

5 Entrepreneurship *and* Education: What *is* Known *and* Not Known *about the* Links Between Education *and* Entrepreneurial Activity

Synopsis

The importance of individual entrepreneurial activity to economic growth and well-being at the national level for both industrialized and developing countries is well established.¹ Research has suggested important links between education and venture creation and entrepreneurial performance. To the extent that education can provide both a greater supply of entrepreneurs and higher levels of entrepreneurial performance, appropriate investments are justified. Thus the question of the significance of the impact of education on selection into entrepreneurship and entrepreneurial performance is an important one. This paper provides a review of research that examines the relationship between both general education and education specific to entrepreneurship, and entrepreneurship and entrepreneurial performance.

A review of recent research measuring the impact of general education on entrepreneurship and entrepreneurial performance suggests three key generalizations. First, the evidence suggesting a positive link between education and entrepreneurial performance is robust. Second, although the link between education and selection into entrepreneurship is somewhat ambiguous, evidence suggests that when “necessity entrepreneurship” and “opportunity entrepreneurship” are considered separately, and when country differences are considered, the link is less ambiguous. Finally, the relationship between education and selection into entrepreneurship is not linear in nature. The highest levels of entrepreneurship are linked to individuals with at least some college education. Education beyond a baccalaureate degree has generally not been found to be positively linked to entrepreneurship.

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The findings of the review of research specific to entrepreneurship education indicate that although existing research does not provide definitive evidence of direct economic impacts from entrepreneurship education, the research does provide evidence suggesting such links. The review acknowledges the limitations, both methodologically and theoretically, of current entrepreneurship education research, but also reveals the growing understanding of how the precursors of entrepreneurial activity can be important and measurable outcomes for entrepreneurship education. Finally, based on what is learned about the state of entrepreneurship education in this review, this chapter discusses a number of important policy implications for organizations supporting entrepreneurship education.

Introduction

The primary purpose of this research is to evaluate the impact of education on entrepreneurial activity. Four key research questions are posed. First, as an individual's level of general education increases, does the probability of selection into entrepreneurship increase?² Second, is the level of education linked to entrepreneurial performance? Third, does education specific to entrepreneurship lead to higher rates of selection into entrepreneurship? Finally, is education specific to entrepreneurship linked to entrepreneurial performance? The acknowledged importance of entrepreneurship to the economic well-being of a nation and the role of education in encouraging and supporting entrepreneurial activity make these important research questions. The following sections will provide a review of recent research that empirically measures the relationship between general education and entrepreneurship education and entrepreneurial activity.

A Review of Research Linking General Education and Entrepreneurial Activity

Study Purpose

The significant impact of entrepreneurship on the economy of the United States, as well as the economic well-being of both industrialized and develop-

2 "Selection into entrepreneurship" means the choice of an individual to forego employment with an existing business in order to pursue some form of self-employment.

ing countries, is well established. Research specific to entrepreneurial activity is both widespread and multidisciplinary in nature. A fundamental assumption that seems to permeate much of the research on entrepreneurship is the positive relationship between education and entrepreneurial activity. In recent years, several international studies have called into question this general assumption. The authors of the Global Entrepreneurship Monitor (GEM) research program, one of the first multi-country studies focusing on a wide range of entrepreneurial issues, suggest from their findings that when viewed across a wide range of countries (34 in 2004) the relationship between the average level of general education and the rate of venture formation is ambiguous and differs greatly across countries.³ Van der Sluis and colleagues, in two of the most comprehensive meta-analyses of existing research, reach a similar conclusion regarding the relationship between general education and new venture formation, but conclude that the evidence is quite strong indicating a positive relationship between education and entrepreneurial performance.⁴ Both of these studies appear to somewhat contradict a wide range of studies reporting positive relationships between education and entrepreneurial activity. The following section will provide a brief review of some of the most recently published research studies and the explanations the studies' authors have offered for the sometimes contradictory findings.

Study Methodology

The following review of the literature has a specific focus on empirical research linking general education to entrepreneurial activity and entrepreneurial firm success and survival, and draws specifically on research published in the past 10 years. Articles for inclusion in this overview were obtained from a wide range of published sources by a thorough database search utilizing ABI/Inform Complete, the Social Sciences Research Network (SSRN) electronic library, the Journal Storage Project (JSTOR) electronic library, the Organisation for Economic Cooperation and Development (OECD) publication archive, and an iterative process utilizing citations provided by recently published research. Because research relating to the economic returns for education is of such great interest, studies span a wide range of academic disciplines including econom-

3 Acs, Arenius, Hay, and Minniti, 2004; Autio, 2005; Minniti and Bygrave, 2003; Neck, Zacharakis, Bygrave, and Reynolds, 2003.

4 Van der Sluis, van Praag, and Vijverberg, 2004; 2005.

ics, sociology, and management, among others. Additionally, the published proceedings of three entrepreneurship-focused organizations, the United States Association for Small Business and Entrepreneurship (USASBE), the International Council of Small Business (ICSB), and the Babson-Kauffman Entrepreneurship Conference were reviewed.

Defining Education and Entrepreneurial Outcomes

One difficulty in aggregating research across disciplines, national settings, and time is the wide range of definitions operationalized by researchers relating to both education and entrepreneurship.⁵ Education level has alternately been measured in terms of “total years of education,” or operationalized as a dummy variable denoting “secondary school graduate,” or “college graduate.” In some studies, the acquiring of an advanced graduate degree is the key variable studied. A wide range of measures have also been employed for entrepreneurship and entrepreneurial performance. In some cases, entry into self-employment is the operative measure of entrepreneurship, while in others it is the formation of a new venture. Entrepreneurial performance has been operationalized in such measures at the firm level as “growth in sales,” “growth in profits,” and “innovation.” At the level of the entrepreneur it is measured primarily in terms of “growth in personal income,” or “income in comparison to wage earners.” Table 5A.1 in the appendix to this chapter provides a brief description of the studies included in this review and how each has operationalized measures of education, entrepreneurship, and entrepreneurial performance. These definitional differences have been offered as explanation by some studies for the contradictory findings sometimes evidenced.

Findings

The literature search yielded 30 studies that explicitly measure the relationship between education and entrepreneurship or education and entrepreneurial performance. Of these studies, twelve were U.S.-based, ten were drawn from Europe, one from Asia, three from Africa, and four included data drawn from multiple countries. Additionally, two meta-analyses drawing on both published and unpublished research going back as far as the early 1980s were identified and are included in this review.

⁵ Ibid.

The most definitive studies aimed at aggregating research measuring general education and entrepreneurship and entrepreneurial performance are those by van der Sluis, van Praag and Vijverberg.⁶ The 2004 meta-analysis had as its focus research done in industrialized countries and drew on 94 published and unpublished studies dating to as early as the 1980s. The 2005 meta-analysis focused on research done in developing countries and drew on 60 published and unpublished studies from the same time period. The primary conclusions drawn by the researchers in both studies were similar. First, even given the definitional and measurement difficulties discussed earlier, the researchers conclude that the preponderance of the evidence, in both developing and industrialized nations, supports a positive and significant relationship between the level of education of the entrepreneur and entrepreneurial performance. They conclude that the higher the level of education of the entrepreneur, the higher the level of performance of the venture—whether measured as growth, profits, or earnings power of the entrepreneur. Second, the researchers conclude that the evidence linking general education and selection into entrepreneurship, however measured, is ambiguous and cannot be classified as either positive or negative. These findings are not dissimilar to those expressed by the GEM researchers, who conclude that evidence linking education to entrepreneurial performance is strong, while that linking education to entrepreneurial activity is ambiguous when viewed across national boundaries.⁷

Somewhat different conclusions from those drawn by van der Sluis et al. are suggested by a brief review of 30 published articles describing research done since 1995 (Table 5A.1); for example, the latter finds:

- An individual's educational level is positively associated with the probability of selection into entrepreneurship (or self-employment);
- The higher the average education level in a country, the higher the rates of venture formation;
- Education beyond a baccalaureate degree has generally not been found to be positively linked to selection into entrepreneurship;
- In studies including a broad range of socioeconomic and institutional variables as predictors of selection into entrepreneurship, education is generally the strongest predictor;

6 Ibid.

7 Acs, Arenius, Hay, and Minniti, 2004.

- Significant differences in the impact of education on entrepreneurial activity are seen based on ethnicity, but not on gender;
- A significant and positive relationship is observed between the educational level of the entrepreneur (or entrepreneurial team) and various venture performance measures including profitability, growth, and innovation;
- The educational attainment of the entrepreneur (or entrepreneurial team) has not been shown to significantly affect firm survival.

Although these generalizations are consistent with those expressed by both van der Sluis, et al., and other studies regarding the relationship between education and entrepreneurial performance, they do diverge with respect to the relationship between education and selection into entrepreneurship. Three additional conclusions drawn from the research presented in Table 5A.1 may help in providing an explanation. First, the findings of those studies utilizing data drawn from multiple countries suggest important differences across countries in the impact of education on selection into entrepreneurship.⁸ Second, when venture type—that is, “necessity” versus “opportunity” entrepreneurship—is considered, significant differences exist.⁹ Finally, a number of studies seem to suggest that the relationship between education and selection into entrepreneurship is not linear in nature, with both the lowest and highest levels of education having little impact on selection into entrepreneurship.¹⁰ All three conclusions would appear to be linked. In countries where necessity entrepreneurship is most prevalent, educational attainment would have little impact on selection into entrepreneurship. Van der Sluis et al. offer an economic explanation as to why higher levels of education might in fact have an inverse relationship to selection into entrepreneurship in countries with strong economic opportunities.¹¹ They cite Le’s argument that higher levels of education might offer greater opportunities for high-paid wage employment, making selection into

8 Arenius and DeClercq, 2005; Delmar and Davidsson, 2000; McManus, 2000; Uhlaner, Thurik, and Hutjes, 2002.

9 Block and Wagner, 2006; Lofstrom and Wang, 2006; McManus, 2000. Necessity entrepreneurship is entrepreneurial behavior typically driven by the lack of job alternatives, while opportunity entrepreneurship is entrepreneurial behavior that is in response to the recognition of a previously unexploited business opportunity (Reynolds et al., 2005).

10 Minniti and Bygrave, 2004; Neck, Zacharakis, Bygrave, and Reynolds, 2003.

11 Van der Sluis et al., 2004.

entrepreneurship a more difficult choice.¹² The studies conducted by van der Sluis et al., while controlling for country of origin, are unable to control for differences in the types of entrepreneurship—necessity or opportunity—since few of the studies included in their analyses do so.

In brief, it would appear that there is sufficient evidence to suggest that the level of educational attainment by entrepreneurs is significantly and positively associated with entrepreneurial performance. The evidence linking education to selection into entrepreneurship is more ambiguous and differs in important ways across countries. When individual countries are considered, particularly developed economies, a positive relationship does appear to exist between the level of education of an individual and the probability of selection into entrepreneurship, but this relationship is not linear in nature. Individuals with at least some college education appear to be the most likely to select into entrepreneurship, while more highly educated individuals are not.

A Review of Research Linking Entrepreneurship Education and Entrepreneurial Activity

Growth in Entrepreneurship Education

Scholars and researchers in entrepreneurship education in the United States have reported that small business management and entrepreneurship courses at both the two- and four-year college and university levels have grown in both the number and diversity of course offerings from 1990 to 2005. The current number of colleges and universities offering small business management and entrepreneurship education programs has grown to 1,600 (Chart 5.1).¹³

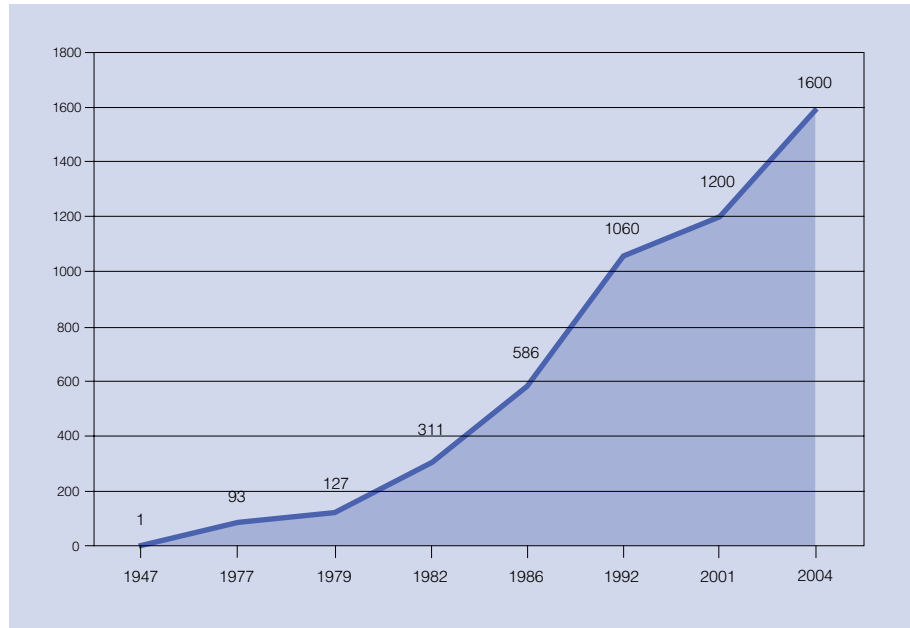
Recent studies indicate that the real total may be far greater and that the course offerings represent a broader range of topics. This expansion of educational offerings has been fueled in part by dissatisfaction with the traditional Fortune 500 focus of business education—dissatisfaction voiced by students and accreditation bodies.¹⁴ The dilemma is not that demand is high but that

12 Le, 1999.

13 Solomon et al., 2002; Solomon et al., 1994; Solomon and Fernald, 1991; Solomon, 1979; and Solomon and Sollosy, 1977.

14 Solomon and Fernald, 1991.

Chart 5.1. Number of Schools Offering Courses in Small Business Management and Entrepreneurship, 1947–2004



Sources: Solomon, et al., 2002; Solomon et al., 1994; Solomon and Fernald, 1991; Solomon, 1979; and Solomon and Sollosy, 1977

the pedagogy selected meets the new and innovative and creative mindset of students. Plaschka and Welsch recommend an increased focus on entrepreneurial education and more reality- and experientially-based pedagogies such as those recommended by Porter and McKibbin.¹⁵

The challenge to educators has been to craft courses, programs and major fields of study that meet the rigors of academia while keeping a reality-based focus and entrepreneurial climate in the learning experience environment. If entrepreneurship education is to produce entrepreneurial founders capable of generating real enterprise growth and wealth, the challenge to educators will be to craft courses, programs, and major fields of study that meet the rigors of academia while keeping a reality-based focus and an entrepreneurial climate in the learning experience environment. In addition, the need for new ways of

¹⁵ Plaschka and Welsch, 1990; Porter and McKibbin, 1988.

thinking to remain competitive has led to entrepreneurship education being applied outside of higher education.

The entrepreneurial experience can be characterized as being chaotic and ill-defined, and entrepreneurship education pedagogies appear to reflect this characterization. In addition, the assumption is often made that it is relatively easy for entrepreneurship students to develop new ideas for their business start-ups. Quite a number of researchers have written about entrepreneurial competencies; however, the competencies that are required for new business start-ups are often addressed by educators in an ad hoc manner. There is little consensus on just what exactly entrepreneurship students should be taught. For entrepreneurship educators, the challenge is to provide the subject matter, resources, and experiences that will prepare entrepreneurship students to cope with the myriad expectations and demands they will face as they start their new ventures. More important, administrators and funders now have added to the discussion by requiring outcome measures—specifically, the number of new business starts as a result of students taking entrepreneurship education courses and programs. Recently *Entrepreneur* magazine joined *The Princeton Review* in ranking entrepreneurship programs. Among the criteria for judging the importance of the entrepreneurial program was the number of business starts generated by students and alumni.

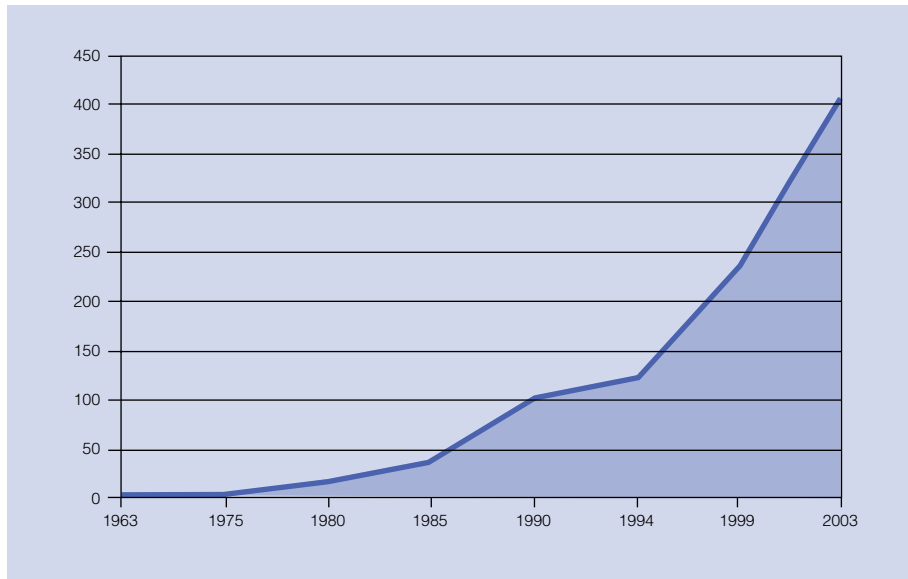
Equally impressive in terms of growth are endowed positions at U.S. colleges and universities. The number of chairs and professorships in entrepreneurship and related fields grew 71 percent, from 237 in 1999 to 406 in 2003 (Chart 5.2). Economists talk about “dollar votes” or voting with one’s checkbook, and if that is truly possible, then the popular and government evaluation of endowed positions in entrepreneurship is highly positive, with over a quarter of a billion dollars being spent on newly endowed positions in the past four years. The situation in the United States parallels the situation worldwide, with 563 endowed positions around the world, up from 271 in 1999.¹⁶

Based on the 1999 survey, the growth in the number of positions in the United States (237 to 406) resulted in a new endowed position every eight days.¹⁷ The rate of growth has been accelerating, as can be seen by the increasingly steep

¹⁶ Katz, 2004.

¹⁷ Ibid.

Chart 5.2 Number of Endowed Positions in the United States, 1962–2003



Source: Katz, 2004.

line in Chart 5.2. The earlier growth rates since 1995 were a new endowed position every:

- 8 days (1995–2003);
- 11 days (1995–1999, 112 to 234 positions);
- 66 days (1991–1994, 97 to 112 positions);
- 46 days (1980–1990, 18 to 97 positions); and
- 343 days (1963–1980, 1 to 18 positions).¹⁸

This growth in endowed chairs is directly correlated to the growth of entrepreneurial activity in the United States. Many successful entrepreneurs are “giving back” to their alma maters in hopes of creating the next generation of entrepreneurs. Colleges and universities see the acquisition of endowed chairs and centers as an opportunity to integrate the theory and concepts in the classroom with the practical reality of starting, managing, and growing new ventures. The significant growth in funding support and educational programs unique

¹⁸ Ibid.

to entrepreneurship education leads to the question, “Does education that is uniquely designed to train entrepreneurs lead to entrepreneurial activity?”

Relationship of Entrepreneurial Education and Entrepreneurship: Study Purpose

The purpose of the following section is to review existing research linking various forms of entrepreneurial education to entrepreneurial activity, specifically, those empirical studies linking education both to the act of venture creation and to those antecedents that have been proposed as directly linked to entrepreneurial activity. The overview of research is limited to research published in peer-reviewed outlets between 1995 and 2005. Gorman, Hanlon, and King provide a review of such research for the period between 1985 and 1994, and Dainow provides a review of research prior to 1985.¹⁹ Both reviews look at a wide range of entrepreneurial education issues, and each provides an overview of research linking such education to entrepreneurial outcomes. The findings of these and other earlier studies will be briefly summarized as part of this review. Although a relatively broad body of research focuses on entrepreneurial education and its relationship to the ongoing management of entrepreneurial firms and small- to medium-sized enterprises, this overview is limited to research specifically focusing on new venture creation.

Overview of Theoretical Frameworks Linking Education and Entrepreneurial Activity

A brief review of some theoretical frameworks historically utilized in developing and understanding entrepreneurship education may be of some value. Béchar and Grégoire report, based on their review of entrepreneurship education research, that such research is principally underpinned by academic theories (62.5 percent of the research they reviewed) and less often by social and technical theories (21.2 and 10.6 percent of the research they reviewed).²⁰ Two of the most often utilized theories are Bandura’s “social learning theory” and “action learning theory.”²¹ Bandura’s theory provides a framework involving five steps necessary for learning:

19 Gorman, Hanlon, and King, 1997; Dainow, 1986.

20 Béchar and Grégoire, 2005.

21 “Social learning theory,” Human, Clark, and Baucus, 2005; “action learning theory,” Leitch and Harrison, 1999.

1) skill and attitude assessment, 2) skill and attitude learning, 3) behavioral guidelines and action steps, 4) skill and attitude analysis, and 5) skill practice.²² The model of action learning was first proposed by Revans and focuses on learning through reflection on actions being taken in solving real organizational problems.²³ While these are only two of many theoretical frameworks utilized, they suggest that a primary focus for entrepreneurial education is the impact of such education on attitudes, skill development, and entrepreneurial actions.

Defining Entrepreneurial Education and Activity

A number of previous writers have pointed out the significant definitional weaknesses that exist in entrepreneurship education research.²⁴ As noted by Sexton and Bowman, the most fundamental problem is the definition of entrepreneurial activity—whether it is the founding of a new venture, the acquisition of an existing business, or the management of an ongoing small- to medium-sized firm.²⁵ De Faoite, Henry, Johnson, and van der Sijde suggest that the activity of interest is most often categorized as either the implementation of a venture or the raising of entrepreneurial awareness, that entrepreneurial education should be considered distinctly different from management training and business skill development, and that it should be specific to a unique stage of the business life cycle.²⁶

Entrepreneurship education is often delineated based on the educational source—higher education, vocational training programs, continuing education, or secondary school programs²⁷—or the structure of the education—didactic, skill-building or inductive.²⁸ Unfortunately many entrepreneurship education studies do not provide the underlying theories or strategies employed in the educational intervention. Since most do provide the source of the educational program, this paper uses the organizational framework based on the categori-

22 Human, Clark, and Baucus, 2005.

23 Revans, 1971; Leitch and Harrison, 1999.

24 Matlay, 2005.

25 Sexton and Bowman, 1984.

26 De Faoite, Henry, Johnson, and van der Sijde, 2003.

27 Béchard and Grégoire, 2005; Gartner and Vesper, 1994; Raffo, Lovatt, Banks, and O'Connor, 2000; Sexton and Bowman, 1984.

28 Garavan and O'Cinneide, 1994.

zation scheme employed by Raffo, Lovatt, Banks, and O'Connor.²⁹ They categorize the source of the entrepreneurial training and education as “higher education” (HE), “further education” (FE), and other “vocational education training” (VET). This categorization unfortunately does not clearly delineate education at the secondary level, and it will be noted here when the education course or training offering is at that level.

Following the suggestion of De Faoite and colleagues, attention is focused here on research specific to either the founding of an entrepreneurial venture or the “raising of awareness” associated with the act of entrepreneurship.³⁰ In specific, as it relates to entrepreneurial awareness, a review of recent research suggests five antecedents for venture creation. These include “entrepreneurial intentions,” “opportunity recognition,” “entrepreneurial self-efficacy,” certain psychological characteristics, and “entrepreneurial knowledge.”³¹

General Findings of Earlier Research

Gorman, Hanlon, and King conducted a survey of entrepreneurship education research published between 1985 and 1994.³² Although their focus was relatively broad (both theoretical and empirical research), they provided a detailed review of empirical research published in leading academic journals that focused on the antecedents of venture creation and the ongoing management of entrepreneurial firms. Their review located 63 articles divided between those focusing on venture creation and those focusing on the management of small- to medium-sized firms. They suggested that the central theme in the research they reviewed is the extent to which formal education can contribute to entrepreneurship. The authors noted that most of the research they reviewed consisted of specific program descriptions and evaluations of those programs. They argued that the existing empirical research published during the time period of their review seems to suggest a consensus among researchers that entrepreneurship can be taught and that entrepreneurial attributes can

29 Raffo, Lovatt, Banks, and O'Connor, 2000.

30 De Faoite, Henry, Johnson, and van der Sijde, 2003.

31 “Entrepreneurial intentions,” Autio, Keelyey, Klofsten, and Ulfstedt, 1997, Krueger and Carsrud, 1993; “opportunity recognition,” DeTienne and Chandler, 2004, Dimov, 2003; “entrepreneurial self-efficacy,” Alvarez and Jung, 2003; psychological characteristics, Hansemark, 1998; “entrepreneurial knowledge,” Kourilsky and Esfandiari, 1997.

32 Gorman, Hanlon, and King, 1997.

be positively influenced by educational programs. The authors conclude that research on education for entrepreneurship, as of 1994, was still in the exploratory stages, with most studies utilizing cross-sectional survey designs and self-reports, with few basic experimental controls employed.

In one of the earliest studies of entrepreneurship education, Dainow reviewed entrepreneurship education literature for a ten-year period prior to 1984.³³ In his findings, Dainow noted a limited number of empirical studies focusing on entrepreneurship education. He concluded that there was a significant need for a more systematic collection of data and a more varied methodological framework to move research in the area forward.

Study Methodology

The following review of the literature builds upon the Gorman, Hanlon, and King, and the Dainow studies, but with a specific focus on empirical research linking entrepreneurship education and entrepreneurial action. Accordingly, published articles for inclusion in this overview of entrepreneurship education research were obtained by a thorough database search utilizing ABI/Inform Complete with a broad array of search terms related to entrepreneurship education. The articles are drawn from a wide range of peer-reviewed journals. Additionally, the published proceedings of three entrepreneurship-focused organizations—the United States Association for Small Business and Entrepreneurship (USASBE), the International Council of Small Business (ICSB), and the Babson-Kauffman Entrepreneurship Conference—were reviewed for the study period of 1995–2005. These organizations in particular have a stated purpose of supporting the dissemination of research relating specifically to entrepreneurship education. Articles were categorized as empirical, theoretical, or descriptive, and based on the type of education program studied. Only those empirical articles that reported specific findings related to entrepreneurship education and the links of such education to entrepreneurial antecedents and outcomes associated with new venture formation were included in the overview (Table 5A.2). Although the studies included are not the full range of studies done during the study period, they provide a good representation. Undoubtedly, additional reports relating to specific and unique programs exist that may not be published in either peer-reviewed journals or

33 Dainow, 1986.

peer-reviewed conference proceedings, but may appear as narrowly published program reports.

Findings

Of the empirical research articles included in this review, seven were located that attempted to measure the impact of some form of education specifically on the act of venture creation (Table 5A.2). All but one of the studies focused on the outcomes of a specific educational program. Most of the studies were located at the university level, but two reported the results of vocational education programs and one reported the results of a continuing education program. In general, the study authors concluded that there was a significant and positive correlation between participation in the educational programs and venture creation. In those that compared program participants and nonprogram participants, higher rates of venture creation were reported for program participants.

Entrepreneurial intention—the expressed intention to start a venture at some point in the future—is the most often studied antecedent of venture creation. This research draws on a well-established body of literature linking intentions to subsequent actions³⁴ and has been proposed for some time as the best predictor of entrepreneurial behavior.³⁵ Six studies testing the relationship between entrepreneurial education and entrepreneurial intentions were located: five were conducted at the university level and one was a vocational training program at the secondary school level. In general, the studies found a positive correlation between entrepreneurial education and the expressed “intent” to form a venture at some point in time. Interestingly, one study noted that a majority of those students expressing an intention to found a venture indicated that they planned to start the venture only after an extended period of 10 years or more. Studies noted that prior work experience affected both participation in the training programs and subsequent intentions to start a venture.

A second antecedent of venture creation measured as an outcome of entrepreneurial education is that of “opportunity recognition.” The implicit assumption of these studies is that the ability to recognize venture opportunities will be positively linked to the subsequent creation of ventures, although there is

34 Ajzen, 1987; Ajzen and Fishbein, 1980.

35 Honig, 2004; Krueger and Carsrud, 1993; Shapero 1975, 1982.

limited evidence of this linkage. Three studies were located that measured the impact of education on opportunity recognition. In one study, a link was shown between entrepreneurial education, recognition of entrepreneurship as personally desirable, and the level of opportunity recognition. A second study linked specific skill training with opportunity recognition, and a third found a negative correlation between prior industry-specific knowledge and opportunity recognition.

Four studies tested the link between entrepreneurial education and entrepreneurial self-efficacy—an individual’s belief that he or she is capable of entrepreneurial behavior. Three of the studies were conducted at the university level and one at the secondary school level. In general the studies conclude that entrepreneurial training positively affects an individual’s perception of their ability to start a new venture.

In addition to these three proposed antecedents to venture creation, one study sought to measure the relationship between an entrepreneurial vocational training program and the participants’ “need for achievement” and “locus of control.” The implied assumption was that those individuals scoring higher on these traits might be more likely to engage in entrepreneurial behavior. A positive relationship between training and changes in these two psychological traits was noted. Also, an entrepreneurial vocational training program at the secondary school level sought to measure the relationship between entrepreneurial education and specific entrepreneurial knowledge proposed as necessary for venture creation. The results of the study indicated that the program did increase the levels of specific entrepreneurial knowledge in participants.

In brief, the following conclusions can be drawn from a review of this literature. First, although the volume of empirical research has increased since Dainow’s review in 1986 and has stayed relatively constant with that reviewed by Gorman, Hanlon, and King in 1997, many of the limitations noted by both still seem to persist. Most studies focus on the outcomes of specific educational programs, are exploratory in nature, and employ cross-sectional surveys with few experimental controls. Second, there has been a notable increase in the number of studies focusing on entrepreneurial intentions as a precursor of entrepreneurial behavior following on the broad foundation of research suggesting intentions as the best predictor of subsequent behavior. Third, while the most direct measure of venture creation is the act itself, researchers have

come to understand that there may be long time periods between the educational experience and subsequent behavior. Therefore, the focus on proposed antecedents to entrepreneurial behavior has in general gained momentum. Finally, even though the vast majority of research still has as its focus specific and often unique educational programs, the general consensus seems to be that there is a positive correlation between entrepreneurial education and entrepreneurial activity.

Research Implications: What Is Known and Not Yet Known

General Education and Entrepreneurship

The apparent country differences and differences in the types of entrepreneurial opportunities pursued suggest a starting point for understanding why the result of past research measuring the link between general education and selection into entrepreneurship is ambiguous. These findings suggest the importance of considering both the type of entrepreneurship selected by the entrepreneur and the opportunities afforded both by the level of education of the entrepreneur and the economic conditions of the entrepreneur's environment. While the evidence for selection into entrepreneurship may be ambiguous, a strong consensus appears to exist across research studies regarding the significant link between education and entrepreneurial performance. Ultimately, if definitive answers are to be found, a general consensus must be reached regarding how the level of education, selection into entrepreneurship, and entrepreneurial performance are to be operationalized and measured.

Entrepreneurship Education and Entrepreneurship

Given the state of entrepreneurship education research, the strongest conclusion that can be drawn at this point is that there are indications of a positive link between entrepreneurial education and subsequent entrepreneurial activity. The key dilemma facing most researchers is that the evidence also seems to suggest that there might be a lengthy time period between the education experience and subsequent action. This suggests both a need for more long-term longitudinal studies and an increased focus on the antecedents of venture creation. Of equal importance is the need to definitively link any proposed

precursors of behavior to the actual behavior both through strong theoretical foundations and empirical research.

Several limitations in the current body of entrepreneurial education research must also be noted. The overreliance on post hoc survey methodologies, the limited focus on specific, unique, and sometimes nontransferable educational programs, and the probability that only the results of successful programs end up being published, are all critical limitations. Additionally, one of the fundamental difficulties in linking entrepreneurship education to entrepreneurial behavior in general through post hoc analysis or even through experimental analysis of existing educational programs is the concern that there is a selection bias at the outset for students choosing to engage in entrepreneurial education. The work of Sagie and Elizur, for example, highlights that psychological differences exist between students enrolled in entrepreneurship courses and those enrolled in general business and economics.³⁶ These psychological differences are the same as those often measured as antecedents of entrepreneurial behavior.

In spite of these and other measurement difficulties, numerous opportunities exist for future research. First, given the growing empirical research focused on entrepreneurship education, even though the educational programs reviewed are often very different, it may now be possible through meta-analytic techniques to combine existing research with specific outcome measures—particularly venture founding, intentions, and opportunity recognition—to provide a more rigorous test of the impact of entrepreneurial education. Second, the international nature of entrepreneurship education is evident from the research cited here. Interestingly, while there has been much work across countries, little has been done across differing cultures and regions within countries. For example, Audretsch and Lehmann find important differences in the relationship between knowledge spillovers from universities and levels of entrepreneurial activity across regions within the United States.³⁷ Given the seemingly important relationship between education and entrepreneurial knowledge, there may well also be interesting and important differences in how that relationship leads to venture creation across regions. Finally, such studies as the one completed by Sørensen and Chang and the GEM report have suggested a strong relationship

³⁶ Sagie and Elizur, 1999.

³⁷ Audretsch and Lehmann, 2005.

between general education and levels of entrepreneurial activity at the country level.³⁸ For researchers interested in the relationship between entrepreneurial education and venture creation, separating the effects of education in general at the macro level from entrepreneurial education specifically at the program and individual level is both a challenge and a future opportunity.

Policy Implications

Since education has been shown in multiple situations to have a positive impact on formation and venture success measures, ongoing questions include who is going to pay for these educational efforts, why they are going to pay, and what outcomes the funding source should expect. The most common forms of education specific to entrepreneurship are the short courses and seminars run by chambers of commerce, the U.S. Small Business Administration-supported small business development centers (SBDCs), SCORE, women's business centers, trade/professional associations, and university continuing education centers. Rapid increases in academic institutions and courses at the university level show a significant impact in this area. A key question that needs to be answered here is what all of this means from a public policy and support perspective. Research by Autio et al. showed that entrepreneurial intentions can be changed; others showed the impact of education on starts and success.³⁹ If education can influence attitudes, intentions, and start-ups, who should be involved and what should be done to further develop these educational resources?

Entrepreneurial Education Policy in the United States

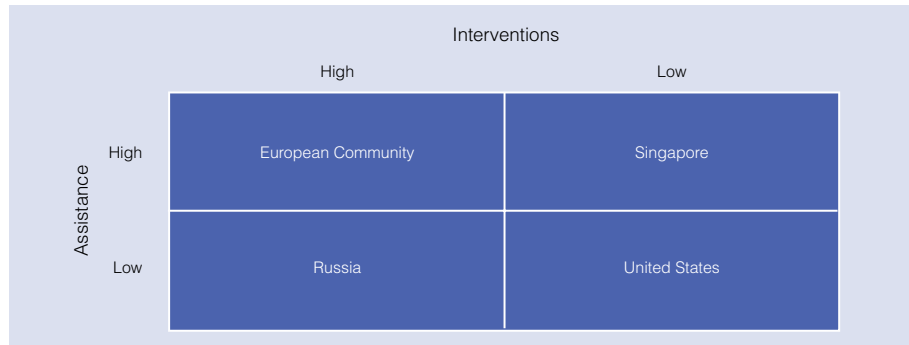
Johnson and Sheehy of the Heritage Foundation offer an illustration of de facto small business policy in the United States vis-à-vis small business policy in other parts of the world (Chart 5.3).⁴⁰ The typology presented contains two axes: the horizontal axis represents government intervention, and the vertical axis represents the extent of assistance available to entrepreneurs from government programs. The model also classifies the level of intervention and assistance as “high,” meaning governments are greatly involved in the operations of

38 Sørensen and Chang, 2006; Neck, Zacharakis, Bygrave, and Reynolds, 2003.

39 Autio et al., 1997.

40 Johnson and Sheehy, 1995.

Chart 5.3 Typology of Public Policy Toward Small Business and Entrepreneurship Education



Source: Johnson, B. T., and Sheehy, T. P., *The Index of Economic Freedom*, Heritage Foundation: Washington, D.C., 1995.

a small business and provide an extensive amount of assistance, or “low,” meaning that governments basically leave small businesses alone and allow them to survive on their own abilities and resources, and provide minimal assistance programs. In Chart 5.3, the United States falls in the quadrant of low direct intervention and low assistance. Compared with most other parts of the world, the United States adopts a *laissez faire* policy toward its education and training of small businesses. It is important to examine closely what Chart 5.3 means by low intervention to better understand whether the United States pursues a consistent entrepreneurial education policy.

Johnson and Sheehy’s four-tier classification system rates the world’s nations (101 of them) in terms of economic freedom. The classification system is based on such issues as property rights, regulation, tax policy, free trade, and other such factors. The levels of intervention and assistance are the key factors they consider. The United States and six other countries fall into the highest category, i.e., economically “free.” Hong Kong and Singapore have the highest ratings. Most industrialized countries are classified “mostly free.” (A similar work conducted for the Fraser Institute yielded similar ratings.⁴¹) Even if one does not subscribe to Johnson and Sheehy’s subjective rating system, their description of the regulatory environment has face validity and appears to be essentially correct. The conclusion is that free market systems by their

41 See Gwartney et al., 1996.

very design are supportive of entrepreneurial ventures and basically allow the market itself to determine who survives. This approach could help explain how the growth in the number of educational programs and professorships has evolved. Without government paying for and controlling everything, educational institutions and entrepreneurs have teamed up to create a broad range of educational efforts.

Role of the States as a Broker to Deliver Support for Entrepreneurs

At the state level, a significant report from the National Governors Association (NGA) found clear and convincing best practices in strengthening state economic policies to create more and more successful entrepreneurial endeavors.⁴² One finding they cited to support the need for some level of intervention was that the National Commission on Entrepreneurship had reported that the Inc. 500 firms grew at an average rate of 1,312 percent over the last five years and that to prosper, states needed to try to create the conditions to make this possible for more firms. Of particular interest here is the need the governors saw to leverage state resources to promote growth. States such as Oklahoma, Kansas, Michigan, Louisiana, and Maine were recognized for their efforts in developing technology centers to turn innovations into opportunities, leveraging existing SBDCs to develop training focusing on networks, development of a community of mentors and service providers for entrepreneurs, and ways to nurture entrepreneurs in rural or disadvantaged areas.

A second major effort cited in the NGA report was to “bolster entrepreneurial, capital, and research networks.” Nevada worked to increase efforts with angel networks; Washington added a policy representative to its technology council; and Michigan and Maryland helped integrate resources, including education, university researchers, and funders.

A third major area of interest was termed “deploy the workforce, unemployment, and community development systems to support entrepreneurs and promote entrepreneurship.” Several examples of education-related efforts were included: Maine lets the unemployed attend start-up seminars and develop business plans while collecting unemployment; Missouri and Illinois offer entrepreneurship workshops to dislocated and disadvantaged workers to

42 National Governors Association, 2004.

promote self-employment; and Nebraska uses subsidies to community colleges to teach and coordinate ongoing efforts to educate entrepreneurs.

Within this “bolstering” effort the governors also proposed nurturing entrepreneurs through the K-12 system to create a pipeline of future entrepreneurs and assist with curriculum design. The logic was that attitude and beliefs can be influenced long before the technical skills need to be developed. This result is consistent with the research reported here. In addition, it was stated that the public universities should provide entrepreneurship education in curricular and noncurricular areas to develop new skill sets and career alternatives. The report from the National Governors Association begins the process of assuring all states that this is a legitimate and necessary field of study and should be encouraged.

A Solomon report cited earlier suggests that individual universities may be ahead of the governors, but the support at the state level is great to see.⁴³ An excellent summary statement excerpted from a report by the Kauffman Foundation stated that states have to become as “entrepreneurial as the clients they serve.”⁴⁴

This focus on entrepreneurship, as well as the recognized need for entrepreneurship training and for academic education efforts in many disciplines associated with entrepreneurship, is an indication that more education for entrepreneurship is coming. Ongoing evaluation of the impacts and best practices is critical to retaining the innovation and flexibility learned from entrepreneurs.⁴⁵ Moreover, attention to best practices keeps the focus on the need to stay innovative and use the passion and support that exist in the field of entrepreneurship education.

Several of the questions Kuratko posed have some policy as well as educational implications. For example, the fact that the use of technology by entrepreneurs and entrepreneurial educators is limited is often an access issue: entrepreneurs are often in areas that do not have high-speed Internet access, and educators do not have “smart” classrooms. Public support of education budgets is one solution, of course, but access is a state and local issue for

43 Solomon, Duffy, and Tarabishy, 2002.

44 Excerpted in National Governors Association, 2004.

45 Kuratko, 2005.

which regulatory concerns will need to be addressed. Pointing policymakers to the topics Kuratko identifies—the ongoing need for vision, willingness to change, and rethinking risk—may be a way to help them stay focused on supporting entrepreneurial efforts rather than creating new programs.

Evidence that both general and entrepreneurial education influence entrepreneurial activity provides even more reasons to support opportunities for people of all ages, ethnicities, and genders to take part in education efforts. These efforts can serve as a source for new ideas, help in identification of gaps in niche markets, and provide the knowledge needed to succeed in new ventures. Evidence in current research of the positive relationship between educational attainment and profitability, growth, and innovation would suggest that traditional educational institutions are a valuable tool in advancing the goals of venture formation and success. Support in the form of, for example, a self-rejuvenating loan fund that encourages people to seek additional educational opportunities, could increase the potential for new ventures.

Chambers of commerce and trade associations could be a significant private sector force by using their contacts and resources to offer educational opportunities to nonmembers at differential and affordable fees, thereby helping raise the overall educational level of the community. This support could mean more and stronger ventures in the future.

Foundations also have a role to play in finding ways to support educational efforts and help keep students in school longer. Computer training, minority- and ethnic-based support systems, training for people transitioning to teaching from other professions, and similar efforts could be enhanced to produce a local and national good.

Universities may need to rededicate themselves to providing scholarship and financial aid to underserved populations to help increase the general educational level of the nation and of regions within it. The consistent evidence that education is linked to higher entrepreneurial performance and productivity is supported by the economic evidence provided by the OECD suggesting significant productivity increases for each year of added education.⁴⁶

46 Englander and Gurney, 1994.

At the federal level, expansion of the tax savings plans that currently exist, income tax credits for tuition and fees, and other tax incentives seem appropriate given the evidence of the returns in entrepreneurial performance afforded by education. Research should also be encouraged at the national level to more clearly define the impact on entrepreneurial starts and performance for each measurable increase in the average national and regional levels of educational attainment, and what these increased starts and performance mean for national and regional productivity.

Conclusions

The primary purpose of this study has been to provide a review of relevant research related to what is known and not known about the links between general education, selection into entrepreneurship, and entrepreneurial performance, and between entrepreneurial education and entrepreneurial activity. A further purpose is to provide suggestions for both future research and future policy decisions. With respect to general education, the general consensus across research from multiple countries is that there is a significant and positive relationship between education and entrepreneurial performance. The findings regarding the link between education and selection into entrepreneurship are ambiguous: several possible explanations for this ambiguity exist. In research published in recent years—in particular, research that considers the necessity or opportunity types of entrepreneurship—the relationship between education and selection into entrepreneurship seems to be less ambiguous and in general positive.

This report also highlights the significant increase in entrepreneurship education programs. While these programs have been growing at all levels, significant growth has occurred in particular at the university level, in programs, course offerings, and endowed professorships. In part because of the rapid growth of entrepreneurial programs and in part because of a limited understanding of the effectiveness of specific forms of entrepreneurial education, this growth has often been chaotic and ill-defined. Underlying the growth is the implicit assumption that entrepreneurship can be taught and that entrepreneurial education can have a measurable impact on entrepreneurial activity. A review of research published between 1995 and 2005 linking entrepreneurship education with entrepreneurial activities highlights both the current state

of knowledge and several important questions regarding future research. The most fundamental difficulty, and therefore a future opportunity for entrepreneurship education research, is developing a consensus regarding both the definitions of entrepreneurial education and what the focus should be regarding appropriate and measurable outcomes for such education. The authors of this report have chosen to focus on research relating to new venture creation rather than on the link between education and the managing of ongoing small to medium-sized enterprises. For this purpose, it would seem that the most appropriate and measurable outcome for entrepreneurship education would be the formation of a new venture; however, research strongly suggests that such outcomes may often be many years after the educational experience. Therefore, it is not surprising that many researchers have chosen to focus on a range of precursors of venture creation.

The most often studied antecedents are “entrepreneurial intentions” and “opportunity recognition.” A review of this research provides indications of a positive link between entrepreneurial education and subsequent entrepreneurial activity. It also suggests that a study of the precursors of entrepreneurial activity or venture founding can provide relevant measures of educational impact. The limitations of the existing research do not allow more definitive conclusions at this time. This overview of existing research suggests, in order to overcome these limitations, a need for more longitudinal studies as well as research aimed specifically at linking the proposed antecedents of entrepreneurial activity to the act of venture founding.

The growth of entrepreneurship education and the associated research regarding the impact of such education present several important policy questions both for the institutions and academicians delivering entrepreneurship education and for support organizations providing funding for entrepreneurship education. Although the findings regarding the link between entrepreneurial education and entrepreneurial activity are not definitive, there is significant research suggesting such a linkage. Reports of the positive impact of specific programs have led a number of government and private sector support organizations to call for increasing support for entrepreneurship education. The future challenge for support organizations will be to encourage entrepreneurship education providers to clearly delineate the theoretical foundations of their course and program offerings and to both track and adequately measure the impact of the programs they provide over time. Second, support organizations should

encourage the frequent consolidation of research findings in order to assess the cumulative evidence provided by these reports regarding the link between entrepreneurial education and entrepreneurial activity. Finally, based on what is learned through this research as well as ongoing “best practices,” support organizations should encourage entrepreneurial education providers to adopt, when merited, innovations and processes known to provide outcomes linked to entrepreneurial activity.

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APPENDIX 5A

Tables

Table 5A.1	Representative Sample of Evidence Linking General Education to New Venture Creation, Venture Success, and Venture Survival, 1995–2006	148
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Table 5A.1 Representative Sample of Evidence Linking General Education to New Venture Creation, Venture Success, and Venture Survival, 1995–2006

Study	Country	Sample Size ²	Education Level ³	+ / - or n.s. ⁴	Study description
General Education and Entrepreneurship¹					
Acs and Armington (2005)	U.S.	394	HE	+	Regional level study with data aggregated into 394 regions. Human capital as measured by the percentage of college graduates was positively related to higher firm formation rates.
Arenius and DeClercq (2005)	Finland and Belgium	4,536	HE	+	Study finds individuals with higher educational levels more likely to perceive entrepreneurial opportunities.
Block and Wagner (2006)	Germany	1,109	YRS	+	The study separates necessity entrepreneurs and opportunity entrepreneurs. The level of overall education was significantly related to becoming an entrepreneur for the opportunity entrepreneurs but not the necessity entrepreneurs.
Camp (2005)	U.S.	394	HE	+	This study compares regional variations in entrepreneurship across 394 regions. Regions with higher percentages of college degree holders were found to have significantly higher levels of entrepreneurial activity.
Delmar and Davidsson (2000)	Sweden, Norway and U.S.	933	YRS	+	Higher levels of education were found to be associated with higher probabilities of becoming nascent entrepreneurs.
Dunn and Holtz-Eakin (2000)	U.S.	371	YRS	n.s.	The level of education was not found to be significant to the probability of self-employment when parent "variables" were considered.
Goedhuys and Sleuwaegen (2000)	Africa	141	SC, HE	+	Completion of secondary school and college were found to significantly impact an individual's propensity towards entrepreneurship.
Kirchoff and Armington (2002)	U.S.	3,152	SC, HE	+	Study concludes that there is a positive relationship between education levels and firm births, but study authors express strong concerns about collinearity among study variables.

Lofstrom and Wang (2006)	U.S.	19,271	YRS	+/-	Lower levels of education were associated with entry into low-barrier businesses, while higher education levels were associated with entry into medium- and high-barrier businesses. Significant differences were seen across cultural groups.
McManus (2000)	U.S. and Germany	7,342	YRS	+/n.s.	The study found that the level of education was positively linked to "high-quality" self-employment but not to "low-quality" self-employment.
Minniti, Bygrave, Zacharakis, and Cole (2004)	U.S. portion of GEM study	9,195	YRS	+	Drawing on the GEM project the study concludes that while higher education is linked to higher levels of entrepreneurship, the relationship is not linear. The highest level was found for individuals with some college but no degree. Authors concluded this is skewed by differences in necessity versus opportunity entrepreneurship.
Neck, Zacharakis, Bygrave, and Reynolds (2003)	U.S. portion of GEM study	7,059	YRS	+	Drawing on the 2002 GEM study, the authors conclude that in general the more education a person has, the more likely the person is to pursue entrepreneurship, although the relationship is found not to hold for the highest levels of educational attainment.
Reynolds, Carter, Gartner, and Greene (2004)	U.S.	1,261	YRS	+	The level of education was significantly related to rates of nascent entrepreneurship, but significant cultural and gender differences were found with education having the greatest impact for minority groups.
Uhlaner, Thurik, and Hutjes (2002)	14 countries	14	YRS	+	The study is a country-level analysis with education as a predictor for levels of self-employment. The level of education is found to be significant and outweigh various country-level economic factors.
Wagner and Sternberg (2004)	Germany	7,802	SC, HE	+	Education positively linked to choice to become a nascent entrepreneur.
Wagner and Sternberg (2002)	Germany	1,000	SC, HE	+	Higher levels of education were found to raise the odds of an individual becoming an entrepreneur, but regional differences were noted.
General Education and Entrepreneurial Performance⁵					
Aidis and Mickiewicz (2004)	Lithuania	399	HE	+	Possession of an upper level degree was found to be positively and significantly related to growth expectations in entrepreneurial firms.

Table 5A.1 Representative Sample of Evidence Linking General Education to New Venture Creation, Venture Success, and Venture Survival, 1995–2006—continued

Study	Country	Sample Size²	Education Level³	+ / - or n.s.⁴	Study description
Almus and Nerlinger (1999)	Germany	20,602	HE	+	A positive correlation was found between technical degrees and the growth of technology-based ventures. Business-based degrees were found to have a positive correlation with growth in noninnovative firms. Individuals with a combination of technical and business degrees did not have a significant impact on firm growth.
Basu and Goswami (1999)	South Asia	118	HE	+	The entrepreneur holding a college degree was found to positively impact firm growth.
Bosma, van Praag, Thurik, and de Wit 2004	U.S.	896	HE	+/n.s.	Study results suggest a strong and positive relationship between level of education of the entrepreneur and venture profitability, although a nonsignificant relationship was found for firm survival.
Goedhuys and Sleuwaegen (2000)	Africa	141	SC, HE	+	Firms led by entrepreneurs with either secondary or college education were found to have higher growth in performance, with the largest effect for entrepreneurs with college degrees.
Jo and Lee (1996)	Korea	48	YRS	+	Researchers observe a positive and significant relationship between level of education and firm profits in a study of 48 Korean firms.
Maes, Sels, De Winne (2005)	Belgium	294	YRS	+	The level of education of the entrepreneurial team was measured based on years of education. A positive relationship was found between the level of education of the founding team and innovation within the entrepreneurial firm.
Morris and Pitt (1995)	Africa	30	YRS	+	A positive and significant relationship was reported in this study between the educational level of the entrepreneur and the operational sophistication of the venture.

Nicholas (1999)	Britain	283	HE	-	A negative performance effect (based on wealth accumulation) was observed for entrepreneurs receiving high-status rather than lower-status education.
Peña (2002)	Spain	114	HE	+	Study concludes that the majority of companies experiencing sales growth were managed by entrepreneurs with college degrees.
General Education and Entrepreneurial Firm Survival					
Chrisman and McMullan (2004)	U.S.	159	YRS	n.s.	The level of education of the entrepreneur was not significant in predicting firm survival.
Fairlie	U.S.	6,417	HE	+/-	In a comparison of African-American-owned businesses and White-owned businesses, a mixed relationship between education and exit was found. Graduating from college decreases the probability of exit for both races. For Whites, graduating from college, in comparison with only high school, increased the probability of exit, while the effect was the opposite for African Americans.
Gimeno, Flota, Cooper, and Woo (1997)	U.S.	1,547	YRS	n.s./+	Education was measured based on the percentage of people in the sample with a lower level of education. Results suggest that higher levels of human capital, including education experience, did not necessarily predict higher survival rates, although more human capital was significantly related to better firm performance.
Taylor (1999)	Britain	10,000	YRS	n.s.	The exit rates of entrepreneurs with various levels of educational attainment were compared. No significant differences were observed based on educational level.

¹ Various measures are utilized including the choice of "self-employment," "firm formation," and "nascent entrepreneurs."

² In some studies the level of analysis is the individual entrepreneur, while in others it is the country or the region.

³ "SC" = secondary school completion verses noncompletion; "HE" = higher education level completed versus no higher education completed; "GR" = graduate education completed versus no graduate education completed; "YRS" = overall years of education—secondary through graduate.

⁴ +/- or n.s. = a positive, negative, or not significant relationship exists between the variables.

⁵ Entrepreneurial performance is operationalized in various methods at the firm level including for example, "growth in sales," "overall growth," "meeting of expectations," and at the individual level as "wage/income growth."

Table 5A.2 Representative Sample of Evidence Linking Education with Entrepreneurial Activity, 1995–2005²

Study	Country	Educational Program ¹	Research Description and Findings
Entrepreneurial Education and Venture Creation			
Charney and Libecap (2000)	U.S.	HE	Study authors obtained completed surveys from 406 nonentrepreneurship graduates of the University of Arizona and 105 graduates of the Berger Entrepreneurship program at the university. Venture creation, along with a broader range of measures, was compared across groups. The study found that on average entrepreneurship graduates were three times more likely than nonentrepreneurship graduates to start new ventures: 17.4 percent of the nonentrepreneurship graduates had been involved in starting a new venture, while 54.0 percent of the entrepreneurship graduates had done so.
Dumas (2001)	U.S.	VET	This study provides a qualitative case analysis measuring the outcomes of a community-based entrepreneurship training program for low-income women. The program involved over 420 women in Boston's inner city neighborhood during the life of the program. The first group of 34 participants was followed during the study. Nineteen businesses were created during the study period.
Kolvereid, L. and Moen, O. (1997)	Norway	HE	Study authors obtained completed surveys from 374 graduates from the Bodo Graduate School of Business. Students who had graduated with a major in entrepreneurial studies were compared with those majoring in other areas of study. Venture founding as well as the "intention" to found a venture were measured and a wide range of control variables was included. Results suggested a significant correlation between education in entrepreneurship and venture founding as well as between entrepreneurial education and the "intention" to found a venture in the future for those students who had not previously done so.
McLarty, R. (2005)	UK	HE	The study reports a qualitative research project involving 39 university graduates who had founded businesses and was focused on determining the relationship between their university preparation and their subsequent ability to found and successfully operate a new venture. The results indicated that 90 percent of the graduates had founded their businesses within two years of graduation, and most drew upon their degree area for their business idea. Additionally, results indicate that almost 75 percent of the business owners sought additional entrepreneurial training and a significant majority demonstrated critical skill deficiencies—particularly in the finance and marketing areas.

Monroe, Allen, and Price (1995)	U.S.	FE	The impact of the FastTrack entrepreneurship training program targeting four groups of displaced workers and welfare transitioning recipients who were graduates of entrepreneurial training programs was measured. Results indicated that of the 28 participants in a program in Rock Springs, WY, five businesses were founded, of which two survived; of the 34 displaced workers in a Kansas city study, 21 had founded businesses and another 11 were involved in business on a part-time basis; 41 welfare transitioning workers in Idaho created nine new ventures; and of the 23 welfare recipients participating in Kansas City, four had founded new businesses.
Osborne, Falcone, and Nagendra (2000)	U.S.	VET	This study assesses the relationship of entrepreneurship training delivered as part of the Self Employment Assistance Program (SEAP) instituted by the state of Pennsylvania. As part of this test program, participants were screened prior to the educational program with only those individuals more inclined towards entrepreneurial "personalities" accepted into the program. Following completion of the training program, 34 of the 51 individuals that completed the training had formed a business within one month of completion and exhibited signs of continuing operations.
Van der Sluis, van Praag, and Vijverberg (2005)	Wide range of developing economies	Other—general education	Study authors developed a meta-analytic review of 80 studies measuring the impact of general education on a number of entrepreneurial outcomes. Results suggest that a marginal year of schooling raised entrepreneurial income (activity) by 5.5 percent.
Entrepreneurial Education and Entrepreneurial Intentions			
Autio, Keelyey, Kiofsten, and Ulifstedt (1997)	Finland, Sweden, Thailand, and the U.S.	HE	The study, in specific, tests a proposed model of entrepreneurial intent. General education is proposed as one predictor of intent. The study incorporated surveys of 1,956 university students in primarily technological programs. Results suggest education as one aspect of an individual's background is positively related to entrepreneurial intent.
Galloway and Brown (2002)	UK	HE	Completed surveys were obtained from 1,954 graduates of the University of Strathclyde. Results indicated that 78 percent of those students who had taken at least one entrepreneurship course indicated an "intention" to start a business at some point in their lives. Nineteen percent reported a desire to start a business within five years, while 43 percent indicated an expectation to start a business after a period exceeding 10 years.

Table 5A.2 Representative Sample of Evidence Linking Education with Entrepreneurial Activity, 1995–2005²—continued

Study	Country	Educational Program ¹	Research Description and Findings
Klapper (2004)	France	HE	In a study of 82 first- and 60 second-year students at a Grande Ecole in France, the researcher discovered a significant increase in the number of students that envisioned becoming an entrepreneur as opposed to working for a larger organization or a small to medium-sized enterprise (SME). It was hypothesized that this result was due in part to the participation of students, between the first and second years, in an entrepreneurship education program and project.
Lüthje and Franke (2002)	U.S. and Germany	HE	The study explored and compared the entrepreneurial intentions of business students at a major German university and the Massachusetts Institute of Technology (MIT). The study encompassed 312 surveys from German university students and 143 from MIT students. The study results indicated that a significantly higher number of the MIT students expressed the intention to start a venture than their German counterparts. Additionally, the U.S.-based education was seen as far more effective in instilling an entrepreneurial spirit among students and in providing activities supporting such endeavors. Those students in the United States with higher levels of risk propensity tended to rate the educational activities higher, while in Germany those students with higher levels of risk propensity tended to rate the educational activities lower.
Noel (2000)	U.S.	HE	Study encompassed 84 graduates with undergraduate degrees in entrepreneurship and comparison groups drawn from general business majors and nonbusiness majors. The study measured differences in business starts, entrepreneurial self-efficacy, and intentions to open a new business. Results suggested marginal support of the hypothesis that entrepreneurship graduates would create ventures at a greater rate, no support that they would have a higher entrepreneurial self-efficacy, and strong support that entrepreneurial intentions would be significantly greater in entrepreneurial graduates.
Peterman and Kennedy (2003)	Australia	VET (Secondary school students)	117 secondary school students completing an enterprise training program are compared with 119 students from the same school but not undergoing entrepreneurial training. Results indicated that students choosing to participate in the program had a significantly higher level of prior experience and prior positive experience than students not participating. The training program was also found to positively increase perceptions of desirability and feasibility.

Entrepreneurial Education and Opportunity Recognition

Brännback, Heinonen, Finland HE
Hudd, Paasio (2005)
Study authors proposed to measure the link between entrepreneurial education, recognition of entrepreneurship as personally desirable and socially acceptable, and opportunity recognition. Completed surveys were obtained from 263 business school students at two universities. Study findings suggest a direct link between entrepreneurial intent and perceptions of entrepreneurship as personally desirable and feasible.

DeTienne and Chandler U.S. HE
(2004)
The study focuses on the relationship between entrepreneurial education, specific skills training at the university level, and opportunity recognition. The experimentally designed study included 130 undergraduate students. The study had a range of control variables including prior involvement in venture creation. Study results suggest a positive relationship between skills training and students' ability to generate more venture ideas and ideas that had the characteristics of being innovative.

Dimov (2003) U.S. HE
The study involved 22 graduate students and measured the relationship between "prior knowledge" in general and opportunity recognition. Surprisingly, prior industry-specific knowledge was negatively correlated with opportunity recognition. Study author concludes that it is not prior knowledge in general, but how it is applied, that impacts opportunity recognition. The study also seems to establish a link between prior knowledge and entrepreneurial intentions.

Entrepreneurial Education, Entrepreneurial Self Efficacy, and Entrepreneurial Orientation

Alvarez and Jung (2003) Mexico HE
The study included 400 undergraduate students attending three universities in Mexico. The study suggests that the greater the exposure to entrepreneurial course work, the greater the students' perceived entrepreneurial self-efficacy and intention toward starting their own business.

Ehrlich, De Noble, Jung, U.S. HE
Pearson (2000)
Twenty-four participants in two university-based entrepreneurial training courses were surveyed at the beginning and conclusion of the six-week program. The results of the study suggested that the entrepreneurial training significantly and positively impacted participants' perceptions of their ability to start and develop new ventures.

Frank, Korunka, Lueger, Austria Other—
and Mugler (2005) secondary
schools
Study authors surveyed 875 students of four different types of secondary schools (secondary schools, commercial academies, technical schools, and technical and business professional schools). The goal of the study was to determine if the type of education and/or other entrepreneurship-related activities impacted the students' preferences for an entrepreneurial career. The results of the study suggest a strong link between the type of education and orientation toward becoming an entrepreneur.

Table 5A.2 Representative Sample of Evidence Linking Education with Entrepreneurial Activity, 1995–2005²—continued

Study	Country	Educational Program¹	Research Description and Findings
Galloway, Anderson, Brown, and Wilson (2005)	UK	HE	Drawing on a sample of 519 Scottish entrepreneurship students, study authors measure the perceptions of the students regarding entrepreneurial skill development. Study results suggest that the perception of the students regarding the impact of the program on developing their entrepreneurial skills varies based on the specific skill. Additionally, the results indicated that a higher percentage of students perceive that it will be a relatively long time (10 or more years) prior to their founding their first venture.
Entrepreneurial Education and Need for Achievement and Locus of Control			
Hansemark, O. (1998)	Sweden	VET	This study measured the impact of a 36-week training program carried out in a rural district. The program followed two models—problem-based learning and action learning. Outcomes measured were the individuals' "need for achievement" and "locus of control." The program included 70 participants and both an experimental and control group. Study results suggested a link between the training intervention and the development of a higher level of "n" achievement and a greater internal orientation of locus of control.
Entrepreneurial Education and Other—Entrepreneurial Knowledge			
Kourilsky and Estandiari (1997)	U.S.	VET (High School)	The entrepreneurial knowledge and advance knowledge of a group of New York high school students was measured following the completion of an "entrepreneurship education intervention." The implicit assumption is that knowledge of entrepreneurship is linked to subsequent entrepreneurial activity. A total of 95 students (51 in a treatment group and 44 in a control group) were included in the study. Results indicate a significant relationship between entrepreneurial education and entrepreneurial knowledge. Treatment subjects were compared to both the control groups and a sample of general population high school students surveyed as part of a Gallup program.

¹ HE = Higher education both undergraduate and graduate, FE = Further education including continuing education, VET = Other vocational educational training programs. This is based on a framework suggested by Raffo, Lovatt, Banks, and O'Connor (2000).

² For reviews of research findings published prior to 1995, see Dainow (1986); Gorman, Hanlon, and King (1997).