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Strategic Entrepreneurship at Universities: Academic Entrepreneurs' Assessment of Policy Programs

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In this article we draw on goal-setting theory to analyze how and why entrepreneurs perceive the usefulness of policy programs aimed at facilitating the development of academic ventures. Using a conjoint study and data on 3,136 assessments nested within 98 academic entrepreneurs, we find that access to finance offered by a policy program is central and enhances the entrepreneurs' perceived benefits of other policy measures such as providing access to nonfinancial resources (networks, business knowledge) and reducing administrative burdens, but diminishes the perceived benefits of offering tax incentives for new ventures. Our results extend the literature on academic entrepreneurship and entrepreneurs' assessments of government policy measures. For policy makers, our study suggests that the simultaneous launch of policy measures may be perceived by academic entrepreneurs as particularly beneficial for fostering the development of their young ventures.

Introduction

Since academic entrepreneurship is a substantial driver of economic growth and wealth creation (Shane, 2004a), policy makers in many countries and regions have introduced measures to support the formation of academic spin-off ventures (Lundström & Stevenson, 2005; Wright, Clarysse, Mustar, & Lockett, 2007). For example, governments provide academic entrepreneurs with initial financing opportunities and facilitate transfer of technologies developed at universities and public research institutes into new and innovative firms (Shane, 2004b; Wright et al.). The major goal of these measures is to motivate academics to become entrepreneurs and create new ventures.

From a strategic entrepreneurship perspective, however, creating a new venture and subsequently achieving competitive advantage for that venture are different, but complementary, tasks for academic entrepreneurs to create wealth (Venkataraman & Sarasvathy,

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2001). Academic entrepreneurs not only need to discover and exploit opportunities through the creation of new goods and services, but also must act strategically in order to achieve their strategic development goals. For example, acting strategically implies that academic entrepreneurs do not exploit all opportunities they discover, but that they carefully select those opportunities that promise the highest future rents (Hitt, Ireland, Camp, & Sexton, 2002). Academic entrepreneurs must manage the resources and capabilities available in a way that their venture outperforms others in the market place and generates above-average returns (Hitt, Ireland, & Hoskisson, 2001). These differences between creating a new venture and subsequently achieving high venture performance suggest that policy programs aimed at motivating academic entrepreneurs to create new ventures may need to be different from programs aimed at making these ventures successful. While a substantial body of literature exists that investigates the effect of policy measures on the creation of new ventures (Lockett & Wright, 2005; Rothaermel, Agung, & Jiang, 2007), little is known about how policy measures can help academic entrepreneurs to achieve their strategic goals.

One reason why academic ventures fail to achieve their goals is the motivation of their founders. Even if their ventures have substantial development opportunities, academic entrepreneurs are often not motivated to raise the funds and show the commitment necessary to achieve high performance (Vohora, Wright, & Lockett, 2004). Perhaps policy programs can motivate academic entrepreneurs to pursue and achieve these goals. According to goal-setting theory, individuals increase their commitment to a task when the goals of this task become more proximal (Stock & Cervone, 1990), suggesting that to the extent that policy programs can lead academic entrepreneurs to perceive their strategic development goals as more proximal, these programs may increase academic entrepreneurs' motivation to develop their ventures.

In this study, we analyze academic entrepreneurs' perceived usefulness of policy measures for the strategic development of their businesses. We focus on measures providing academic ventures with access to important resources and adjusting the regulatory and legal environment to the needs of entrepreneurial ventures (Lundström & Stevenson, 2005). We focus on entrepreneurial perceptions of these programs since perceptions of the environment are central to managerial decision making (March & Shapira, 1987) and the entrepreneurial intentions for action (Krueger, 2000). The specific and unique focus of our work is how and why "access to finance" provided by a policy program enhances or diminishes the perceived usefulness of other policy measures.

We conduct a conjoint study and analyze data on 3,136 assessments nested within 98 German academic entrepreneurs. Our work makes the following contributions to the literature. First, the literature on academic entrepreneurship has mainly focused on the environmental conditions that promote the creation of new ventures, but few studies have analyzed the development of existing ventures (Rothaermel et al., 2007). We focus on the assessments of entrepreneurs of existing ventures. Second, these few studies on existing academic ventures have identified the ventures' human and social capital (Ensley & Hmieleski, 2005; Grandi & Grimaldi, 2003), knowledge base (Lockett, Siegel, Wright, & Ensley, 2005), and university environment (Monck, Porter, Quintas, Storey, & Wynarczyk, 1988) as critical factors for development. We show that academic entrepreneurs perceive the political environment as another important factor. Finally, scholars have shown that access to capital is essential for the formation and growth of new ventures (Dollinger, 1995). Our results suggest that entrepreneurs' perceived utility of access to financial resources is more complex in that it enhances the usefulness of some policy measures—access to nonfinancial resources and the reduction of administrative burdens—but substitutes for others—tax incentives.

Theory and Hypotheses

Goal setting is one of the most important mental processes that guide human action (Bandura, 1986; Locke & Latham, 1990). Goals denote something that individuals want to achieve, and this desire motivates them to act in a way to attempt to achieve that goal (Locke & Latham). The formulation of specific goals as motivators and guides of human action appears particularly important for individuals operating in the context of high uncertainty, such as entrepreneurs (McMullen & Shepherd, 2006). Applied to strategic entrepreneurship, this suggests that entrepreneurs should set concrete strategic development goals for their ventures. For example, research has shown that formulating strategic development goals in a business plan enhances the survival chances of entrepreneurial ventures (Shane & Delmar, 2004), and that explicit strategic goals with respect to financial performance, innovative output, and growth are associated with better organizational performance (Baum, Locke, & Smith, 2001). Thus, the extent to which entrepreneurs' strategic selection and exploitation of opportunities (Hitt et al., 2002) is driven by specific goals influences the development of the venture.

Even if entrepreneurs set strategic goals that are concrete and ambitious, however, their motivation may be low because these goals are too distant in time, which can lead to procrastination and discouragement (Bandura, 1986). Strategic goals of academic entrepreneurs appear to be particularly distal because their ventures often develop complex and highly sophisticated products and technologies. For instance, academic entrepreneurs who spun off a biopharmaceutial venture from a university institute may have to spend more than 10 years before their first product enters the market (DiMasi, Hansen, & Grabowski, 2003). Moreover, an important strategic goal for many academic entrepreneurs is to take their company to initial public offering (IPO)—a goal that usually takes several years to achieve after the inception of their venture (Chang, 2004).

It appears that policy makers can influence academic entrepreneurs' perceptions of goal proximity by influencing the environmental context (Casper, 2000; Lundström & Stevenson, 2005; Wright, Lockett, Clarysse, & Binks, 2006). Bruno and Tyebjee (1982) divided the entrepreneurial environment into one related to resource availability and one related to the costs of doing business. Similarly, Casper described access to resources and the legal framework as two environmental forces impacting the development of young ventures. We follow these studies and investigate policy measures that influence both the academic entrepreneurs' access to resources and the legal/regulatory environment in which they operate. We focus on measures providing academic entrepreneurs with access to financial and nonfinancial resources, as well as measures reducing administrative burdens and offering tax incentives. These measures are frequently part of entrepreneurship policy programs (Lundström & Stevenson).

In order to create an environment supportive of entrepreneurial action, however, it is rarely the case that one policy measure is sufficient, but the adjustment of multiple environmental variables may be necessary to effectively influence the entrepreneurs' perceptions of goal proximity. Indeed, governments do not usually introduce just one measure at one time but often policy programs are started which include several measures (Storey, 2003). Moreover, entrepreneurs have, at the same time, access to programs launched at the regional, state, country, or even international level (Gilbert, Audretsch, & McDougall, 2004), each of which may consist of different policy measures. The focus of our work is to study how entrepreneurs conjointly evaluate numerous policy measures in terms of their usefulness in helping them to achieve their strategic development goals.

The availability of resources is a necessary condition for firms to reach their strategic goals and achieve competitive advantage (Barney, 1991; Grant, 1991). "For managers, the

challenge is to identify, develop, protect, and deploy resources and capabilities in a way that provides the firm with a sustainable competitive advantage" (Amit & Schoemaker, 1993, p. 33). Since new ventures are particularly short of resources, resource accumulation is one of the main tasks of academic entrepreneurs and essential to the development of their ventures (Wright et al., 2006). In order to facilitate this accumulation process and subsequent development of young firms, policy makers have launched several policy measures. Some of these measures directly provide the entrepreneurs with resources (e.g., direct financing), whereas others facilitate their transfer from other organizations (e.g., technology transfer from public research institutions). Among the most frequently introduced measures are those that provide access to finance, technology, networks, and business knowledge (Lockett & Wright, 2005; Lundström & Stevenson, 2005; Storey, 2003; Wright et al.).

Access to Financial Resources

Financial resources are an essential ingredient for the development of new ventures (Dollinger, 1995). Financial resources serve to acquire other resources (Dollinger) thereby providing a venture with strategic flexibility (Romanelli, 1987) and facilitating its adjustment to complex environments (Tan & Peng, 2003). Specifically, academic entrepreneurs involved in innovation have a high need for financing availability because innovative activities are often costly (Greene & Brown, 1997). The entrepreneurs can only reach their strategic goals when they have sufficient finance available. For example, the development of biotechnological products can amount to several hundreds of millions of U.S. dollars (DiMasi et al., 2003), and the costs of new product development are also high in other industries such as chemicals, consumer goods, and industrial equipment (Kessler, 2000). Moreover, the introduction of new products to market (Shane, 2004a; Teece, 1986) and the acquisition and motivation of skilled employees (Pfeffer, 1998) can be an expensive endeavor for academic entrepreneurs. Thus, financial resources are a critical ingredient for the development of new ventures, and academic entrepreneurs need to have sufficient access to financial resources to move their products to market and reach their strategic goals (Dollinger; Shane; Wright et al., 2006).

Although academic entrepreneurs' demand for financial resources is often high, their opportunities to acquire these resources appear quite limited. Since informational asymmetries between entrepreneurs and investors such as venture capitalists are often substantial, it is difficult for many young firms to obtain financing via the private markets (Storey, 1994). This is particularly true in the context of academic spin-off ventures, because their founders often lack the skills necessary to attract venture capital, for example by developing a sophisticated business plan (Wright et al., 2006). In addition, most academic ventures are in an early development stage and may not even have developed a prototype yet, which creates difficulties for investors to judge the future potential of the venture's technology and makes them reluctant to invest in these early-stage ventures (Lockett, Murray, & Wright, 2002). Thus, academic entrepreneurs will likely perceive their strategic goals as more distal in an environment where finance is difficult to access.

Policy makers have long recognized that difficulties in acquiring financial resources are a major hurdle to the development of new ventures, and they have made efforts to create an environment with improved financing opportunities. For example, some governments offer various types of direct funding to young ventures such as low-interest loans, silent equity partnerships, and subsidies (Lundström & Stevenson, 2005). Some of these policy programs were introduced specifically for innovative ventures (Lerner, 1999), and others are exclusively dedicated to academic entrepreneurs (Gilbert et al., 2004).

Further, some governments facilitate debt financing for entrepreneurs by either reducing the lending risk of banks (e.g., providing government securities) and/or enhancing the knowledge of banks regarding the new ventures' markets and business activities (Lundström & Stevenson). While all these measures differ in their specific characteristics and may be more or less appropriate for ventures in different development stages and operating in different industries (e.g., Wright et al., 2006), they have in common the ability to facilitate academic entrepreneurs' acquisition of financial resources and help them to push their products to market.[1]

While these arguments suggest that improved access to financial resources offered by policy programs directly enhances academic entrepreneurs' perceptions of goal proximity, there is likely to be an additional, more complex effect because entrepreneurs can use financial resources to acquire and develop other resources (Dollinger, 1995) and adapt the strategy of their ventures to environmental conditions (Romanelli, 1987; Tan & Peng, 2003). That is, when policy measures offer additional access to other, nonfinancial resources that facilitate strategic entrepreneurship, simultaneous access to finance may moderate these effects because it influences the extent to which entrepreneurs can capitalize on the access to nonfinancial resources (Dollinger). Similarly, when policy measures change the regulatory and legal environment in which the academic entrepreneurs operate, the entrepreneurs' ability to adapt the strategy of their venture to this new environment, and thus profit from these policy measures, likely depends on their access to finance (Romanelli). These moderating effects are the focus of our study and are investigated in more detail below.

Access to Nonfinancial Resources

Access to Technology. New and innovative technologies are often developed at universities or public research institutes and it is sometimes difficult to transfer ownership of these technologies to entrepreneurial firms (Audretsch & Feldman, 1996). Young ventures have, due to their sparse resource endowments, only limited ability to manage the often complex technology transfer process. This process can take years (Roberts, 1991), likely leading entrepreneurs to perceive their goal to develop new products based on these technologies distal in time. Policy makers have recognized the important role a quick and efficient transfer of technology has for strategic entrepreneurial action and introduced measures to facilitate this process (Slaughter & Leslie, 1997). For example, governments promote the formation of technology transfer agencies which assist the transfer of technology (Henderson, Jaffe, & Trajtenberg, 1998), and they have launched programs that provide incentives for universities to support patenting activities (Shane, 2004b). Academic entrepreneurs likely assess a higher usefulness of policy programs that provide them with, and improve access to, new technology and bring them closer to their strategic goals of bringing a new product or technology to market.

The extent to which an improved access to technology will lead academic entrepreneurs to view their strategic goals as more proximal, however, depends on whether the entrepreneurs have access to finance. Universities and public research organizations are

1. The investigation of different types of finance (e.g., equity vs. debt) is beyond the scope of our study. Similarly, it is not our goal to explain variance between different types and development stages of academic ventures. The statistical method we use (hierarchical linear modeling) allows us to control for variance in the assessments of policy programs between entrepreneurs and ventures, and focus exclusively on variance between different environments.

usually focused on basic research, and the technologies and intellectual property transferred likely need to be converted into marketable products, which may demand substantial financial resources. Moreover, even if the transferred technology is close to marketability, the young firms must "ramp up" marketing and distribution, which can be costly (Teece, 1986). This complementarity of access to finance and technology has also been recognized by practitioners. For example, technology transfer offices (TTOs) offer financing opportunities (Florida & Kenney, 1990) and/or help to establish contacts with investors (Shane & Cable, 2002). Therefore, academic entrepreneurs will view their strategic goals as more proximal and assess a higher usefulness of policy programs that provide access to technology when they also have access to the financial resources required for advancing that technology to market.

Access to Networks. Entrepreneurial networks refer to the personal ties between the entrepreneur and other individuals and organizations with whom he/she performs economic transactions (Aldrich & Zimmer, 1986). Networks are an important source of learning and can provide access to important knowledge (Dubini & Aldrich, 1991). Moreover, networking activities may also contribute to enhance the visibility and reputation of new ventures and may help academic ventures to partly overcome their liabilities of newness (Dubini & Aldrich). Finally, academic entrepreneurs can benefit when they draw on their network to identify new business opportunities or validate their new ideas (Aldrich & Zimmer). The importance of networking opportunities for strategic entrepreneurship has also been recognized by policy makers, and they have launched policy programs to improve entrepreneurs' access to various networks (Lundström & Stevenson, 2005). Some policy programs provide a platform for entrepreneurs and their business partners to meet and build up their personal and business relationships. Other measures promote the formation of local clusters or "science parks," which increase the density of potential contacts with other individuals and organizations and therefore facilitate their formation of regional networks (Cooke, 2001). The greater the opportunities to build up an extended network offered by policy program, the more able academic entrepreneurs are to develop their ventures, and the more they will perceive their strategic goals as proximal and assess a higher usefulness of policy measures if these measures provide them with an improved access to networks.

It appears, however, that the extent to which improved access to networks leads academic entrepreneurs to perceive their goals as more proximal depends on their access to finance. Efficient networking can be costly and requires that academic entrepreneurs have sufficient financial resources available. First, academic entrepreneurs need to monitor their network partners and employ contractual controls to protect themselves and their ventures from opportunistic behavior of the partners. The monitoring and contracting costs associated with efficient protection for the entrepreneur's venture can be substantial (Gulati, Nohria, & Zaheer, 2000). In addition, the efficient use of resources and capabilities acquired via the network such as intellectual property, which needs to be converted into new products, also demands financial resources before the entrepreneurs can receive the full benefits from these nonfinancial resources (Dubini & Aldrich, 1991). Thus, if academic entrepreneurs' access to financial resources is limited, they will perceive the usefulness of an improved access to networks offered by policy programs as weaker than if they have considerable access to financial resources.

Access to Business Knowledge. In his interviews with academic entrepreneurs from Massachusetts Institute of Technology, Shane (2004a, p. 241) found that three types of business knowledge are particularly important and are often lacking in new academic

ventures: knowledge of how to develop and manage a new company, knowledge of the processes of product development and production, and knowledge of the particular market in which the new company will operate. While some of this knowledge is tacit and can only be built up by entrepreneurs through collecting personal experience in running a company, some business knowledge can be acquired by the entrepreneurs through training and mentoring. For example, budgeting and accounting techniques, knowledge about the legal and marketing side of business, planning and human resource practices, knowledge about business internationalization and international markets, and leadership skills can, to a certain extent, be taught (Hambrick & Mason, 1984). The more access academic entrepreneurs have to services offering business knowledge, the more they are able to acquire the skills required to push their products to market, and the more they will perceive the strategic goals for their venture as proximal.

While many entrepreneurs are aware of the benefits of training and mentoring services for enhancing their competencies to successfully develop their venture, they are usually averse to paying fees for any advice or training from outsiders (Storey, 2003). Since policy makers have become aware of this problem, attempts to provide easy and cheap access to business knowledge are part of policy programs aimed at stimulating strategic entrepreneurship in various countries (Lundström & Stevenson, 2005). First, policy makers establish information and outside advice services, for example, in the United States (Chrisman, Nelson, Hoy, & Robinson, 1985). The second way to provide entrepreneurs with an improved access to business knowledge is to involve them in training programs. These learning supports and mentoring services have been implemented, for example, in the United Kingdom, Ireland, Finland, Taiwan, and the United States (Finkle & Deeds, 2001). When academic entrepreneurs can access these programs to develop their business skills, they likely believe that they have the personal abilities to achieve the strategic goals of their venture, and perceive those goals as more proximal, enhancing the perceived usefulness of such programs.

In order to fully exploit the access to business knowledge provided by policy programs, it appears that entrepreneurs need to have sufficient access to finance. First, the acquisition of business knowledge through training may demand a substantial amount of academic entrepreneurs' scarce time resources (Ravasi & Turati, 2005), and they may have to expand their employee base in order to deal with the work they fail to accomplish themselves, which demands more financial resources. Second, the benefits gained from the additional skills and knowledge acquired by the entrepreneurs may be enhanced if their firms have sufficient access to finance. More business skills will enable them to professionalize their businesses and develop them faster, which is associated with an increasing need for finance (Dollinger, 1995). Thus, access to business knowledge offered by policy programs will enhance academic entrepreneurs' perceptions that their strategic goals are more proximal, but even more so if they have sufficient access to finance to fully capitalize on their improved skills.

In sum, it appears that policy programs can enhance academic entrepreneurs' perceptions of goal proximity by providing them with improved access to technology, networks, and business knowledge. The degree to which access to these nonfinancial resources enhances academic entrepreneurs' perceived goal proximity and usefulness of these measures appears to increase when complementary access to finance is offered by the program. Thus:

> **Hypothesis 1:** The level of access to nonfinancial resources ([a] technology, [b] networks, [c] business knowledge) provided by a policy program will be positively related to an academic entrepreneur's perceived usefulness of the program, and this

relationship will be more positive when access to finance is high than when access to finance is low.

Besides providing access to financial and nonfinancial resources, policy programs may enhance academic entrepreneurs' perceptions of goal proximity by adjusting the regulatory and legal environment in such a way that it facilitates the achievement of strategic development goals (Casper, 2000). We focus on the reduction of administrative burdens and provision of tax incentives. Administrative burdens and taxes are known to be hurdles to entrepreneurial activity, and measures to reduce these hurdles are among the most frequently employed entrepreneurship policy measures (Lundström & Stevenson, 2005).

Reduction of Administrative Burdens

In many countries, developing a new venture is associated with substantial administrative burdens and complicated bureaucratic challenges that counteract the strategic goals of academic entrepreneurs (Lundström & Stevenson, 2005; Smallbone & Welter, 2001). Germany and Sweden, for example, are characterized by a high level of coordinating and regulating institutions within their economy which impedes the development of radically innovative products (Casper & Whitley, 2004) and therefore makes it more difficult for academic entrepreneurs to achieve their product development goals. Moreover, dealing with administrative burdens consumes the academic entrepreneur's scarce time and resources in conforming to such bureaucratic requirements. The time and resources the entrepreneur allocates to administration and regulatory tasks will not be available to the entrepreneur's efforts to achieve important strategic goals. The more administrative burdens, the more distal entrepreneurs will perceive their goals.

Policy makers have recognized that high levels of bureaucracy and administrative hurdles negatively impact the development of young ventures, and they have started policy measures to reduce these burdens to facilitate strategic entrepreneurship. For example, the simplification of filing and reporting processes and the introduction of single business numbers facilitate academic entrepreneurs' dealing with government departments (Lundström & Stevenson, 2005). Governments have also strengthened intellectual property and protection policies thereby facilitating the development of new technological products (Lundström & Stevenson). Further, some countries provide active support to entrepreneurs dealing with administration, and governments have introduced simplified and costless electronic administration tools for young ventures (Commission of the European Communities, 2003). All these policy measures have in common that they reduce the bureaucratic hurdles academic entrepreneurs face and the time, resources, and effort they have to allocate to dealing with these hurdles, and academic entrepreneurs will perceive their strategic development goals as more proximal if those administrative burdens are reduced.

However, this effect is likely magnified if, in addition, the entrepreneurs are offered improved access to finance. Reduction of administrative burdens allows entrepreneurs to focus more on their daily business rather than spending time, resources, and effort on dealing with administration tasks. That is, the entrepreneurs can allocate more resources and effort on their product development processes, or they can spend more time on sourcing new business opportunities in their environment. Speeding up product development or exploring new business opportunities, however, is associated with higher resource demands, specifically financial resources. For example, starting new product development projects to address additional market needs may require the hiring of new staff, the purchase of new machinery and devices, and building up new marketing facilities and

distribution channels, all of which can be costly (Teece, 1988). Therefore, academic entrepreneurs can capitalize more on the additional time, resources, and effort gained from the reduction of administrative burdens when they have finance readily available. Thus:

> **Hypothesis 2:** The level of reduction of administrative burdens provided by a policy program will be positively related to an academic entrepreneur's perceived usefulness of the program, and this relationship will be more positive when access to finance is high than when access to finance is low.

Tax Incentives

High corporate taxes counteract the development of entrepreneurial ventures since financial resources paid to the government as corporate taxes are not available for future venture development (Lundström & Stevenson, 2005). For example, when their young ventures generate high revenues in 1 year and a substantial amount of these revenues goes to the government by the end of that year, academic entrepreneurs will have less financial resources available for pursuing ongoing product development projects, building up marketing and distribution facilities, sourcing new product opportunities, and hiring new employees to achieve high growth rates. The higher the tax rates, the less financial resources the entrepreneurs will be able to allocate to these activities in the fiscal year following, thereby increasing the time frame they will need to achieve their desired strategic development goals.

Given these counterproductive effects of high corporate tax rates for venture development, policy makers have recognized that tax incentives for entrepreneurial firms may be an efficient measure to stimulate strategic entrepreneurship (Lundström & Stevenson, 2005). Governments in many countries including the United Kingdom, Sweden, Australia, Canada, and Spain provide these incentives for new firms (Commission of the European Communities, 2003; Lundström & Stevenson; Parker, 2002). Measures to reduce the tax burdens for young ventures include respites of tax payments or the exoneration from collection and remission of value-added or goods and service tax (Lundström & Stevenson). Moreover, in order to support innovation and new product development efforts of young ventures, some governments have introduced opportunities to partially write off R&D expenses (Wise & Miles, 2003). These possibilities to save taxes provide the new ventures with more financial slack by the end of the fiscal year, and enhance the financial slack available to the academic entrepreneurs to achieve their strategic goals the year following.

The positive effect of tax incentives on academic entrepreneurs' goal proximity perceptions, however, is likely diminished in an environment where entrepreneurs have greater access to finance. For example, if the academic entrepreneur's venture operates in a context where finance is offered by policy programs, the entrepreneur can turn to these programs to acquire the financial resources necessary for achieving their strategic goals. In that case, additional tax incentives may be welcomed by the academic entrepreneur because they increase the ventures' financial resources; however, the tax incentives are likely perceived to be less important if the program also offers access to finance. In contrast, if policy programs do not offer access to financial resources and academic entrepreneurs have difficulties acquiring finance from other sources in their environment, reduced taxes may be perceived as essential to ensure that they are able to finance the development of their ventures. Therefore, there appears to be a substitution effect between tax incentives and access to finance in enhancing the perceived goal proximity of academic entrepreneurs. Thus:

Hypothesis 3: The level of tax incentives provided by a policy program will be positively related to an academic entrepreneur's perceived usefulness of the program, and this relationship will be less positive when access to finance is high than when access to finance is low.

Research Method

Data and Sample

Our sample frame is academic entrepreneurs in Germany. In order to identify academic entrepreneurs, we used the online database of the EXIST program. EXIST was started in 1997 by the German Federal Ministry of Education and Research and extends over large parts of Germany. EXIST consists of regional networks of entrepreneurial ventures and support agencies and aims to improve the conditions for academic entrepreneurship. We consider the EXIST list as a useful sampling frame for our analysis for the following reasons. First, because nearly all German universities are funded by the government, the EXIST list is unlikely to be systematically biased as compared with the overall population of German academic entrepreneurs. It is also known that EXIST and non-EXIST regions in Germany do not differ substantially and, for example, show the same spin-off intensity (BMBF, 2002). Second, some but not all entrepreneurs on this list had applied for policy programs before, and some but not all of the applications had been successful (for details see below). This allowed us to cover a wide range of academic entrepreneurs with different attitudes toward, and previous experiences with, policy programs. Finally, EXIST is not targeted at entrepreneurs from any particular sector or type of start-up, but includes entrepreneurs of high technology as well as low technology firms such as service and retail businesses.

The EXIST database was available over the website of the program (http://www.exist.de, accessed in January/February 2006) and listed 587 firms and their contact data. We trained three research assistants, who contacted all firms by telephone, explained the purpose of our study, and asked for the lead entrepreneur to participate. Of the 587 firms, we were able to make contact with 479 firms; the others were unavailable by telephone. Further investigation revealed that most of the unavailable firms had ceased to exist.[2] Individuals in 361 of the 479 firms agreed to participate in our study (75.4%). We sent an e-mail invitation to these academic entrepreneurs, which summarized the purpose of our study and provided them with a link to our online research instrument (see below). If the academic entrepreneurs did not participate within 2 weeks, we sent another e-mail which reminded them of the importance of their participation and again provided them with a link to the online study. We finally received responses from 109 entrepreneurs, representing a 30.2% response rate in terms of individuals invited. Since we had to eliminate 11 of these responses because of missing data or unreliable answers (see below), we were left with 98 participants. When we compared the assessments of early (first 30 of the 98) and late respondents (last 30) there were no significant differences ($p > .10$), indicating that there is unlikely to be a nonresponse bias in our sample.

On average, participants of our study were 36.0 years old, and 20.6% of them were female. With respect to their education, 19.4% had a PhD degree, 72.4% a diploma degree or equivalent, and the remaining 8.2% had high school degrees but did not finish their university studies prior to company foundation. Moreover, 26.5% had a background in

2. There is also the possibility that some of these firms had not yet started their operations.

natural sciences, 29.6% in management/economics, 30.6% in engineering, and the remaining 13.3% in other fields such as social sciences. Seventy-six (78%) of the academic entrepreneurs had applied for policy programs at least once before, and 63 (64%) had been successful. Thus, 36% of our sample had never been enrolled in a policy program. When we compared the assessments of enrolled and nonenrolled academic entrepreneurs, we found no significant differences ($p > .10$). The average venture was 4.7 years old and had 3.9 employees. Fifty-three percent of the ventures were technology-based (e.g., biotechnology, software); the others belonged to various industries (e.g., consulting, tourism, public relations, marketing agencies). Thus, our sample is similar to other studies on academic entrepreneurship in Europe with respect to share of technology-based firms (Chiesa & Piccaluga, 2000) and average number of employees (Heirman & Clarysse, 2004).

Conjoint Analysis

A metric conjoint analysis was used to collect data on the academic entrepreneurs' assessments of the usefulness of policy programs. Conjoint studies require decision makers to make assessments based on a number of attributes representing the research variables. These attributes are described by different levels (e.g., high and low). Several attributes with predetermined levels constitute a profile to which the decision maker assigns her/his judgement. As compared with *post hoc* methods such as questionnaires, interviews, or surveys, conjoint analysis has the advantage that it is not biased due to the mistaken or missing introspection of decision makers (Shepherd & Zacharakis, 1997), which can substantially influence the results (Fischhoff, 1988). A second advantage of metric conjoint analysis is that it enables researchers to analyze contingent relationships between variables (Shepherd & Zacharakis) as we hypothesize them in our study.

Two possible limitations of conjoint methods are mentioned in the literature. The first is that participants may take the attributes described in the profiles only as important because they are part of the assessment task (Shepherd & Zacharakis, 1997). We consider this to be a minor limitation in our study because all our research variables are described in the literature as major elements of entrepreneurship policy programs in many countries (see above, Lundström & Stevenson, 2005). A second possible limitation of conjoint techniques is that the scenarios do not represent real decision situations. However, scholars have shown that conjoint analyses reflect well real-world judgements of individuals (Brown, 1972; Hammond & Adelman, 1976).

Research Instrument

We used an online instrument to investigate academic entrepreneurs' assessments of the usefulness of different policy programs. When we contacted prospective participants by telephone, we explained to them the purpose of our study and the experimental task. These instructions were again given as part of a follow-up e-mail invitation letter, which also provided them with a link to the webpage of the study. The first three pages of the experiment provided a short description of its purpose and the task, as well as a more detailed description of the attributes and their levels (see below). Moreover, participants were told to assume that they were acting in today's economic environment in Germany and to consider all other factors potentially influencing their assessments as constant

across all profiles. They were then asked to judge how useful the subsequently described hypothetical policy programs would be for development of their venture. Each program was presented on one screen (i.e., webpage). After completion of the conjoint task, participants filled out a questionnaire where they were asked to provide demographic information including the variables used to describe our sample. Further, the participants were offered the opportunity to provide feedback about the study and leave their address so that we could inform them about the study's results. While almost all participants demonstrated their interest in the study by asking for its results, none of them reported any problems with its design or the task.

Dependent Variable. The dependent variable of our study is academic entrepreneurs' assessment of the usefulness of the described policy programs for the development of their firm. We chose this broad description and did not further specify these goals for three reasons. First, strategic goals likely differ across firms. For example, firms with a developed prototype may pursue the primary goal to introduce this prototype to market, whereas the primary development goals of ventures still at the R&D stage may be to achieve particular research milestones. Second, entrepreneurs are heterogeneous in their motivations to start, grow, and sustain their ventures (Kuratko, Hornsby, & Naffziger, 1997). Third, entrepreneurs also differ in the extent to which they explicitly formulate strategic goals (Shane & Delmar, 2004). Our aim was to include all of these entrepreneurs, and the broad description "usefulness for the development of their firm" covers their heterogeneity. However, the description also indicates that we refer to the achievement of some development goal (as opposed to maintaining the status quo). We asked academic entrepreneurs to assess the usefulness of the policy programs on a 7-point Likert-type scale anchored by the end-points "very high" and "very low."

Decision Attributes. The profiles consisted of six attributes, each of which is assigned one of two possible levels (extensive and limited). *Finance* describes the access to finance provided by the program and ranges from extensive (the program offers extensive access to financial funds [low interest debt and/or silent equity partnerships]) to limited (the program offers only limited access to financial funds [low interest debt and/or silent equity partnerships]). *Technology* means the access to technology provided by the program and ranges from extensive (the program offers extensive access to technology by facilitating its transfer from universities and research institutes) to limited (the program offers limited access to technology and does not facilitate its transfer from universities and research institutes). *Network* describes the access to networks provided by the program and ranges from extensive (the program offers extensive access to networks covering other entrepreneurs, investors, and firms) to limited (the program offers limited access to networks covering other entrepreneurs, investors, and firms). *Knowledge* stands for the access to entrepreneurial knowledge provided by the program and ranges from extensive (the program offers extensive access to entrepreneurial knowledge by providing consulting services and entrepreneurship education) to limited (the program offers limited access to entrepreneurial knowledge and does not provide consulting services and entrepreneurship education). *Administration* means the reduction of administrative burdens provided by the program and ranges from extensive (the program includes an extensive reduction of administrative burdens for new companies) to limited (the program does not include reduction of administrative burdens for new companies). *Tax* stands for the tax incentives provided by the program and ranges from extensive (the program provides extensive tax incentives for new companies) to limited (the program provides no tax incentives for new companies).

Conjoint Design

The profiles of our study are described by six attributes, each of which is represented by two levels, yielding $2^6 = 64$ possible combinations. Since reliability in conjoint studies is accounted for by replicating profiles and performing test–retest checks (Shepherd & Zacharakis, 1997), our final design would have consisted of 128 profiles. We chose an orthogonal fractional factorial design that allowed us to test all main effects and all hypothesized two-way interactions, which reduced the attribute combinations to 16.[3] Including retests, the assessment task thus consisted of 32 profiles and one additional profile that was used to familiarize respondents with the task but which was excluded from analysis. Because of the orthogonal design, we omit a correlation table—the correlation between all attributes is zero. The 32 profiles and six attributes describing the profiles were randomly assigned in two ways, each to control for ordering effects, which yielded four versions of our study. We did not find significant differences across versions.

Statistical Method

Data consist of 32 assessments for each of the reliably answering 98 participants, yielding 3,136 data points. These data points, however, are not independent of each other because they are nested within individuals and the judgements of individuals likely differ according to their mental models, which are a function of their experiences and values as well as the organizational contexts in which they operate (Hambrick & Mason, 1984). That is, the total variance in the assessments of the entrepreneurs arises from two sources—the different levels of the decision attributes described in the scenarios ("within individual variance") and the differences between individuals and their organizational contexts ("between individual variance"). The appropriate method to account for this nested nature of data is Hierarchical Linear Modeling (HLM). HLM separates both types of variance and allows us to focus exclusively on the effect of the decision attributes while controlling for all factors that are different across academic entrepreneurs and their organizations (such as firm size and development stage, sector, competition).

Results

Our survey yielded 109 responses from academic entrepreneurs. Four of these responses were not included in the analysis because of missing data. We tested the reliability of the remaining 105 responses by calculating Pearson correlations between the original and the repeated profiles. Seven of these 105 participants (6.7%) did not provide reliable answers ($p > .05$) and were also excluded from further data evaluation. Our final sample thus consisted of responses from 98 individuals. The mean test–retest correlation was .82, which is similar to other studies (Shepherd, 1999; .69). The mean R^2 of the individual models was .86, again in line with previous work (Shepherd; .78). In Table 1, we report the results of our analysis.

Our results reveal significant main effects for all decision attributes ($p < .001$). That is, academic entrepreneurs' assigned usefulness of a policy program increases with an extensive access to (1) finance, (2) technology, (3) networks, and (4) business knowledge

3. We focus our analysis on two-way interactions because research on decision making has shown that individuals do not rely heavily on three-way and higher order interactions in their decision policies (these interactions account only for a minimal amount of variance [Louviere, 1988]).

Table 1

Entrepreneurs' Assessments of the Policy Programs' Usefulness

Evaluation criteria	Coefficient	Standard error	*t*-ratio
Intercept	3.834	.056	68.839***
Access to resources			
Finance	1.857	.107	17.430***
Technology	.526	.062	8.465***
Network	.730	.071	10.346***
Knowledge	.605	.056	10.786***
Regulatory framework			
Administration	.826	.068	12.072***
Tax	.788	.068	11.546***
Interactions			
Finance × technology	−.051	.074	−.688
Finance × network	.158	.062	2.542**
Finance × knowledge	.142	.059	2.412**
Finance × administration	.112	.062	1.822*
Finance × tax	−.153	.065	−2.368**

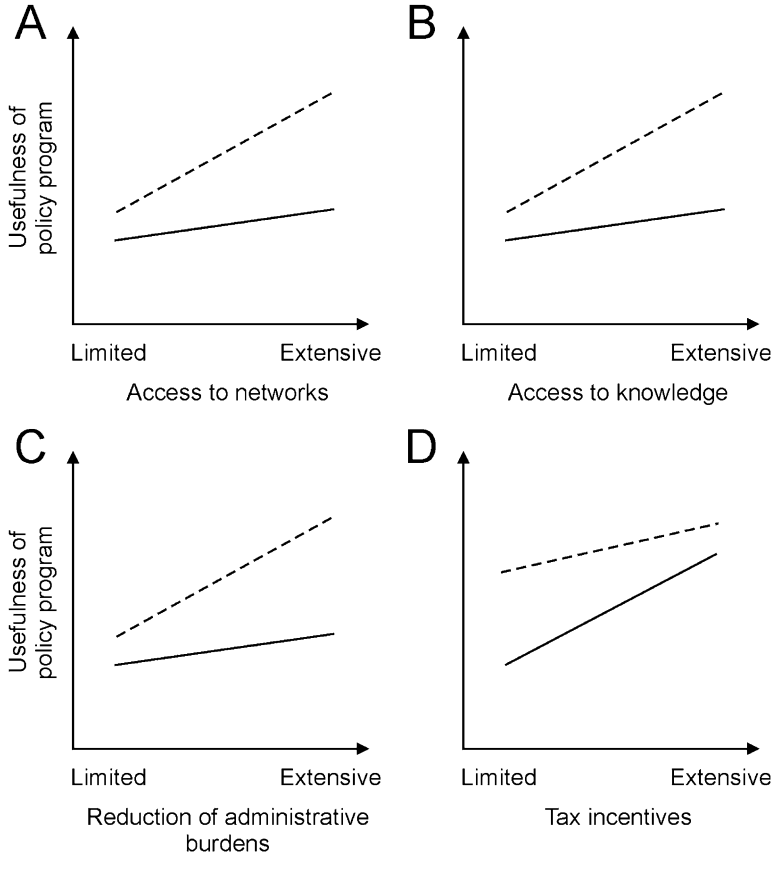
* $p < .10$; ** $p < .05$; *** $p < .01$
n = 3,136 decisions nested within 98 entrepreneurs.

offered by the program. Moreover, the assigned usefulness of a policy program is increased with extensive (5) reduction of administrative burdens, and (6) tax incentives. The focus of our analysis, however, was on interaction effects between the access to finance provided by the policy program and other research variables. Table 1 shows that three interactions are significant ($p < .05$), and one is marginally significant ($p < .10$). Because we do not find a significant interaction between access to finance and access to technology, we conclude that hypothesis 1a is not supported. To interpret the nature of the significant interactions, we plot each relationship. On the x-axis is the decision attribute, on the y-axis is the assessed usefulness of the policy program, and we plot separate lines for low and high access to finance.

Figure 1A demonstrates that academic entrepreneurs assess a higher usefulness of policy programs that provide more access to networks and this positive relationship is more positive when programs also provide extensive access to finance than when they provide minimal access to finance. The nature of this significant interaction provides support for hypothesis 1b. Figure 1B demonstrates that academic entrepreneurs assess a higher usefulness of policy programs that provide more access to business knowledge and this positive relationship is more positive when programs also provide extensive access to finance than when they provide minimal access to finance. The nature of this significant interaction provides support for hypothesis 1c. Figure 1C demonstrates that academic entrepreneurs assess a higher usefulness of policy programs that provide more reduction of administrative burdens and this positive relationship is more positive when programs also provide extensive access to finance than when they provide minimal access to finance. The interaction, however, is only marginally significant ($p < .10$), thus there is marginal support for hypothesis 2. Figure 1D demonstrates that academic entrepreneurs assess a

Figure 1

Interaction Effects between Access to Finance (Extensive: Dashed Lines; Limited: Solid Lines) and (A) Access to Networks, (B) Access to Knowledge, (C) Reduction of Administrative Burdens (Marginally Significant), and (D) Tax Incentives



higher usefulness of policy programs that provide more tax incentives and this positive relationship is less positive when programs also provide extensive access to finance than when they provide minimal access. The nature of this significant interaction provides support for hypothesis 3.

Discussion

This study's focus on strategic entrepreneurship allowed us to extend the literature on academic entrepreneurship by investigating the development of existing academic ventures rather than the creation of new ventures. So far, most studies have analyzed factors that promote the creation of new ventures (Rothaermel et al., 2007). For example, these studies have identified university policies (Di Gregorio & Shane, 2003), the royalty

regime of the university (Lockett & Wright, 2005), and its entrepreneurial culture (Franklin, Wright, & Lockett, 2001) as factors influencing the rate by which academic spin-offs are formed. Moreover, a substantial body of literature has investigated the role of the TTO in the creation of new academic ventures (e.g., Lockett & Wright). Among the few studies that have focused on existing ventures, Ensley and Hmieleski (2005) found that academic ventures have more homogeneous management teams and experience lower performance than nonacademic ventures, and Grandi and Grimaldi (2003) showed that the founding team's intentions to build up external relationships are an important factor to achieve high performance. Our analysis complements these studies by showing that, according to entrepreneurs' perception, governmental policies may also contribute to the strategic development of academic ventures.

In line with previous strategic entrepreneurship research (see Dollinger, 1995), our article emphasizes the central role of access to finance for young ventures. Our results demonstrate that availability of financial resources increases academic entrepreneurs' perceptions that they can capitalize more on other, nonfinancial resources such as networks and business knowledge. These resources have been shown to independently promote venture growth (Chrisman & McMullan, 1996). The interaction effects between the availability of financial and nonfinancial resources indicate that strategic decisions of entrepreneurs depend on contingent relationships between resources rather than their additive effect. In line with other scholars (Heirman & Clarysse, 2004), we call for a more sophisticated application of resource-based theory in future entrepreneurship research which views the venture as a complex "bundle of resources" (Penrose, 1959) to explicitly take into account resource interactions.

We also find that entrepreneurs perceive the access to financial resources to interact with variables describing the regulatory and legal environment of their ventures. Previous strategic entrepreneurship studies have analyzed interactions between a venture's financial resources and environmental variables such as dynamism (Wiklund & Shepherd, 2005) and complexity (George, 2005). We show that entrepreneurs perceive financial resources to impact the relationship between institutional variables describing the venture's regulatory/legal environment and strategic venture development. While entrepreneurs perceive tax incentives positively, academic entrepreneurs perceive them less positively when programs also provide greater access to finance. Our marginally significant findings allow us to speculate that entrepreneurs perceive the reduction of administrative burdens through policy programs to more positively affect the strategic development of their ventures when financial resources are available at the same time. The marginal significance of the findings suggests the need for further research.

Of particular interest for the literature on academic entrepreneurship may be that, over and above the direct effects of policy measures on the entrepreneurs' perceived usefulness, we find that access to finance enhances the perceived access to other, nonfinancial resources provided by policy programs. It is known that both universities and governments offer academic entrepreneurs access to a variety of different resources, but so far, researchers have paid little attention to potential interaction effects. For example, Lockett and Wright (2005) showed that the formation of university spin-offs is higher the more resources, in terms of technology to commercialize, intellectual property advice, and business development capabilities, TTOs provide to academic entrepreneurs, but they do not consider interactions between these resources in explaining venture formation. Our results suggest that the effect of some resources provided by TTOs on new venture formation may be stronger if the TTO, in parallel, offers access to complementary finance (as some TTOs do; Shane & Cable, 2002). Future research can explore whether the interaction effects between financial and nonfinancial resources that we found to enhance

the academic entrepreneurs' perceptions of the usefulness of policy programs for existing ventures enhance the number of new ventures that are created.

Our study also contributes to the literature on entrepreneurship policy. This stream of literature is relatively new and much of it is still exploratory and describes the policy measures that governments introduce to stimulate entrepreneurial action (Gilbert et al., 2004; Lundström & Stevenson, 2005). To date, few studies have investigated whether the policy measures introduced do indeed have the desired effect on entrepreneurial activity and the development of entrepreneurial ventures. For example, Chrisman et al. (1985) found that ventures who received advice and counseling by the Small Business Development Centers experienced higher performance than ventures that did not receive these services. One of the most sophisticated evaluations of a policy program was provided by Lerner (1999) who showed that ventures enrolled in the Small Business Innovation Research program grew significantly faster than other ventures. While these studies are important to demonstrate the overall positive impact entrepreneurship policy can have on new venture development, they do not pay attention to the entrepreneurs' perceptions and assessments of these programs. These perceptions, however, are known to be a major driver of entrepreneurial behavior (Krueger, 2000). Our work thus complements existing studies on entrepreneurship policy by focusing on entrepreneurial perceptions.

However, we did not find support for all our (interaction) hypotheses. Unexpectedly, we do not find an interaction between access to finance and access to technology in academic entrepreneurs' assessed usefulness of policy programs. Since technologies developed at universities and research organizations are often at an early development stage when they are transferred into private firms (Wright et al., 2007), academic ventures require substantial additional financial resources to convert this technology into a marketable product and build up marketing and distribution facilities (Teece, 1986). Perhaps the amount of financial resources required for these tasks exceeds that available through policy programs. For example, policy programs in Europe typically provide financing ranging from several tens to several hundred thousands of Euros (Wright et al.), but ventures developing high-technology products need many millions of Euros to develop their products and take them to market.

We did not analyze the economic impact of policy measures and therefore want to be careful in drawing implications for policy makers. To the extent that policy makers may want to consider the academic entrepreneurs' assessments of policy programs, however, our study suggests that the appropriate combination of entrepreneurship policy measures can multiply their perceived benefits for strategic entrepreneurship at universities. That is, if newly launched policy measures are considered as being part of a bundle of existing measures rather than in isolation, policy makers may be able to launch policy programs that are perceived as more useful by academic entrepreneurs for achieving their strategic goals from a limited amount of the taxpayers' money.

We hope that future research will continue along the lines of this study by addressing its limitations. First, care must be taken when generalizing our results to nonacademic entrepreneurs. Academic entrepreneurs are known to differ from other entrepreneurs with respect to their human capital, resource demands, and, importantly, availability of policy programs (Shane, 2004a; Wright et al., 2007), and thus may differ in their assessment policies from nonacademic entrepreneurs. Future research can test whether our hypotheses hold for nonacademic entrepreneurs. Second, our experimental design allowed us to investigate only those hypothesized two-way interactions. While our theory suggests that finance plays a central role as a moderator in academic entrepreneurs' assessments, other interactions may also be considered by entrepreneurs. Finally, our study focused on explaining variance in entrepreneurs' assessments of policy programs based on the

characteristics of those programs ("within individual variance"), but there is additional variance between entrepreneurs' assessments due to the specific background of the entrepreneurs and the characteristics of their ventures. Future research can make additional contributions by investigating variance between entrepreneurs' assessments.

In this paper, we show that academic entrepreneurs perceive policy programs as a means to facilitate strategic entrepreneurship. Programs that provide access to finance, technology, networks, and business knowledge, as well as programs that offer tax incentives and reduce administrative burdens are perceived by academic entrepreneurs as useful for achieving their strategic development goals. We also showed that academic entrepreneurs' perceived utility of access to financial resources enhances the usefulness of policy measures providing access to nonfinancial resources but substitutes for programs that provide tax incentives. Policy programs that offer, in addition to access to nonfinancial resources, access to financial resources may be particularly useful for fostering strategic entrepreneurship at universities.

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