently hire employees for managing non-research activities (Waxell 2009, pp. 1616- 1617). This is supported by a case study from an information and communications technology cluster in Waterloo, Canada (Bramwell et al. 2008, p. 102). This study found the most important function of the Communitech Technology Association was to allow companies to share information on how to best run their businesses (Bramwell et al. 2008, p. 112). This organization was most important for small start-up firms (Bramwell et al. 2008, p. 112). The Communitech Technology Association can be seen as to some extent taking the place of business consulting firms, an important component of business services.

Access to business services therefore seems to be an important environmental factor in boosting the level of innovative entrepreneurship. This is especially true given the finding in the previous section that entrepreneurial firms tend to be younger and less experienced than non-entrepreneurial firms. This lack of experience would imply entrepreneurial firms may not necessarily be able to perform some functions of business as well as experienced firms that have been engaging in them longer. Policy-makers should endeavor to either attract private business service providers to a region or to provide such services directly. A good model for policy makers to learn from in this regard would be the Canadian government's policy on training programs at the technology transfer offices of some Canadian universities (Rasmussen 2008, p. 515). These training programs better educate the staff at technology transfer offices on how to advise people on successfully running a business, and appear to be filling the need for individuals with this skill set (Rasmussen 2008, p. 515).

While access to a skilled labor force and business services are important environmental contributors to entrepreneurship, innovation ultimately depends on the generation of new ideas. The number of new ideas, in turn, depends heavily on the level of existing knowledge in an area (Pakes and Griliches 1987, p. 56). The level of existing knowledge in an area is often represented as being equivalent to the expenditure on research and development in that area (Pakes and Griliches 1987, p. 56). Therefore, the level of R&D spending in an area would be expected to have a strong, positive effect on the level of innovative entrepreneurship in that area. Xue and Klein's (2010) statistical analysis of entrepreneurship in U.S. states provides evidence confirming this intuition (p. 305). Specifically, Xue and Klein (2010) find federal R&D spending in a state has

a statistically significant and positive impact on the level of entrepreneurship in that state (p. 305). The level of R&D spending in a state appears to be an important environmental factor in determining the level of innovative entrepreneurship in that state.

It should be noted there is some potential for reverse causality between R&D spending and entrepreneurship. However, Romijn and Albaladejo's (2002) analysis of small British software and electronics firms finds, while some reverse causality may be present, public R&D does have a positive causal effect on innovation (pp. 1064-1065). They go on to describe public R&D to encourage new start-up firms as "vital" (Romijn and Albaladejo 2002, p. 1065). This provides strong evidence for policy-makers that boosting public R&D spending will increase innovation, entrepreneurship, and economic growth.

It is also important to have a culture that supports innovation and entrepreneurship. Dramatic evidence of this can be found in the work of Saxenian (1994), who compares the economic performance of the computer industry clusters located at Silicon Valley in California and Route 128 in Massachusetts. Saxenian (1994) points out both of these regions had quite similar levels of a variety of economic indicators, including the education and skill of their respective workforces (pp. 3-4). However, the level of innovative entrepreneurship was generally much higher in Silicon Valley than along Route 128 (Saxenian 1994, p. 64). In 1981, for instance, venture capitalists along Route 128 funded only 17 new companies (Saxenian 1994, p. 64). In contrast, venture capitalists in Silicon Valley funded 37 new companies that year (Saxenian 1994, p. 64). Saxenian argues this regional difference is due to differences in the regional cultures of Silicon Valley and Route 128 (1994, pp. 59- 64).

Saxenian (1994) first points out many individuals in Silicon Valley would tend to discuss business matters and cooperate a great deal with each other outside of work (pp. 31- 33). This was even true when the companies they owned or worked for were technically competitors (Saxenian 1994, pp. 31- 33). In addition, many competing businesses would often directly share information and cooperate with each other (Saxenian 1994, pp. 33 & 45- 46). These high levels of formal and informal cooperation and information-sharing ensured important new technological knowledge was rapidly spread throughout Silicon Valley (Saxenian 1994, p. 33). They became an essential source of knowledge for innovative entrepreneurs in Silicon Valley (Saxenian 1994, p. 33). Silicon Valley also had a culture which strongly encouraged people to change jobs or form new companies relatively frequently (Saxenian 1994, pp. 34- 36). These social trends strongly encouraged innovative entrepreneurship in Silicon Valley (Saxenian 1994, p. 39).

The culture of Route 128 provided a sharp contrast to that of Silicon Valley. Firms along Route 128 were generally very insular, with competing firms and even individuals from competing firms rarely sharing information or cooperating either formally or informally (Saxenian 1994, p. 59). Additionally, there was a high degree of social pressure for an individual to only work for a single company during their lifetime (Saxenian 1994, p. 75). This pressure was so strong those who did quit their job and work for another company were viewed as outcasts and pariahs by their former coworkers (Saxenian 1994, p. 75). These social trends greatly reduced the level of innovative entrepreneurship along Route 128 (Saxenian 1994, pp. 62- 64).

The main lesson from this comparison of Silicon Valley and Route 128 is that the general culture of a region can have a dramatic effect on the level of innovative entrepreneurship in that region. A region may have a skilled workforce, a high level of R&D spending, and many other characteristics favoring innovative entrepreneurship, but without a supportive culture it may still not develop the appropriate level of innovative entrepreneurship. Currently, it is unclear what steps (if any) policy-makers should take to promote a more entrepreneurial culture. This is an important area for future academic research.

Further evidence for the important role an open culture can play in stimulating entrepreneurship in a region is provided by Todtling, Prud'homme van Reine, and Dorhofer (2011), who point out the open and tolerant culture in Eindhoven, NL was critical in attracting entrepreneurs to that region (p. 1891). This open culture was in large part due to the efforts of the private company Philips, which actively encouraged collaborative research between many different actors (Todtling et al. 2011, p. 1890). Todtling et al. (2011) conclude by arguing that

while policy actors such as regional governments do have a crucial role to play promoting an open and collaborative regional culture, they must tailor their policies to the specific region in question (pp. 1904-1905). This is an important point, as it cautions policy-makers against simply applying policies from one region to another without careful consideration.

In conclusion, the business environments where innovative entrepreneurship tends to flourish will have skilled workforces, numerous supporting business services, high levels of R&D spending, and a culture supportive of collaboration and information sharing. Regional economic developers should focus on implementing policies that increase these factors. Table 3 summarizes these environmental characteristics and the corresponding literature.

**Table 3. Summary of Environmental Characteristics of Entrepreneurial Regions**

<b>Environmental Characteristic</b>	<b>Empirical Evidence</b>	<b>Relevant Literature</b>
Skilled labor force	Cluster formation in the aircraft and biotechnology industries is strongly influenced by the presence or absence of a skilled labor force	Niosi and Zhegu (2010); Bagchisen and Smith (2008); Bramwell, Nelles, and Wolfe (2008)
Network of business services	Case studies in biotechnology and ICT clusters both indicate providers of business services are extremely important to entrepreneurial firms in them	Waxell (2009); Bramwell, Nelles, and Wolfe (2008); Rasmussen (2008)
High research and development (R&D) spending	Evidence drawn from the U.S. suggests higher R&D spending will result in more knowledge (and more innovative entrepreneurship) being in a region	Pakes and Griliches (1987); Xue and Klein (2010); Romijn and Albaladejo (2002)
Culture supportive of entrepreneurship	A more open and entrepreneurial culture is associated with increased innovation and entrepreneurship in clusters both in the U.S. and Europe	Saxenian (1994); Todtling, Prud'homme van Reine, and Dorhofer (2011)

## **Conclusion**

This paper has examined an array of literature characterizing innovative entrepreneurs at the levels of the individual, the firm, and the broader business environment. On the individual level, innovative entrepreneurs tend to be motivated by a mixture of rational decision-making and psychological trends (Schindehutte et al. 2006, p. 365). Chief among these psychological trends are need achievement, a propensity for risk-taking, and a desire to innovate. Innovative entrepreneurial firms tend to be larger and younger than non-innovative new firms, and usually have a more organic organizational structure. Many are also spin-offs of larger firms. Finally, innovative entrepreneurs will usually be found in regions with a skilled workforce, access to supporting business services, a high level of R&D spending, and a culture that promotes collaboration and information sharing.

Academically, this paper represents a response to Johnson's (1990) argument that entrepreneurship should be analyzed at the levels of the individual, the firm, and the external environment (p. 48). As such, it summarizes and organizes existing literature on innovative entrepreneurship into this framework, and provides a useful starting point for future research on the subject.

From a policy perspective, this paper gives regional developers a better picture of innovative entrepreneurs and the environments that support them. It also gives policy makers concrete ways

to boost entrepreneurship in an area. For instance, policy-makers could increase R&D spending in that area or make it easier for companies to spin off from larger firms. It provides policy-makers with valuable tools to let them better target their policies towards firms more likely to be entrepreneurial. This paper finally cautions policy makers to expect some variability in the success of such policies due to the extent by which innovative entrepreneurship is determined by psychological traits.

This analysis indicates several different directions for future research and policy formation. Academic research into the psychological characteristics of entrepreneurs should focus on how often the rational side of entrepreneurs comes into conflict with their personality traits and what the outcome is. This will provide important insight into the extent to which entrepreneurs are motivated by internal factors. From a policy standpoint, research might be conducted into what environmental features are attractive to entrepreneurial personalities so regions can better attract entrepreneurs.

In terms of the organizational characteristics of entrepreneurial firms, one avenue for academic research would be to determine whether the characteristics identified in this analysis cause other firms to be more entrepreneurial or whether more entrepreneurial firms tend to naturally develop these characteristics. Policy-makers should focus more on crafting policies that create a supportive environment for firms with these characteristics.

**Table 4. Summary of Implications for Future Research and Policymaking**

<b>Area</b>	<b>Directions for Future Research</b>	<b>Policy Implications</b>
Psychological characteristics of entrepreneurs	Determine extent to which entrepreneurs are influenced by psychological traits as opposed to rationality	Develop strategies to make areas more attractive to individual entrepreneurs
Characteristics of entrepreneurial firms	Determine whether the identified characteristics cause firms to become more entrepreneurial or vice versa	Create an environment conducive to firms with entrepreneurial characteristics
Environmental characteristics of entrepreneurial regions	<ul style="list-style-type: none"> <li>• Explore the distinction between generic and industry specific skills</li> <li>• Identify the reasons for a strong business services sector</li> <li>• Analyze how to measure entrepreneurial culture and ascertain its determinants</li> <li>• Continue to examine direction of causality between entrepreneurship and R&amp;D spending</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure members of the workforce have access to education and training programs</li> <li>• Ensure entrepreneurial firms have access to business support services (private or otherwise)</li> <li>• Increase R&amp;D spending</li> </ul>

The implications of the research on environmental characteristics of entrepreneurial regions are more varied. An interesting topic for academic research relating to a skilled workforce would be to look at the differences between industry specific skills and more generic skills (such as how to prepare an effective presentation). Policy-makers, on the other hand, should focus on ensuring workers in their region have adequate access to educational and training programs. In terms of business services, academic research should focus on how a strong business services sector arises in a given region. In the absence of a strong private business services sector, policy-makers should ensure entrepreneurs have access to support services such as business incubators. There

are a great deal of potential issues relating to entrepreneurial culture for academic researchers to explore, such as how to accurately measure entrepreneurial culture and what its determinants are. Implications for policy-makers on this subject are still somewhat dependent on what future academic research determines. Finally, academic research into the effect of R&D spending on entrepreneurship should seek to determine the direction of causality in the relationship between the two. If R&D spending does boost entrepreneurship, policy-makers should endeavor to raise the level of R&D spending in their region. Table 4 summarizes these conclusions.

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