

Entrepreneurial characteristics in Switzerland and the UK: A comparative study of techno-entrepreneurs

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Abstract The entrepreneur is the central actor in generating entrepreneurial activity. Thus, it is important to understand the motivational characteristics and variables associated with entrepreneurial behavior spurring people to become entrepreneurs. For this study, a comparative analysis of high-tech entrepreneurs in Switzerland and the UK was undertaken to determine the extent to which they differ in terms of entrepreneurial characteristics. A total of 253 useful questionnaires from entrepreneurs in both countries enabled us to distinguish differences between these two groups. Findings reveal that some entrepreneurial characteristics such as autonomy, propensity for risk, and locus of control are higher among UK techno-entrepreneurs while other characteristics such as achievement need, tolerance for ambiguity, innovativeness, and confidence are higher among Swiss techno-entrepreneurs.

Keywords Swiss techno-entrepreneur · Risk taking · Confidence · Ambiguity · Innovativeness · Achievement · Autonomy · Locus of control

Introduction

In recent years, there has been considerable interest and debate over entrepreneurial characteristics as a predictor of entrepreneurial success (Gartner and Shane 1995; Gürol and Atsan 2006; Koh 1996; Lee 1997; McClelland 1961; Pavlovich and Corner 2006). Historically, entrepreneurs have been viewed as innovative, resourceful, and opportunistic risk takers. Successful entrepreneurs are described as innovative individuals who recognize opportunities and marshal resources to

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achieve their goals (Stevenson and Gumpert 1985). Over 70 years ago, Schumpeter (1934) described the entrepreneur as a creative, driven individual who finds “new combinations of [factors] of production” to develop a new product, corner a new market, or design a new technology.

Switzerland is a developed and economically advanced country. Yet many scholars and practitioners believe that it suffers from a lack of entrepreneurial activity relative to other advanced countries (Kurzman 2004; Eckert 2005). While entrepreneurship has been studied extensively in a variety of transitional and developing countries under different social and cultural settings (Pang 1999; Roland 2004; Taylor 1987), a significant void exists with respect to the study of entrepreneurship in Western Europe generally and the continental non-English-speaking countries such as Switzerland in particular.

We begin with an overview of the Swiss economy and evaluate both economic and institutional support for entrepreneurial activities in that country. The rise of techno-entrepreneurship in Europe and its impact on both the Swiss and UK economies are highlighted. A review of research on national differences in entrepreneurial activity suggests that neither Switzerland nor the UK enjoy the same level of entrepreneurial activity as other advanced economies such as the US, Canada, and Ireland. A review of the literature on entrepreneurial characteristics reveals that possession of certain personal characteristics increases the likelihood that one will engage in entrepreneurial activities and that the prevalence of these characteristics in a population varies from country to country. Based on this review, we propose that the UK and Switzerland, while similar in terms of economic development and institutional support for techno-entrepreneurs, differ in the level of entrepreneurial characteristics. Using a sample of UK and Swiss techno-entrepreneurs, we conduct an empirical study to test for differences in the two groups in terms of seven key entrepreneurial characteristics.

The Swiss economy

Switzerland is a non-European-Union country with a population of 7.5 million situated in the heart of Europe. Over half of Switzerland’s gross domestic product (GDP) comes from foreign trade and more than a third of domestic demand for products and services are met by imports (Quayle 2001). In terms of economic geography, Switzerland consists of about 300,000 small- and medium-size enterprises (SMEs) which accounts for nearly 95% of active organizations (Quayle 2001). The economy in Switzerland is divided into three sectors: agriculture (less than 10% of population), industry (approximately 40% of population), and services (over 50% of population).

While most of the industrialized world has experienced serious economic and social problems caused by the plague of mass unemployment since the severe crisis of the 1970s recession, Switzerland has gained fame as an “employment paradise” and for the exceptional performance of its labor market (Flückiger 1998). However, at the beginning of the 1990s, this country underwent an economic recession of exceptional length triggering an increase in the unemployment rate much higher than in other European countries (Flückiger 1998). As a result and due in part to other

factors such as technological change, the growing importance of the tertiary sector, and labor market rigidities, self-employment has steadily increased in Switzerland since 1980 reaching 18% in 2004 compared to approximately 10% in the early 1980s (Falter 2005).

Economic support for entrepreneurship

Support for entrepreneurial activity in Switzerland is mixed. On the positive side, the country has created an environment that makes starting a business or investing in one relatively easy. The tax system is designed to attract investment to the country and there is no capital gains tax. The population is highly educated (near 100% literacy) resulting in a very competent albeit expensive labor force.

Switzerland has a strong and stable economy with low inflation (2.8%), low unemployment (2.7%), a GDP per capita of about \$64,000 compared to \$77,000 for the US (2002), and a highly qualified workforce. The Swiss take punctuality for business and social meetings very seriously and expect that everybody will do likewise.

To encourage entrepreneurial activity, the amount of entrepreneurship awards for SMEs and enterprise startups has increased rapidly in Switzerland over the past several years. The Swiss Federal Statistical Office has also observed an increase in newly founded firms. Entrepreneurship awards are numerous (e.g., Innovation Award; Entrepreneurship Award) rewarding economic efficiency, economic success, or degree of innovation of firms. There are also awards given for social entrepreneurs, good governance, and the ethical behavior of firms (Fueglistaller 2006).

On the negative side, innovation performance in Switzerland has weakened somewhat in recent years. OECD (2006) notes that this weakening resulted to some degree from the protracted economic slowdown, but there are areas in which policy reform could have strengthened innovation. Some scholars (Kurzman 2004; OECD Economic Surveys 2006; Shannon 2000) and practitioners (Eckert 2005) argue that much of Switzerland's innovation and entrepreneurship comes from outside the country. Similarly, statistics on entrepreneurship in Switzerland indicate that the majority of business creators are of foreign origin (Krasna 2003). In this regard, there are signs that innovativeness is lacking in small firms in the sheltered service sectors (OECD 2006). Although maintaining the nation's attractiveness for multinationals remains important, boosting the innovative capacity of SMEs and removing obstacles to their growth should move up the policy agenda (OECD 2006). This would require improving conditions for entrepreneurship and better bridging of the gap between fundamental and applied research (Economic Survey of Switzerland 2006).

Institutional support for entrepreneurship

Nicolas G. Hayek, the savior of the Swiss watch industry, notes that Switzerland lacked entrepreneurs with courage, imagination, and vision in the early 1980s (Eckert 2005). However, in recent years, there has been heightened interest in stimulating entrepreneurial behavior in Switzerland. For example, while Hayek

argues that politicians should focus more on entrepreneurs rather than on managers (Eckert 2005), Krasna (2003) notes that it is a question of attitude: the Swiss are rather averse to risk taking. It is easier to launch a business in the English-speaking world, where there is a strong tradition of entrepreneurship and willingness to take a risk. Krasna notes that the English phrase “venture capital” is linked with ideas of adventure and exploration, while this phrase in Switzerland means “risk capital” with the stress on risk (Krasna 2003). On the other hand, it is interesting to note that more recently Falter (2005) found that a majority of Swiss workers would prefer to be self-employed. So the question is why does Switzerland lack entrepreneurs?

Strebel (2004) believes that a combination of three factors has held back entrepreneurship in Switzerland: *First*, while it is true that Switzerland is a wealthy nation, it lacks sufficient venture capitalists prepared to invest in new companies. *Secondly*, young people are not inclined to work the required 14-h days to run their own businesses. *The third* factor is the common perception in Switzerland that it is shameful for business people to go bankrupt. In the US on the other hand, even very successful people have been through two or three bankruptcies and have learned from the experience (Strebel 2004). Similarly, OECD (2006) outlines the obstacle to entrepreneurship in Switzerland:

- ◆ The larger size of the domestic market, due to the removal of local barriers, could stimulate firms to grow in some sectors.
- ◆ Administrative burdens are also an important obstacle to entrepreneurship, especially due to the lack of cooperation among cantons.
- ◆ A third obstacle to entrepreneurship is the bankruptcy law which in situations relevant for new undertakings extends de facto creditors’ claims against a bankrupt entrepreneur indefinitely. Beyond its deterrent effect on the creation of businesses, entrepreneurs are less likely to take risks and may refrain from expanding their activities, in particular if it would require using bank credits.
- ◆ Finally, equity financing and venture capital still play only minor roles in the financing of new ventures and innovation projects.

The rise of techno-entrepreneurship in Europe

In the new millennium, the development of hi-tech information technologies continues at an unprecedented pace. High-tech markets can be described as marketing dependent and technologically driven (Nystrom 1990), highly internationalized and competitive (Bürgel et al. 2001), complex (Rosen et al. 1998), and under rapidly changing technological conditions with short life cycles (Davidow 1986). High-tech startups and technology development firms, also known as technological “techno-” entrepreneurs, play an important role in developing and commercializing technologies worldwide (Kropp and Zolin 2005). These firms are integral to many industries including artificial intelligence, biotechnology, software, and the telecommunications (Zahra 1996). Kelley and Rice (2002) believe that these firms rely on technology as a key strategic resource that can be used to develop a competitive advantage through innovation.

Similar to many European countries, Switzerland has been the cradle of remarkable innovations in high-technology products. Over the past 10 years, the Swiss economy has become increasingly dependent on high-tech products (Swiss Federal Statistics Office 2005). In this regard, recognition of the economic significance of high-tech small firms in particular grew during the last quarter of the twentieth century (Acs and Audretsch 1990; Loveman and Sengenberger 1991). It is believed that Switzerland may well have many hi-tech firms with an abundance of know-how, but, if these young companies are to succeed, they have to grow rapidly to be competitive at the international level. Thus, while the development of leading-edge technology may be one vital ingredient, commercial success depends on winning the confidence of the market and the innovation arising from the entrepreneurial vision of the management team.

Techno-entrepreneurship in Switzerland versus the UK

The economies of Switzerland and the UK are remarkably similar in terms of support for techno-entrepreneurship. Both countries are established world leaders in several fields known for their technological sophistication. Based on the European Investment Monitor reported in 2007, both countries provide attractions of investment. These attractions include their stable economic and political environment, good international transport links and communications infrastructure, sound legal and regulatory environment, and ready access to finance. Switzerland and the UK both have high-technology state-of-the-art industries but in different technologies.

While Swiss engineering is legendary (as exemplified by Swiss watches and turbines), the UK is known for its own high-tech industries such as artificial intelligence, biotechnology, software, and the telecommunications. Furthermore, the Swiss “precision spirit” has also moved from the more traditional applications (watches) into new fields of activity in microtechnology and nanotechnology. Switzerland’s renowned competences in mechatronics and automation are enhanced by globally competitive strengths in fields such as nanotechnology.

The UK and Switzerland are also similar with respect to success of small- and medium-size enterprises (Quayle 2001). According to a report published by *swissinfo* (2008), only half of Swiss startup firms survive their first 5 years of business with many failures attributed to lack of market knowledge or unrealistic expectations. Government statistics reveal that 36,427 firms were founded in Switzerland in 2007, up 6.3% from 2006 and the third annual increase in a row. The Federal Statistics Office measured the success rate of firms that started between 2000 and 2004 by counting how many were still in business in 2005 (*swissinfo* 2008). According to this report, more than four fifths survived the first year, but that number dropped to 49% in the fifth year.

Similarly, the UK’s record of new venture creation has, over the past few years, not been overly successful (Dhaliwal and Adcroft 2005). For example, since the early 1990s, the stock of small businesses has fallen by roughly 50,000 (Bank of England 2002). For the economy as a whole, the key issue is the difference between the number of startups and the number of closures (Dhaliwal and Adcroft 2005).

Based on the report of DTI (2002), Dhaliwal and Adcroft (2005) argue that the overall negative outcome of this equation has resulted in an economy where wealth creation is focused on large firms. By 2002, while SMEs accounted for over 99% of all enterprises, they accounted for just 52% of total turnover and roughly 55% of all employment. This suggests that the proportion of UK's population engaged in business startups or new business growth may actually be declining.

According to GEM UK 2007, early-stage entrepreneurial activity (TEA) in the UK in 2007 was 5.6%, compared with 5.8% in 2006. This continues a long-term pattern in the UK of lower TEA rates than the US and Canada and higher TEA rates than other G7 nations (Harding et al. 2007). According to this report, the UK had a relatively low number of individuals expecting to start up a business compared to France, Italy, or the US in 2007.

As a side note, the UK government encourages individuals on Incapacity Benefits back to work. However, the rules governing Incapacity Benefits are such that the potential self-employed are often dissuaded by the perceived risks of losing income and status (Kautonen et al. 2008). The indignity and effort of regular contact with benefits officials as a result of the change in status (from an Incapacity Benefit recipient to Job Seeker status), should the self-employment not be successful, is a significant disincentive (Kautonen et al. 2008).

National differences in entrepreneurial activity

There is considerable evidence to suggest that some cultures and societies are more conducive to the pursuit of entrepreneurial activity than others (Mueller 2004). A published comprehensive report on entrepreneurial activity in 37 industrialized countries provides documentation for differences in founding rates (Reynolds et al. 2002). A major finding of this Global Entrepreneurship Monitor (GEM; <http://www.gemconsortium.org/article.aspx?id=45>, accessed June 2008) 2007 study was that the level of entrepreneurial activity varied significantly among industrialized countries. For example, while less than 2% of adults were involved in entrepreneurial activities in Belgium in 2007, more than 7% were involved in the US. Autio (2007) has reported in GEM that, for the highly developed economies, the highest rates of entrepreneurial activity are reported for Oceania (Australia and New Zealand) followed by North America. In contrast, the European Union (plus Iceland, Norway, and Switzerland) and highly developed Asia (including Japan and South Korea) exhibit the lowest rates of adult-population prevalence of entrepreneurial activity at all levels of growth expectation (Autio 2007).

A number of empirical studies over the last decade suggest that differences among countries in entrepreneurial activity can be explained by cultural and/or economic factors (Reynolds et al. 1994; McGrath et al. 1992a, b). Bosma et al. (2008), for example, found that national Early-Stage Entrepreneurship (HEA) rates vary with economic context. The US, New Zealand, Iceland, and Canada have higher levels of HEA than other high-income countries. The HEA rate for these countries is over 1%. In the UK, Switzerland, Germany, Norway, and Denmark, the HEA rate is between 0.5% and 0.8%. The lowest levels of HEA, at under 0.5%, occur in Greece, Japan, Spain, Belgium, France, Finland, and Italy.

In a separate study, Miettinen (2006) found that financial and personal engagements were major obstacles for entrepreneurs. This finding was based on a 14-country study that provided a picture of students' career aspirations and future goals. A special index construction was administrated for comparative purposes. It was firstly asked whether or not the students had ever considered setting up their own business. The international average of the index is 35.5%. The highest percentage was found in Ireland at 40.9% followed by Singapore at 39.5% and Liechtenstein at 37.5%. The lowest ones are those of Germany at 33.9% and Switzerland at 34.5% (Miettinen 2006).

Entrepreneurial characteristics

The study of entrepreneurship from an individual or "traits" perspective (Gürol and Atsan 2006; Koh 1996; Littunen 2000) focuses on the attributes of the person and how these attributes might be related to exploiting opportunities which others either do not recognize or choose not to pursue (Pavlovich and Corner 2006). In the past, some scholars have been critical of the traits approach (Brockhaus and Horwitz 1986; Cools and Broeck 2006; Carsrud et al. 1986; Gartner 1985). However, a growing number of authors (Cools and Broeck 2006; Cromie 2000; Gürol and Atsan 2006; Mueller and Goić 2002) argue that identifying a cluster of relevant traits may be more useful to assess the entrepreneurial personality than focusing on a single characteristic.

The major thrust of entrepreneurship research in the "traits" stream has been to show that entrepreneurs are different from nonentrepreneurs (Brockhaus 1982; Gartner 1985; McClelland 1961; Roland 2004). Joseph Schumpeter described entrepreneurs as individuals who attempted to "...reform or revolutionize the pattern of production by exploiting an invention... or untried technical possibility for producing a new commodity or producing an old one in a new way... [This] requires aptitudes that are present in only a small fraction of the population..." (Schumpeter 1934:132). Mueller and Goić (2002) note that Schumpeter's observation suggests that in addition to an entrepreneurial climate, the creation of new ventures and entrepreneurial activity depends upon the availability of prospective entrepreneurs, i.e., individual possessing personality traits combined with personal circumstances which are likely to lead them to forming a new venture.

A number of personal characteristics associated with entrepreneurship has been investigated independently. They include internal locus of control (e.g., Budner 1962; Rotter 1966), need for achievement (e.g., McClelland 1961), belief in the effect of personal effort on outcomes (McGhee and Crandall 1968; Lao 1970), self-confidence or overconfidence (e.g., Stevenson and Gumpert 1985; Busenitz and Barney 1997; Liles 1974), tolerance for ambiguity (e.g., Schere 1982), willingness to bear uncertainty (e.g., Khilstrom and Laffont 1979), and attitudes towards risk (e.g., Liles 1974; Mintzberg 1973). While the prevalence of entrepreneurial characteristics has been documented in different countries with different cultures (e.g., Pang 1999; Roland 2004; Taylor 1987), few studies have examined entrepreneurial characteristics collectively to profile countries in terms of their prevalence of individual with entrepreneurial potential.

For this study, seven personal characteristics are examined that define the entrepreneurial profile of an individual and (in the aggregate) the entrepreneurial potential of a nation. They are: need for achievement, need for autonomy, propensity for risk, locus of control, tolerance for ambiguity, innovativeness, and confidence. These characteristics were chosen because they are the most frequently cited personality characteristics in the entrepreneurship literature having impact on an individual's choice in becoming an entrepreneur. Gürol and Atsan (2006) consider these characteristics as capable of representing the entrepreneurial behavior of individuals in a natural and instinctive way.

Risk-taking propensity

Perhaps the most widely cited description of entrepreneurs is the willingness to assume risk (Cunningham and Lischeron 1991; Ho and Koh 1992; Morris and Trotter 1990; Pichot 1987). A person's risk-taking propensity can be defined as his or her orientation towards taking chances in uncertain decision-making contexts (Koh 1996). Bird (1989) divides risks into five types, four of which are clearly relevant to any potential entrepreneur: economic risk, risks in social relations, risks in career development, plus psychological and health risks. However, Brockhaus (1982) found that the preference for a particular risk type does not differ between professional managers and the general population nor between successful and unsuccessful firms. Mill (1984) suggested that risk bearing is the key factor in distinguishing entrepreneurs from managers.

Need for achievement

Conventional entrepreneurial wisdom holds that the "need to achieve" motivates individuals to overcome obstacles and difficulties. It also motivates entrepreneurs to strive to obtain their goals and excellence quickly. According to McClelland (1961), the entrepreneur is primarily motivated by an overwhelming need for achievement. Need for achievement has traditionally been conceptualized as a "unitary disposition that motivates a person to face challenges in the interest of attaining success and excellence" (Atkinson and Raynor 1974; Grote and James 1991; McClelland 1961; Mehrabian 1968; Winter 1974).

The achievement motive is expressed by behaviors such as undertaking a difficult job, facing uncertainty (or being tolerant of ambiguity), and taking personal responsibility for the consequences of one's performance (Sagie and Elizur 1999). Some scholars (e.g., Epstein and Harackiewicz 1992; Lee 1992; Sagie and Elizur 1999) state that striving for high achievement does not necessarily mean or imply "success" or "high performance." It is satisfied primarily by an intrinsic sense of success and excellence rather than by extrinsic rewards (McClelland 1961; Sagie and Elizur 1999), taking into consideration the strong need for achievement influences on both new venture creation and development as well as innovativeness (tendency to innovation). Lerner et al. (1997) found that motivations showed a strong relationship to performance.

Locus of control

Locus of control is defined as an individual's general expectancy of the outcome of an event as being either within or beyond her or his personal control and understanding (Rotter 1966). Boone et al. (1996: 668) have observed that “[t]he face validity of this construct for studying the influence of [entrepreneurs and managers] follows directly from its definition, as leading a company is in essence a persistent attempt to control the environment.” Rotter's (1966) original locus of control formulation classified generalized beliefs concerning who or what influences things along a bipolar dimension from internal to external control: “Internal control” is the term used to describe the belief that control of future outcomes resides primarily in oneself while “external control” refers to the expectancy that control is outside of oneself, either in the hands of powerful other people or due to fate–chance.

Indeed, an entrepreneur's or manager's locus-of-control internality has been reported to be positively related with, for instance, short- and long-term financial performance (e.g., Boone et al. 1996, 2000; Govindarajan 1989; Lee and Tsang 2001), organizational survival, growth, profitability, and renewal (Anderson 1977; Boone et al. 2000; Zahra 1995, 1996), take action to carry out the plans (Thomas and Mueller 2000) and innovative strategies (Miller et al. 1982).

Tolerance of ambiguity

Ambiguity, dealing with new or complex situations, refers to an uncertainty about an outcome or result due to insufficient convictional data, information, or knowledge. This term refers to a person's tolerance for uncertainty and risk. Because ambiguity exists and humans must cope with it, individuals display varying levels of tolerance or intolerance for ambiguity or ambiguous situations.

Budner (1962) defines ambiguous stimuli or “ambiguous situations” as those that are not adequately structured or categorized by the perceiver because they lack sufficient cues. Tolerance of ambiguity can be effectively conceptualized as “the ability to respond positively to ambiguous situations.... an individual's orientation toward taking chances in a decision-making state” (Gürol and Atsan 2006:30) and “the tendency to perceive ambiguous situations as desirable” (Budner 1962:29). Jonassen and Grabowski (1993) conclude that tolerant individuals should perform well in new and complex learning situations.

Entrepreneurial managers are generally believed to tolerate ambiguity better than conservative managers because the entrepreneurial ones face a less structured, more uncertain set of possibilities and actually bear the ultimate responsibility for decision (Entrialgo et al. 2000). Risk and uncertainty are elements of the entrepreneurial behavior since entrepreneurs' decisions result in actions that are innovative and original (Cromie 2000). Entrepreneurs tend to have a high tolerance for ambiguity and learn how to manage risks for themselves and others. They treat failure of a project as a learning experience, not a personal tragedy (Gürol and Atsan 2006).

Self-confidence

Confidence, coming from long experience, refers to a feeling or consciousness of one's powers or of reliance on one's circumstances. This confidence stresses faith in an individual to act in a right, proper, or effective way and to be able to succeed.

Self-confidence and overconfidence have been documented in the entrepreneurship literature. For example, Gürol and Atsan (2006) argue that entrepreneurs are typically described as having self-confidence because they seek out and complete demanding tasks and it is unlikely that they could do this successfully if they had low confidence. In other words, entrepreneurs have confidence in their own ability to both accomplish any goal they set for themselves, also overcome the odds, and succeed where others may fail.

Some scholars (e.g., Gürol and Atsan 2006; Koh 1996; Robinson et al. 1991) note that entrepreneurs demonstrate a higher degree of self-esteem compared with others. On the other hand, Busenitz and Barney (1997) note that overconfidence enables an entrepreneur to proceed with an idea before all the steps to that specific venture are fully known.

Innovativeness

In recent years, there has been considerable interest and debate about innovativeness (e.g., Goldsmith and Hofacker 1991; Im et al. 2003; Venkatraman and Price 1990; Wood and Swait 2002; Yang 2005). Many scholars (e.g., Baden-Fuller 1995; Covin and Slevin 1991; Fernald and Solomon 1987; Miller and Friesen 1983; Schumpeter 1934; Thomas and Mueller 2000) have identified innovativeness as one of the essential enduring characteristics of entrepreneurs and the focal point of entrepreneurship. In terms of entrepreneurship, entrepreneurs are always looking for new opportunities (Zacharakis 1997), willingness to change (e.g., Blake et al. 2005; Goldsmith and Hofacker 1991; Hurt et al. 1977), and risk-seeking behavior (Agarwal and Prasad 1998). Innovativeness was found to distinguish entrepreneurs from managers and nonentrepreneurs (e.g., Busenitz and Barney 1997) and also evidence reported (e.g., Gürol and Atsan 2006; Koh 1996) that those who are entrepreneurially inclined have higher innovativeness. Utsch and Rauch (2000) suggest that there is a powerful link between innovativeness and venture performance and that innovativeness is linked to achievement orientation.

Need for autonomy

Although there are differences of opinion on the details (Dworkin 1988), broad consensus among researchers is that autonomy means that individuals make their own choices independent of others (Gelderen et al. 2003). People who value autonomy strive for a state of independent self-determination (Gelderen et al. 2003). Prior studies (e.g., DeCarlo and Lyons 1979; Hornaday and Aboud 1971) have shown that entrepreneurs have a higher need for independence, i.e., autonomy, than the general population.

Autonomy refers to the degree of independence and discretion individuals have over their work (Hackman and Oldham 1975). Pritchard and Karasick

(1973) found that people with high need of autonomy generally prefer self-directed work, care less about others' opinions and rules, and prefer to make decisions alone. Barrick and Mount (1993) found that autonomy moderated the relations of conscientiousness, extraversion, and agreeableness with job performance, such that the relations were stronger when autonomy was high. When jobs are high in autonomy, individuals have discretion over where, when, and how things are done (Langfred and Moya 2004). A job that is high in autonomy gives the individual freedom in scheduling activities and deciding how work should be done (Langfred and Moya 2004).

In contrast, "a job that is low in autonomy is externally controlled and provides little opportunity for individual discretion" (Diefendorff et al. 2006:370). Barrick and Mount (1993) suggest that autonomy operates as a proxy for situation strength, with low autonomy reflecting a strong situation and high autonomy reflecting a weak situation. Morgeson et al. (2006) suggest that work redesigns that enhance worker autonomy are most effective in contexts where other supportive management systems are absent. Building on some different authors, Morgeson et al. (2006) categorize three benefits of an increased autonomy in an organization: First, increased autonomy is motivating, resulting in greater effort on the part of team members. Second, increased autonomy allows team members to self-manage. Third, increases in autonomy allow an organization to tap into the existing knowledge of the workforce as well as fostering further learning.

National differences in entrepreneurial characteristics

The prevalence of individuals possessing entrepreneurial characteristics varies across countries and cultures (Mueller and Thomas 2001). Key factors which contribute to national differences in entrepreneurial potential are culture, stage of economic development, and political-economic traditions (Mueller et al. 2002). For example, Mueller et al. (2002) found that individuals socialized in masculine cultures, such as the US, Canada, and UK, are more psychologically predisposed toward entrepreneurship than are individuals socialized in feminine cultures such as Denmark, Netherlands, and Sweden. In another international comparative study, Mueller and Goić (2002) found substantial differences among countries in transition in terms of their populations of individuals with entrepreneurial potential. They concluded that, while an economy develops and grows, more resources are available for the creation of new ventures. In turn, these new ventures spawn innovation fueling additional growth. The cycle continues as economic growth stimulates entrepreneurial activity and successful new ventures stimulate further growth.

Switzerland versus UK

Given their similarities in terms of economic development and support for entrepreneurship, one would expect Switzerland and the UK to be similar in the prevalence of individuals with an entrepreneurial orientation. However, as several studies have shown, entrepreneurial attitudes, values, and behaviors are shaped by culture (Mueller and Thomas 2001; Mueller et al. 2002) with some countries having

relatively large populations of potential entrepreneurs (US and Ireland) and other countries having relatively small populations of potential entrepreneurs (Germany and Belgium). While neither the UK nor Switzerland was included in these earlier studies of national differences in entrepreneurial characteristics, culturally, the UK is very similar to the US and Switzerland is very similar to Germany (Schwartz 2006).

This study was undertaken to ascertain the extent to which techno-entrepreneurs in Switzerland and the UK differ in level of entrepreneurial characteristics. Since this study is a preliminary empirical investigation into the relatively unexplored area of entrepreneurial potential between these two countries, we elected to pose only a general research question and not offer formal hypotheses based on a specific economic or social theory. However, the discussion above about differences between the social-cultural settings of Switzerland and UK leads to certain logical expectations as to how these settings and history may affect entrepreneurial potential. We offer these expectations in the form of a general proposition:

The level of risk-taking propensity, need for achievement, locus of control, tolerance of ambiguity, self-confidence, innovativeness, and need for autonomy is higher among UK techno-entrepreneurs than among Swiss techno-entrepreneurs.

The remainder of this paper describes the research design, methodology, and results of an empirical study of Swiss and UK entrepreneurs comparing them in terms of the seven entrepreneurial characteristics described in the previous section.

Research design and methodology

Sample

Prior studies of entrepreneurial characteristics focused on the entrepreneurially inclined among university students (Gürol and Atsan 2006; Koh 1996; Thomas and Mueller 2000) or sales tax files (e.g., Busenitz and Murphy 1996). For this study, owners of high-tech entrepreneurial firms founded between 2003 and 2005 in Switzerland and the UK were identified. High-tech sectors such as the aerospace industry, electronics industry, office machinery and computer industry, pharmaceutical industry, and instruments industry were included. To identify these firms, we used data from Dun and Bradstreet in the UK and Federal Statistical Office in Switzerland. Company records were subsequently screened to exclude firms whose business activities suggested that they were not primarily engaged in producing and developing high-tech products or services.

Data on the entrepreneurial characteristics of the business owners were collected using a survey instrument. The questionnaire was pretested using four academics in order to insure that the survey content and measurement scales were clear, valid, and appropriate. Following some modifications, a second pretest was carried out with eight high-technology business owners (four in each country) to confirm that all the questions were relevant for the respondents. Based on their responses, some demographic items were modified. Finally, a few open-ended questions were added to give “color” to our data and lead the respondents (owners, CEOs, managing directors) to think analytically and critically.

English was used for all the questionnaires with the agreement of the majority of the Swiss respondents. To maximize response, different strategies were used, such as making more contacts, altering the length and the form of the survey, a personalized cover letter as well as the promise of feedback and confidentiality. Interestingly, a saffron tea bag was sent with any questionnaire and the respondents were asked to drink them while they were answering the questionnaire. Furthermore, in many places that one of the authors visited and left the survey and in the second or follow-up visit, questions were answered and the completed survey was collected. Data were collected during business operations. However, sometimes, it was necessary to collect the completed surveys while the business was closed or at a convenient time that met the business owner–manager’s schedule.

The data collection lasted between March and August 2006. Care was taken to consider firm size. In the second mail-out, of 263 received responses, 253 were usable, resulting in a good response rate of 28.6%. As a result, 120 firms in the UK and 133 firms in Switzerland were retained as eligible for inclusion in the sample.

The extrapolation procedure of Armstrong and Overton (1977) was used to compare early and late responding firms on the mean values of study variables. For comparison purposes, the total sample was split into two groups, those received before the second wave of mailing and those received after the second wave. We then compared these groups in terms of the mean responses on each variable, the demographic profile [using chi-square tests] and the mean values of all the remaining study variables [using *t* tests]; between early and late respondents, we found no significant differences [at the 0.05 level], leading us to conclude that the probability of a nonresponse bias was minimal.

Measures

All measures were drawn from previous research and carefully aligned with the conceptual aspects of each construct. The research instrument was structured into two parts. Following prior studies associated with entrepreneurship (Gürol and Atsan 2006; Koh 1996; Lee 1997), the first part of the survey instrument included demographic variables to develop a profile of the sample and verify that the two groups of the Swiss and UK entrepreneurs were homogeneous with respect to demographic characteristics. This procedure ensures that the results are not confounded by extraneous factors (Koh 1996). For this purpose, questions on sex, age, and marital status were asked in the first part of the questionnaire. The second part included items to measure the respondent’s encompassed variables to the behavioral entrepreneur’s characteristic measures focusing on different aspects of an entrepreneur’s attributes. To preserve consistency across the questionnaire and to make it easier for the respondents to answer quickly, respondents indicated their level of agreement with these items by using a seven-point Likert-type response style.

A scale was developed to measure each of the seven entrepreneurial characteristics. *Achievement need and autonomy* were measured using five items each from Steers and Braunstein (1976). Respondents indicated their level of agreement with these items by using a seven-point Likert-type response style (1 = *Always*; 7 = *Never*). In prior studies (e.g., Lee 1997; Young and Brymer 2000), this scale has been used frequently.

Propensity for risk taking was measured using eight items from the Jackson personality inventory (Jackson 1976). The eight items used are the same as those selected by Begley and Boyd (1987).

Rotter's (1966) instrument (excluding three items dealing with educational settings (cf. Brousseau and Mallinger 1981) was utilized to measure locus of control.

Tolerance for ambiguity was measured by using six items selected among the 16 items from the scale of intolerance for ambiguity (Budner 1962). We selected items that would be most relevant to company owners and eliminated items dealing with student–teacher relationship and items unrelated to our objective. The responses are coded in a way that higher scores reflected higher levels of tolerance for ambiguity.

Confidence was quantified using six items from the entrepreneurial self-assessment scale (Technonet Asia 1981). In previous research (e.g., Gürol and Atsan 2006; Koh 1996), this scale has been used.

Finally, following the lead of Stewart et al. (1999) and consistent with other entrepreneurship studies (e.g., Sexton and Bowman-Upton 1985; Begley and Boyd 1987; Thomas and Mueller 2000), preference for innovation (*innovativeness*) was measured using statements from the innovativeness subscale of the Jackson Personality Inventory (Jackson 1976). Our data collection consisted of seven items, each measured by a seven-point Likert-type scale ranging from “1” (strongly disagree) to “7” (strongly disagree).

Analysis and results

Descriptive statistics (e.g., means, standard deviations, and frequency distributions) were computed to develop a profile of the sample. To verify whether the Swiss and UK entrepreneurs in the sample were homogeneous with respect to selected demographic (i.e., sex, age, marital status, and education), chi square tests of independence are conducted. To analyze the data, both univariate and multivariate as well as independent sample *t* tests were conducted. At the univariate level, *t* tests of significant differences are performed to investigate if Swiss and UK entrepreneurs are different significantly on the seven behavioral characteristics one at a time. At the multivariate level, logit analysis was performed to test the association between the seven psychological characteristics and Swiss entrepreneur's inclination simultaneously.

Descriptive statistics of samples and variables

The total number of respondents was 253 including 133 entrepreneurs in Switzerland (52.6%) and 120 entrepreneurs in the UK (47.4%). The 133 Swiss entrepreneurs included 35 females and 98 males. The number of female and male in the UK were 26 and 94, respectively. The result provides evidence that the seedbed of the hi-tech industry constitutes an extremely masculine environment in which women are welcome as long as they perform as surrogate men (Acker 2004; Cooper 2000).

The mean age of the entrepreneurs in the UK and Switzerland were 36.9 (SD of 5.74) and 38.1 (SD of 4.29), respectively. The mean age of the women entrepreneurs in the UK tended to be higher than in Switzerland. The mean age of women entrepreneurs in the UK was 39.3 years (SD 4.9) and in Switzerland was 42.2 (SD 3.6). The majority of the entrepreneurs in both countries were between the age of 30

and 40. It is interesting that, in a research regarding high-tech entrepreneurs in the nonmetro West in the US, the average age of entrepreneurs had a mean age of 37 at the time of business startup (Barkley et al. 1990).

As shown in Table 1, in both countries, the number of entrepreneurs older than 60 are near to 1% and most of them are married or have a partner. The results show that young people are more likely involved in high-technology entrepreneurship. Furthermore, in terms of qualifications, 81.2% of the Swiss entrepreneurs and 80.9% of the UK entrepreneurs have a university degree. Thus, Swiss entrepreneurs were slightly more likely to hold higher education qualifications than UK entrepreneurs. These findings are similar to the findings of Barkley et al. (1990) showing that the majority of hi-tech entrepreneurs are highly educated and have collage or university degrees. Therefore, education is an issue of paramount concern in the high-tech industry across different countries.

At the univariate level and at a significance level of 0.05, all demographic variables investigated are significant (Table 2). Accordingly, the two groups of

Table 1 Descriptive statistics of samples and variables

Variable	Total sample	Entrepreneurs	
		Switzerland	UK
Means (standard deviations)	253	133	120
Achievement need	6.01	6.09 (1.12)	6.02 (1.96)
Autonomy	6.29	5.23 (1.01)	6.35 (1.24)
Propensity for risk	5.94	5.80 (1.08)	6.03 (1.15)
Locus of control	6.03	6.01 (1.56)	6.06 (1.02)
Tolerance for ambiguity	6.18	6.22 (1.55)	6.17 (1.27)
Innovativeness	6.19	6.34 (1.29)	6.02 (1.25)
Confidence	6.04	6.09 (1.06)	6.01 (1.28)
Frequency distribution			
Sex			
Male	192 (75.9%)	98 (76.1%)	94 (78.3%)
Female	61 (24.1%)	35 (23.9%)	26 (21.7%)
Age			
<30	72 (28.5%)	31 (23.3%)	28 (23.3%)
30–40	87 (34.4%)	49 (36.8%)	41 (34.2%)
41–50	61 (24.2%)	33 (24.9%)	38 (31.7%)
50–60	30 (11.8%)	18 (13.4%)	12 (10.1%)
>60	3 (1.1%)	2 (1.6%)	1 (0.7%)
Median		30–40	30–40
Mean		38.1 (SD 4.29)	36.9 (SD 5.74)
Marital status			
Single	61 (24.2%)	34 (25.5%)	27 (22.5%)
Married, partnership	192 (75.8%)	99 (74.5%)	93 (77.5%)
Education qualification			
9-year study	7 (2.8%)	3 (2.3%)	4 (3.3%)
Diploma 12-year study	41 (16.2%)	22 (16.5%)	19 (15.8%)
BA/BSc	102 (40.3%)	49 (36.8%)	53 (44.6%)
MA/MSc/MBA	103 (40.7%)	59 (44.4%)	44 (36.3%)
Ph.D.	–	–	–
Median		MA/MSc/MBA	BA/BSc

Table 2 Results of univariate tests—Chi square tests of independence

Variable	<i>df</i>	χ^2	<i>p</i> value
Sex	1	29.674	0.000
Age	10	32.646	0.000
Marital status	1	39.761	0.000
Education	3	48.169	0.000

entrepreneurs can be considered homogeneous with respect to gender, age, marital status, and education.

Reliability analysis

Reliability analysis of the measures utilized for the multidimensional constructs of needs for achievement, autonomy, propensity for risk, locus of control, tolerance for ambiguity, innovativeness, and confidence was conducted by utilizing Cronbach's coefficient alpha (Churchill 1979). In Table 3, the overall coefficient alpha score for each construct suggests a high level of reliability since in each case the value is greater than the suggested cutoff level of 0.7 (Nunnally 1978).

Given the results of reliability analysis, it is possible to test for differences between Swiss and UK techno-entrepreneurs with respect to the seven behavioral characteristics identified in the study without the confounding effects of demographic variables.

Statistical tests

A test of normality was conducted to calculate the Kolmogorov–Smirnov statistic. Based on the aggregate scores for all entrepreneurial characteristic scale items, the Kolmogorov–Smirnov statistic was conducted indicating that the scores were normally distributed. Since parametric testing is more powerful and the samples were normally distributed, independent sample *t* tests were used to compare differences in the mean scores for Swiss and the UK techno-entrepreneurs.

Overall, the mean scores shown in Table 4 are consistent with the expectation that UK entrepreneurs have higher mean scores in entrepreneurial characteristics than Swiss entrepreneurs. However, there are some interesting points in the results. While

Table 3 Results of reliability on measures

Variable	Reliability entrepreneurs and employees compared						
	Achievement	Autonomy	Propensity for risk	Locus of control	Tolerance for ambiguity	Innovativeness	Confidence
Swiss entrepreneurs	0.925	0.897	0.789	0.846	0.801	0.827	0.832
UK entrepreneurs	0.845	0.758	0.710	0.733	0.793	0.779	0.801

Table 4 Results of univariate tests—*t* tests of significant differences

Variable	Means scores		<i>t</i> value	<i>p</i> value
	Swiss entrepreneurs	UK employees		
Achievement need	6.09 (1.12)	6.02 (1.96)	4.147	0.000
Autonomy	5.23 (1.01)	6.35 (1.24)	5.417	0.000
Propensity for risk	5.80 (1.08)	6.03 (1.15)	2.147	0.035
Locus of control	6.01 (1.56)	6.06 (1.02)	2.070	0.022
Tolerance for ambiguity	6.22 (1.55)	6.17 (1.27)	3.613	0.011
Innovativeness	6.34 (1.29)	6.02 (1.25)	2.365	0.021
Confidence	6.09 (1.06)	6.01 (1.28)	3.256	0.028

some entrepreneurial characteristics levels such as autonomy (*mean*=6.35), propensity for risk (*mean*=6.03), and locus of control (*mean*=6.06) are slightly more likely to be higher in the UK entrepreneurs than in Swiss entrepreneurs, achievement need (*mean*=6.09), tolerance for ambiguity (*mean*=6.22), innovativeness (*mean*=6.34), and confidence (*mean*=6.09) are slightly more likely to be higher in Swiss entrepreneurs than in the UK entrepreneurs.

To investigate the differences statistically at the univariate level, *t* tests of significant differences were conducted. At a 0.05 significance level, Table 4 exhibits those entrepreneurs who have a significantly greater need for achievement (*p*=0.000), higher need for independence (autonomy; *p*=0.000), higher propensity to take risk (*p*=0.035), more internal locus of control (*p*=0.020), greater tolerance of ambiguity (*p*=0.010), greater innovativeness (*p*=0.020), and self-confidence (*p*=0.020). Unlike the findings of Koh (1996), in this study, all entrepreneurial characteristics are significant at a 0.05 level.

Results of multivariate analysis

To further investigate the entrepreneurial characteristics in a multivariate setting, logit analysis was performed. The dependent variable is Swiss entrepreneurs and the independent variables are the seven entrepreneurial characteristics. Logit analysis results are summarized in Table 5. As shown, the logit model has a *p* value of 0.0049, indicating a good fit. The results of logit analysis are consistent with those of the *t* tests in that, at a 0.05 level of significance, achievement need, autonomy,

Table 5 Results of multivariate analysis—logit analysis results

Variable	<i>df</i>	Coefficient	Chi-square	<i>p</i> value
Intercept	1	29.4523	5.2768	0.0049
Achievement need	1	-2.5498	2.3786	0.0009
Autonomy	1	-1.0983	4.3197	0.0004
Propensity for risk	1	-2.3376	3.1202	0.0001
Locus of control	1	-1.8272	4.1992	0.0000
Tolerance for ambiguity	1	-3.2278	3.2980	0.0000
Innovativeness	1	-2.2901	2.1890	0.0000
Confidence	1	-2.2792	4.2981	0.0003
Model (-2Log L)			54.3839	0.0001

propensity for risk, locus of control, tolerance for ambiguity, innovativeness, and confidence are statistically significant. The negative coefficients indicate that Swiss entrepreneurs have a great achievement need, high autonomy, great propensity for risk, high locus of control, high tolerance for ambiguity, great innovativeness, and much confidence.

Discussion

This paper reports the findings of a study of 133 Swiss and 120 UK techno-entrepreneurs with respect to seven entrepreneurial characteristics. The main objective of the study was to explore the entrepreneurship profile of Swiss high-tech entrepreneurs and evaluate their entrepreneurial orientation by comparison to a similar sample of UK entrepreneurs. The results of the analysis provide general support for the proposition that the prevalence of characteristics associated with entrepreneurial success are higher among UK entrepreneurs than among Swiss entrepreneurs. However, these results exhibit some mixed support for earlier arguments about Swiss entrepreneurship. For example, although the findings reveal that UK entrepreneurs are more likely risk takers than Swiss entrepreneurs as expected, innovativeness in Swiss entrepreneurs is slightly higher than in UK entrepreneurs. Also, findings reveal that while some entrepreneurial characteristics such as autonomy, propensity for risk, and locus of control are more likely to be higher among UK entrepreneurs, achievement need, tolerance for ambiguity, innovativeness, and confidence are more likely to be higher among Swiss entrepreneurs. That is, Swiss entrepreneurs are more likely to have a greater need for achievement, higher tolerance of ambiguity, greater innovativeness, and a higher confidence compared with entrepreneurs in the UK.

These results help to build a more complete picture of the Swiss entrepreneur. Similar to prior research regarding entrepreneur characteristics, Swiss entrepreneurs seem likely to be motivated by challenging tasks and the wish to create something lasting, to realize their own ideas, determined to fulfill their needs to achieve and do their job perfectly, with strong internal locus of control. They have high tolerance of ambiguity and confidence to do their job well. However, the findings also show that autonomy and propensity for risk are relatively low—at least compared to the UK entrepreneurs.

To explain these differences between UK and Swiss entrepreneurs, entrepreneurship must be understood in its social and cultural contexts. The most common strategy found in cross-cultural research is to compare groups from very different perspectives (e.g., Japan vs. the US) because it increases cultural specificity. On the other hand, some researchers have compared two rather similar cultures (e.g., Norway and the US by Sørnes et al. 2003).

A useful tool in comparing cultures is Hofstede's (1980) dimensions of culture framework. Regarding propensity for risk, the Swiss entrepreneur's score is lower than that of the UK entrepreneurs (Table 4). Similarly, Hofstede's uncertainty avoidance dimension for Swiss culture is 58, while for the UK culture it is 35 indicating that Swiss people are rather averse to risk taking, so it may influence their entrepreneurial behaviors. In contrast with the individualism dimension reported by

Hofstede (1980) which is close to autonomy in entrepreneurial behavior, Swiss entrepreneur score is lower than that in the UK, while Hofstede (1980) found that individualism in Switzerland is 68 and in the UK it is 89.

It should be noted that the overall results of research on these characteristics remains inconclusive. In entrepreneurship literature, research either supports or refutes the relationship among the behavioral characteristics. Some scholars (e.g., Gürol and Atsan 2006; Robinson et al. 1991) believe that methodological, definitional, and conceptual complexities are regarded as the major reasons of these differences.

One of the main findings of this paper is that, despite the existing argument that “Switzerland suffers from lack of entrepreneurial activity,” it can be argued that perhaps there is a lack of entrepreneurial zest in relative terms but not in absolute terms. Switzerland is not like Soviet Russia where the state subsumed most entrepreneurial activity. A developed country would never have achieved its very high level of development without entrepreneurial activity.

A salient feature of entrepreneurship is risk taking. Our findings support the view that Swiss are more reluctant to take risks and establish businesses on their own, preferring the security of being an employee. The Swiss education system could help to change this attitude toward risk—at least in an entrepreneurial setting. The spirit of enterprise at a personal level from an early stage of study should be awakened and, at the higher levels, young people can be encouraged to be enterprising, in the widest meaning of the word.

Conclusions

As with any research project of this nature, there are limitations. First, the study is limited to Swiss and UK high-tech firms. Generalizing the results to other industries and countries may not be appropriate. Second, all data were collected in a cross-sectional manner, so all we can conclude is that the role variables and their posited consequences are related at one point in time.

Three major priorities are proposed for future research. First, it would be useful to replicate this study and repeat this model-testing approach using a completely different sample. Interesting comparisons could then be undertaken by using an identical model for a developing country and a different industry and then comparing the estimated structural parameters. Second, more antecedent variables could be incorporated into the model. And, finally, using a longitudinal study may help to identify the direction of causality between variables.

Contribution to entrepreneurship research and implications for public policy

There is little published research about the characteristics of entrepreneurship in Switzerland compared to other national contexts. A failure to understand factors which stimulate or retard entrepreneurial activity in Switzerland puts their corporations and educators at a disadvantage in this time of globalization. Trade agreements such as the North American Free Trade Agreement and Central America Free Trade Agreement are pushing entrepreneurial companies toward more international collaborations making it important to understand what characteristics are associated with leadership and professional success (Duffy et al. 2006).

The increasing push toward business partnerships among companies in the UK and Switzerland suggests that firms that understand the characteristics and experiences of entrepreneurship in these countries could turn the development of leadership talent into a major competitive advantage. Within the UK and Swiss communities, there is now a growing realization and recognition of the vital contribution that traditional entrepreneurs can make to the growth of different-size business enterprises and how, in turn, the business sector can be used to serve the holistic economic development and social advancement needs and interests of indigenous peoples.

In considering the nature of the entrepreneurship in the UK, most academic research offers a rich analysis of the entrepreneurial events, activities, and personalities which underpin this thriving business sector (Dhaliwal and Adcroft 2005). However, much of this analysis lacks a hard empirical economic foundation (Dhaliwal and Adcroft 2005) with voids existing in comparative research vis-à-vis other European countries such as Switzerland.

From a public policy perspective, education and training intervention programs are indicated to encourage entrepreneurship in the community. Chia (1996) suggests that a radical change in intellectual and educational priorities is needed in university business schools. As Swiss practitioners have suggested and in light of increasing demand globally, our findings support the view that Swiss schools should pay more attention to this need and strive to improve the educational entrepreneurial system.

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