Entrepreneurship
A survey of the literature

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1. Introduction

This paper seeks to provide a roadmap to the entrepreneurship literature. This is not an easy or obvious task, because entrepreneurship does not correspond nicely with any established academic discipline such as economics, let alone any particular sub-discipline within economics, such as labour economics or industrial economics. Rather, the subject of entrepreneurship has been the topic of scholarship and research in a variety of academic fields, including but not limited to economics. The interdisciplinary nature of scholarship reflects the subject – entrepreneurship itself is a multifaceted, complex social and economic phenomenon.

The purpose of this roadmap is to highlight those aspects of the entrepreneurship that can serve as a guiding light to direct policy makers in understanding the issues, the debates, the most important questions and issues, and in distinguishing what is known and has been established from areas which are at the frontier of research or need to be researched in the future. In addition, direct comparisons are made between entrepreneurship in the European and American contexts.

The paper begins in the following section by addressing the question of how entrepreneurship is understood and defined at the conceptual level. While it is clear that no singular definition of entrepreneurship exists, most studies conclude that it centers around the process of change. The third section moves from conceptualizing entrepreneurship to actual measurement. This is an important section because the ideal measures of entrepreneurship remain to be developed. Empirical knowledge is generally based on measures which are available but do not generally reflect the exact definitions of entrepreneurship made in the previous section. The fourth section provides an explanation of the evolution of entrepreneurship and why it has become more important than it was during the post-World War II era. The links between entrepreneurship and economic performance are the focus of section five. These links are important, because they provide the basis for considering entrepreneurship as a source for improving economic performance. The links between entrepreneurship and economic performance are considered across a variety of units of analysis, spanning from the firm, to the region and the country. Performance measures include employment generation, growth, survival, innovation, productivity, and exports. An important conclusion of this section is that, regardless of the unit of analysis and performance measure, the relationship between entrepreneurship and economic performance is remarkably robust.

The sixth section focuses on the determinants of entrepreneurship. Examining factors shaping the extent of entrepreneurial activity is important because it provides insights as to how policy could be used to promote entrepreneurship. In particular, the determinants of entrepreneurship are considered at the level of the individual, the enterprise, the region and the country. The final section focuses on the role of public policy. Two important policy distinctions are made. The first is that, in contrast to the prevalent public policy approach in the Post World War II era restraining enterprises, the new policy focuses on enabling rather than constraining economic actors. The second is that entrepreneurship policy has an orientation that is distinct from traditional SME or small business policy.

While the systematic scholarly focus on entrepreneurship is a relatively new subject, this study concludes that several important insights have been established. First, entrepreneurship has become relatively more important since the post-World War II era. Second, entrepreneurship is a multidimensional phenomenon spanning different units of observation, ranging from the individual to the firm, region and even nation. Third, robust statistical and econometric links have been confirmed to exist between entrepreneurship and economic growth. The positive relationship between entrepreneurship and growth has been verified to exist both in the European and North American contexts. Fourth, the determinants of entrepreneurial activity reflect its underlying multidimensional dimension and include factors specific both to the ability of individuals and enterprises to engage in entrepreneurial activities and the demand for entrepreneurship. Fifth, there is a key role for public policy to stimulate entrepreneurial activity as a mechanism for promoting economic growth.

2. What is Entrepreneurship?

While it has become widely acknowledged that entrepreneurship is a vital force in the economies of developed countries, there is little consensus about what actually constitutes entrepreneurial activity. Scholars have proposed a broad array of definitions, which when operationalized, have generated a number of different measures (Hebert and Link, 1989). Herbert and Link (1989) have identified three distinct intellectual traditions in the development of the entrepreneurship literature. These three traditions can be characterized as the German Tradition, based on von Thuenen and Schumpeter, the Chicago Tradition, based on Knight and Schultz, and the Austrian Tradition, based on von Mises, Kirzner and Shackle. The Schumpeterian tradition has had the greatest impact on the contemporary entrepreneurship literature. The distinguishing feature from Schumpeter is that entrepreneurship is viewed as a disequilibrating phenomenon rather than an equilibrating force. In his 1911 classic treatise, *Theorie der wirtschaftlichen Entwicklung* (Theory of Economic Development), Schumpeter proposed a theory of *creative destruction*, where new firms with the entrepreneurial spirit displace less innovative incumbents, ultimately leading to a higher degree of economic growth. Even in his 1942 classic, Capitalism and Democracy, Schumpeter (p. 13) still argued that entrenched large corporations tend to resist change, forcing entrepreneurs to start new firms in order to pursue innovative activity: “The function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention, or more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way…To undertake such new things is difficult and constitutes a distinct economic function, first because they lie outside of the routine tasks which everybody understand, and secondly, because the environment resists in many ways.”

Despite the Schumpeterian emphasis on the process of starting a new enterprise as the defining entrepreneurial activity, there is no generally accepted definition of entrepreneurship for the developed countries of the OECD (OECD, 1998). The failure of a single definition of entrepreneurship to emerge undoubtedly reflects the fact that it is a multidimensional concept. The actual definition used to study or classify entrepreneurial activities reflects a particular perspective or emphasis. For example, definitions of entrepreneurship typically vary between the economic and management perspectives.

From the economic perspective, Hebert and Link (1989) distinguish between the supply of financial capital, innovation, allocation of resources among alternative uses and decision-making. Thus, an entrepreneur is someone encompassing the entire spectrum of these functions: “The entrepreneur is someone who specializes in taking responsibility for and making judgmental decisions that affect the location, form, and the use of goods, resources or institutions” (Hebert and Link, 1989, p. 213).

By contrast, from the management perspective, Sahlman and Stevenson (1991, p.1) differentiate between entrepreneurs and managers in that, “entrepreneurship is a way of managing that involves pursuing opportunity without regard to the resources currently controlled. Entrepreneurs identify opportunities, assemble required resources, implement a practical action plan, and harvest the reward in a timely, flexible way.”

The most prevalent and compelling views of entrepreneurship focus on the perception of new economic opportunities and the subsequent introduction of new ideas in the market. As Audretsch (1995) argues, entrepreneurship is about change, just as entrepreneurs are agents of change; entrepreneurship is thus about the process of change. This corresponds to the definition of entrepreneurship proposed by the OECD, “Entrepreneurs are agents of change and growth in a market economy and they can act to accelerate the generation, dissemination and application of innovative ideas….Entrepreneurs not only seek out and identify potentially profitable economic opportunities but are also willing to take risks to see if their hunches are right” (OECD, 1998, p. 11).

While the simplicity of defining entrepreneurship as activities fostering innovative change has its attraction, such simplicity also masks considerable complexity. Entrepreneurship is shrouded with complexity for at least two reasons. The first reason emerges because entrepreneurship is an activity crossing multiple organizational forms. Does entrepreneurship refer to the change inducing activities of individuals, groups of individuals such as networks, projects, lines of business, firms, and even entire industries, or even for geographic units of observation, such as agglomerations, clusters, and regions?

Part of the complexity involved with entrepreneurship is that it involves all of these types of organizational forms. No single organizational form can claim a monopoly on entrepreneurship.

The second source of complexity is that the concept of change is relative to some benchmark. What may be perceived as change to an individual or enterprise may not involve any new practice for the industry. Or, it may represent change for the domestic industry, but not for the global industry. Thus, the concept of entrepreneurship is embedded in the local context. At the same time, the value of entrepreneurship is likely to be shaped by the relevant benchmark. Entrepreneurial activity that is new to the individual but not the firm or industry may be of limited value. Entrepreneurial activity that is new to the region or country may be significant but ultimately limited. By contrast, it is entrepreneurial activity that is new across all organizational forms, all the way up to the global, that carries the greatest potential value.

Thus, one of the most striking features of entrepreneurship is that it crosses a number of key units of analysis. At one level, entrepreneurship involves the decisions and

actions of individuals. These individuals may act alone or within the context of a group. At another level, entrepreneurship involves units of analysis at the levels of the industry, as well as at spatial levels, such as cities, regions and countries.

3. Measuring Entrepreneurship

Operationalizing entrepreneurship for empirical measurement is difficult (Storey, 1991). The degree of difficulty involved increases exponentially when cross-country comparisons are involved. Studies focusing on a single country, either in a cross-sectional or time series context, have deployed a variety of proxy measures, spanning self-employment rates, business ownership rates, new-firm startups (births), as well as other measures of industry demography, such as turbulence (turnover), or the extent of simultaneous births and exits and net entry. An ideal measure would incorporate each of these different measures reflecting a different aspect of entrepreneurship. However, systematic measurement conducive to cross-country comparisons is limited.

The different contexts and organizational forms involving entrepreneurship account for the paucity of measures used to reflect entrepreneurial activity. Measures of self-employment reflect change that is occurring at least for the individual starting a new business. That very little of this change is projected onto the larger industry, nation or global market has long resulted in the criticism of self-employment as a measure of entrepreneurial activity. That is, what is new and different for the individual may not be so different for the industry or global market. Even for a developed country such as the United States, only a very small fraction of new startups are really innovative. Still, measures of self-employment are widely used to reflect the degree of entrepreneurial activity, largely because they are measured in most countries, and measured in comprehensive facilitating comparisons across countries and over time (Blau, 1987).

Audretsch, Carree, van Stel and Thurik (2002) and Carree, van Stel, Thurik and Wennekers (2001) use a measure of business ownership rates to reflect the degree of entrepreneurial activity. This measure is defined as the number of business owners (in all sectors excluding agriculture), divided by the total labour force. There are a number of important qualifications that should be emphasized when using and interpreting this measure. First, it lumps together all types of a very heterogeneous activity across a broad spectrum of sectors and contexts into a solitary measure. This measure treats all businesses as the same, both high-tech and low-tech. Second, it is not weighted for magnitude or impact. Again, all businesses are measured identically, even though some clearly have a greater impact than others. Third, this variable measures the stock of businesses and not the startup of new ones. Still, this measure has two significant advantages. The first is that, while not being a direct measure of entrepreneurship, it is a useful proxy for entrepreneurial activity (Storey, 1991). Second, it is measured and can be compared across countries and over time.

Other measures of entrepreneurship focus more on change that corresponds to innovative activity for an industry. Such measures include indicators of R&D activity, the numbers of patented inventions, and new product innovations introduced into the market (Audretsch, 1995). These measures have the advantage of including only firms that actually generate change at the industry level, that is at a level beyond the firm itself.

However, such measures must always be qualified by their failure to incorporate significant types of innovative activity and change not reflected by such measures (Griliches, 1990).

Similarly, other measures of entrepreneurial activity focus solely on the criterion of growth. Firms exhibiting exceptionally high growth over a prolonged duration are classified as *gazelles*. For example, Birch (1999) measures the number of gazelles to reflect entrepreneurship. Such measures of entrepreneurship must also be qualified for their narrow focus not only on a single unit of observation – enterprises – but also on a single measure of change – growth.

Lundstrom and Stevenson (2001) followed the precedent of the Global Entrepreneurship Monitor (GEM) study (Reynolds et al., 2000) by defining and measuring entrepreneurship as "mainly people in the pre-startup, startup and early phases of business" (Lundstrom and Stevenson, 2001, p. 19). This definition has a tilt toward incipient entrepreneurs and startups because, "these are the targets for entrepreneurship policy measures." An obvious limitation of this approach is that it restricts entrepreneurial activity to the process of the firm startup. While an important manifestation of change and innovation is no doubt reflected by the process of starting a new business, at the same time there is a considerable amount of change and innovation contributed by incumbent enterprises of all sizes, or what is sometimes referred to as intrapreneurship. Lundstrom and Stevenson (2001, p. 19) justify their emphasis on pre-startup and startup as well as the incipient and early stages of business ownership because, "These are the targets for entrepreneurship policy measures and we propose that entrepreneurship policy measures are taken to stimulate individuals to behave more entrepreneurially. It is our position that this can be done by influencing motivation, opportunity and skill factors. Therefore, our aim is to see what types of policy actions are taken towards individuals in the pre- and early stages of idea and business development."

The above discussion makes it clear that while entrepreneurship is a heterogeneous activity encompassing a broad spectrum of disparate organizations and types of activities, many of the conventional definitions and measures are, in fact, remarkable for reflecting entrepreneurship as a homogeneous activity. In the context of developing countries such a narrow definition and measure of entrepreneurship must be qualified.

4. Why Entrepreneurship Has Become More Important

The role of entrepreneurship in society has changed drastically over the last half century. During the post-World War II era, the importance of entrepreneurship and business seemed to be fading away. While alarm was expressed that small business needed to be preserved and protected for social and political reasons, few made the case on the grounds of economic efficiency. This position was drastically reversed in recent years. Entrepreneurship has become the engine of economic and social development throughout the world. The role of entrepreneurship has changed dramatically between the traditional and new economies.

During the post-war period a generation of scholars spanning a broad spectrum of academic fields and disciplines devoted their research to identifying the issues involving

this perceived trade-off between economic efficiency on the one hand and political and economic decentralization on the other. Scholars responded by producing a massive literature focusing on essentially three issues: (i)What are the gains to size and large-scale production? (ii) What are the economic welfare implications of having an oligopolistic market structure, i.e. is economic performance promoted or reduced in an industry with just a handful of large-scale firms? and (iii) Given the overwhelming evidence that large-scale production resulting in economic concentration is associated with increased efficiency, what are the public policy implications?

This literature produced a series of stylized facts about the role of SMEs during the post-war economies in North America and Western Europe:

(1) *SMEs were generally less efficient than their larger counterparts*. Studies from the U.S. in the 1960s and 1970 revealed that SMEs produced at lower levels of efficiency, leading Weiss (1976, p. 259) to conclude that, "On the average, about half of total shipments in the industries covered are from suboptimal plants. The majority of plants in most industries are suboptimal in scale, and a very large percentage of output is from suboptimal plants." Pratten (1971) found similar evidence for the United Kingdom, where suboptimal scale establishments accounted for 47.9 percent of industry shipments.

(2) *SMEs provided lower levels of employee compensation*. Empirical evidence from both North America and Europe found a systematic and positive relationship between employee compensation and firm size (Brown, Hamilton and Medoff, 1990 and Brown and Medoff, 1989).

(3) *SMEs were only marginally involved in innovative activity*. Based on R&D measures, SMEs accounted for only a small amount of innovative activity.

(4) The relative importance of SMEs was declining over time in both North America and Europe

In the post-war era, small firms and entrepreneurship were viewed as a luxury, perhaps needed by the west to ensure a decentralization of decision making, but in any case obtained only at a cost to efficiency. Certainly the systematic empirical evidence, gathered from both Europe and North documented a sharp trend towards a decreased role of SMEs during the post-war period.

Thus, it was particularly startling and a seeming paradox, when scholars first began to document that what had seemed like the inevitable demise of SMEs actually began to reverse itself starting in the 1970s. Loveman and Sengenberger (1991) and Acs and Audretsch (1993) carried out systematic international studies examining the re-emergence of SMEs and entrepreneurship in North America and Europe. Two major findings emerged from these studies – first, the relative role of SMEs varies systematically across countries, and secondly, in most European countries and in North America, SMEs began increasing their relative importance starting in the mid-1970s. In the U.S. the average real GDP per firm increased by nearly two-thirds between 1947 and 1980, from $150,000 to $245,000, reflecting a trend towards larger enterprises and a decreasing importance of SMEs. However, within the subsequent seven years, by 1987, it

had fallen by about 14 percent to $210,000, reflecting a sharp reversal of this trend and the re-emergence of SMEs (Brock and Evans, 1989). Similarly, SMEs accounted for one-fifth of manufacturing sales in the U.S. in 1976, but by 1986 the small-firm share of sales had risen to over one-quarter (Acs and Audretsch, 1990).

The reversal of the trend towards large enterprises towards the re-emergence of SMEs was not limited to North America. In fact, a similar trend was found to take in Europe as well. For example, in the Netherlands the business ownership rate fell during the post-war period, until it reached a trough of 0.085 in 1982. But this downward trend was subsequently reversed, rising to a business ownership rate of 0.10 by 1998 (Audretsch et al., 2002b). Similarly, the small-firm employment share in manufacturing in the Netherlands increased from 68.3 percent in 1978 to 71.8 percent in 1986; in the United Kingdom from 30.1 percent in 1979 to 39.9 percent by 1986; in (West) Germany from 54.8 percent in 1970 to 57.9 percent by 1987; in Portugal from 68.3 percent in 1982 to 71.8 percent in 1986; in the North of Italy from 44.3 percent in 1981 to 55.2 percent by 1987, and in the South of Italy from 61.4 percent in 1981 to 68.4 percent by 1987 (Acs and Audretsch, 1993). EIM documents how the relative importance of SMEs in Europe (19 countries), measured in terms of employment shares has continued to increase between 1988 and 2001 (EIM, 2002b).

As the empirical evidence mounted documenting the re-emergence of entrepreneurship as a vital factor, scholars began to look for explanations and to develop a theoretical basis. The early explanations (Brock and Evans, 1989) revolved around six hypotheses:

1. That technological change had reduced the extent of scale economies in manufacturing

2. Increased globalization had rendered markets more volatile as a result of competition from a greater number of foreign rivals

3. The changing composition of the labour force, towards a greater participation of females, immigrants, and young and old workers may be more conducive to smaller rather than larger enterprises, due to the greater premium placed on work flexibility

4. A proliferation of consumer tastes away from standardized mass-produced goods towards stylized and personalized products facilitates niche small producers

5. Deregulation and privatization facilitate the entry of new and small firms into markets that were previously protected and inaccessible

6. The increased importance of innovation in high-wage countries has reduced the relative importance of large-scale production and instead fostered the importance of entrepreneurial activity.

More recently, Audretsch and Thurik (2001) have developed the explanation for the re-emergence of entrepreneurship in Europe and North America based on increased globalization, which has shifted the comparative advantage towards knowledge-based economic activity. Conventional wisdom would have predicted that increased globalization would present a more hostile environment to small business (Vernon,

1970). Caves (1982) argued that the additional costs of globalization, that would be incurred by small business "constitute an important reason for expecting that foreign investment will be mainly an activity of large firms".

Certainly the empirical evidence by Horst (1972) showed that even after controlling for industry effects, the only factor significantly influencing the propensity to engage in foreign direct investment was firm size. As Chandler (1990) concluded, "to compete globally you have to be big." Gomes-Casseres (1997, p. 33) further observed that, "[s]tudents of international business have traditionally believed that success in foreign markets required large size. Small firms were thought to be at a disadvantage compared to larger firms, because of the fixed costs of learning about foreign environments, communicating at long distances, and negotiating with national governments."

According to Audretsch and Thurik (2001), SMEs did not become obsolete as a result of globalization, but rather their role changed as the comparative advantage has shifted towards knowledge-based economic activity. This has occurred for two reasons. First, large enterprises in traditional manufacturing industries have lost their competitiveness in producing in the high-cost domestic countries. Second, small enterprises take on a new importance and value in a knowledge-based economy.

The loss of competitiveness by large-scale producers in high-cost locations is manifested by the fact that, confronted with lower cost competition in foreign locations, producers in the high-cost countries have three options apart from doing nothing and losing global market share: (1) reduce wages and other production costs sufficiently to compete with the low-cost foreign producers, (2) substitute equipment and technology for labour to increase productivity, and (3) shift production out of the high-cost location and into the low-cost location.

Many of the European and American firms that have successfully restructured resorted to the last two alternatives. Substituting capital and technology for labour, along with shifting production to lower-cost locations has resulted in waves of *Corporate Downsizing* throughout Europe and North America. At the same time, it has generally preserved the viability of many of the large corporations.

The experience has not been different in Europe. Pressed to maintain competitiveness in traditional industries, where economic activity can be easily transferred across geographic space to access lower production costs, large European companies deployed two strategic responses. The first was to offset greater wage differentials between Europe and low-cost locations by increasing productivity through the substitution of technology and capital for labour. The second was to locate new plants and establishments outside of Europe. What both strategic responses have in common is that the European flagship companies have been downsizing the amount of employment in the domestic economy. For example, between 1991 and 1995 manufacturing employment in German plants decreased by 1,307,000 while it increased in foreign subsidiaries by 189,000 (BMWi, 1999). In the chemical sector, the decrease of domestic employment was 80,000, while 14,000 jobs were added by German chemical companies in plants located outside of Germany. In electrical engineering employment in German

plants decreased by 198,000. In automobiles employment in Germany decreased by 161,000, while 30,000 jobs were added outside of Germany.

That SMEs would emerge as becoming more important in a knowledge-based economy seems to be contrary to many of the conventional theories of innovation. The starting point for most theories of innovation is the firm. In such theories the firms are exogenous and their performance in generating technological change is endogenous (Arrow, 1962). For example, in the most prevalent model found in the literature of technological change, the model of the knowledge production function, formalised by Griliches (1979), firms exist exogenously and then engage in the pursuit of new economic knowledge as an input into the process of generating innovative activity. The most decisive input in the knowledge production function is new economic knowledge. Knowledge as an input in a production function is inherently different than the more traditional inputs of labour, capital and land. While the economic value of the traditional inputs is relatively certain, knowledge is intrinsically uncertain and its potential value is asymmetric across economic agents. The most important, although not the only source of new knowledge is considered to be research and development (R&D). Other key factors generating new economic knowledge include a high degree of human capital, a skilled labour force, and a high presence of scientists and engineers.

There is considerable empirical evidence supporting the model of the knowledge production function. This empirical link between knowledge inputs and innovative output apparently becomes stronger as the unit of observation becomes increasingly aggregated. For example, at the unit of observation of countries, the relationship between R&D and patents is very strong. The most innovative countries, such as the United States, Japan and Germany, also tend to undertake high investments in R&D. By contrast, little patent activity is associated with developing countries, which have very low R&D expenditures. Similarly, the link between R&D and innovative output, measured in terms of either patents or new product innovations is also very strong when the unit of observation is the industry. The most innovative industries, such as computers, instruments and pharmaceuticals also tend to be the most R&D intensive. Acs and Audretsch (1990) find a simple correlation coefficient of 0.74 between R&D inputs and innovative output at the level of four-digit standard industrial classification (SIC) industries. However, when the knowledge production function is tested for the unit of observation of the firm, the link between knowledge inputs and innovative output becomes either tenuous and weakly positive in some studies and even non-existent or negative in others. The model of the knowledge production function becomes particularly weak when small firms are included in the sample. This is not surprising, since formal R&D is concentrated among the largest corporations, but a series of studies (Audretsch, 1995) has clearly documented that small firms account for a disproportional share of new product innovations given their low R&D expenditures.

The breakdown of the knowledge production function at the level of the firm raises the question, *Where do innovative firms with little or no R&D get the knowledge inputs?* This question becomes particularly relevant for small and new firms that undertake little R&D themselves, yet contribute considerable innovative activity in newly emerging industries such as biotechnology and computer software (Audretsch, 1995). One answer that has recently emerged in the economics literature is from other, third-

party firms or research institutions, such as universities. Economic knowledge may spill over from the firm conducting the R&D or the research laboratory of a university

Why should knowledge spill over from the source of origin? At least two major channels or mechanisms for knowledge spillovers have been identified in the literature. Both of these spillover mechanisms revolve around the issue of appropriability of new knowledge. Cohen and Levinthal (1989) suggest that firms develop the capacity to adapt new technology and ideas developed in other firms and are therefore able to appropriate some of the returns accruing to investments in new knowledge made externally.

By contrast, Audretsch (1995) proposes shifting the unit of observation away from exogenously assumed firms to individuals, such as scientists, engineers or other knowledge workers – agents with endowments of new economic knowledge. When the lens is shifted away from the firm to the individual as the relevant unit of observation, the appropriability issue remains, but the question becomes, *How can economic agents with a given endowment of new knowledge best appropriate the returns from that knowledge?* If the scientist or engineer can pursue the new idea within the organisational structure of the firm developing the knowledge and appropriate roughly the expected value of that knowledge, he has no reason to leave the firm. On the other hand, if he places a greater value on his ideas than do the decision-making bureaucracy of the incumbent firm, he may choose to start a new firm to appropriate the value of his knowledge. In the metaphor provided by Albert O. Hirschman (1970), if voice proves to be ineffective within incumbent organizations, and loyalty is sufficiently weak, a knowledge worker may resort to exit the firm or university where the knowledge was created in order to form a new company. In this spillover channel the knowledge production function is actually reversed. The knowledge is exogenous and embodied in a worker. The firm is created endogenously in the worker's effort to appropriate the value of his knowledge through innovative activity.

Thus, as knowledge has become more important as a factor of production, knowledge spillovers have also become more important as a source of economic growth (Romer, 1986). Entrepreneurship takes on new importance in a knowledge economy because it serves as a key mechanism by which knowledge created in one organization becomes commercialized in a new enterprise.

5. Linking Entrepreneurship to Economic Performance

5.1 The Theoretical Framework

The theoretical framework linking entrepreneurship and economic growth is provided by the new theories of industry evolution (Jovanovic, 1982; Ericson and Pakes, 1995; Audretsch, 1995; Hopenhayn, 1992; Lambson, 1991 and Klepper, 1996). While traditional theories suggest that entrepreneurship will retard economic growth, these new theories suggest exactly the opposite – that entrepreneurship will stimulate and generate growth. The reason for these theoretical discrepancies lies in the context of the underlying theory. In the traditional theory, new knowledge plays no role; rather, static

efficiency, determined largely by the ability to exhaust scale economies dictates growth. By contrast, the new theories are dynamic in nature and emphasize the role that knowledge plays. Because knowledge is inherently uncertain, asymmetric and associated with high costs of transactions, divergences emerge concerning the expected value of new ideas. Economic agents therefore have an incentive to leave an incumbent firm and start a new firm in an attempt to commercialize the perceived value of their knowledge. Entrepreneurship is the vehicle by which (the most radical) ideas are sometimes implemented.

A distinguishing feature of these evolutionary theories is the focus on change as a central phenomenon. Innovative activity, one of the central manifestations of change, is at the heart of much of this work. Entry, growth, survival, and the way firms and entire industries change over time are linked to innovation. The dynamic performance of regions and even entire economies is linked to how well the potential from innovation is tapped.

Why are new firms started? The traditional, equilibrium-based view is that new firms to an industry, whether they be startups or firms diversifying from other industries, enter when incumbent firms in the industry earn supranormal profits. By expanding industry supply, entry depresses price and restores profits to their long-run equilibrium level. Thus, in equilibrium-based theories entry serves as a mechanism to discipline incumbent firms. The new theories of industry evolution develop and evaluate alternative characterizations of entry based on innovation and costs of firm growth.

For example, Audretsch (1995) analyzes the factors that influence the rate of new firm startups. He finds that such startups are more likely in industries in which small firms account for a greater percentage of the industry's innovations. This suggests that firms are started to capitalize on distinctive knowledge about innovation that originates from sources outside of an industry's leaders. This initial condition of not just uncertainty, but greater degree of uncertainty vis-à-vis incumbent enterprises in the industry is captured in the theory of firm selection and industry evolution proposed by Jovanovic (1982). Jovanovic presents a model in which the new firms, which he terms *entrepreneurs*, face costs that are not only random but also differ across firms. A central feature of the model is that a new firm does not know what its cost function is, that is its relative efficiency, but rather discovers this through the process of learning from its actual post-entry performance. In particular, Jovanovic (1982) assumes that entrepreneurs are unsure about their ability to manage a new-firm startup and therefore their prospects for success. Although entrepreneurs may launch a new firm based on a vague sense of expected post-entry performance, they only discover their true ability -- in terms of managerial competence and of having based the firm on an idea that is viable on the market -- once their business is established. Those entrepreneurs who discover that their ability exceeds their expectations expand the scale of their business, whereas those discovering that their post-entry performance is less than commensurate with their expectations will contact the scale of output and possibly exit from the industry. Thus, Jovanovic's model is a theory of *noisy selection*, where efficient firms grow and survive and inefficient firms decline and fail.

What emerges from the new evolutionary theories and empirical evidence on the role of entrepreneurial small firms is that markets are in motion, with a lot of new firms

entering the industry and a lot of firms exiting out of the industry. The evolutionary view of entrepreneurship is that new firms typically start at a very small scale of output. They are motivated by the desire to appropriate the expected value of new economic knowledge. But, depending upon the extent of scale economies in the industry, the firm may not be able to remain viable indefinitely at its startup size. Rather, if scale economies are anything other than negligible, the new firm is likely to have to grow to survival. The temporary survival of new firms is presumably supported through the deployment of a strategy of compensating factor differentials that enables the firm to discover whether or not it has a viable product.

The empirical evidence supports such an evolutionary view of the role of new firms in manufacturing, because the post-entry growth of firms that survive tends to be spurred by the extent to which there is a gap between the MES level of output and the size of the firm. However, the likelihood of any particular new firm surviving tends to decrease as this gap increases. Such new suboptimal scale firms are apparently engaged in the selection process. Only those firms offering a viable product that can be produced efficiently will grow and ultimately approach or attain the MES level of output. The remainder will stagnate, and depending upon the severity of the other selection mechanism -- the extent of scale economies -- may ultimately be forced to exit out of the industry. Rather, by serving as agents of change, entrepreneurial firms provide an essential source of new ideas and experimentation that otherwise would remain untapped in the economy. The impact of entrepreneurship is manifested by growth – at the levels of the firm, the region and even at the national level.

5.2 Performance Measures

The new view of entrepreneurship that is based on its role as an agent of change in a knowledge-based economy implies that a positive economic performance should be linked to entrepreneurial activity. This hypothesis has raised two challenges to researchers: (1) What is meant by economic performance and how can it be measured and operationalized? and (2) Over which units of analysis should such a positive relationship between entrepreneurship and economic performance be manifested? In fact, these two issues are not independent from each other. The answer to the second question, the appropriate unit of analysis, has influenced the first question, the performance criteria and measure.

The most prevalent measures of performance have been growth, income, wages, survival, innovation, and productivity. Other performance measures that have been used include profitability, and satisfaction (of the owners and employees). At the unit of observation of the individual, the most typical performance measure has been individual earnings. Typically this involves income generated from a self-owned firm. Measures of growth make little sense at the level of the individual. There are several studies which have focused on survival (typically in self-employment or as a small-business owner) as a performance measure. However, since entrepreneurial performance at the level of the individual has not been the subject of much research, it will not be discussed in this paper.

At the level of the enterprise and establishment, the most prevalent performance measure has been growth, typically employment growth. A second common measure of performance at the level of the firm has been survival. Other performance measures used at the enterprise/establishment level include profitability, exports, foreign direct investment, levels of employee compensation, innovation, and productivity. While it may seem surprising that profitability has not been used more often there are several explanations. First, measurement is more difficult and it is certainly not common for researchers to obtain access to measures of firm profitability. Second, profitability as a performance measure is fraught with accounting difficulties. When comparisons are made across countries, the limitations of profitability as a performance measure becomes even more glaring.

At the spatial unit of observation, such as the city, region or state, and country, employment growth has been the main performance measure, although a number of studies have focused on innovative activity as a performance criterion (Acs, Audretsch and Feldman, 1994; Audretsch and Feldman, 1996; Almeida and Kogut, 1997).

Using these different performance measures across the different units of analysis, a mountain of empirical evidence has been accumulated in the last two decades providing compelling links between entrepreneurship and performance. This evidence points to a positive and robust relationship between measures of entrepreneurship and economic performance. The positive relationship between entrepreneurship and performance has been found to hold not just for a single measure of performance, but rather across a broad spectrum of performance measures, such as employment creation, growth, firm survival, innovation and technological change, productivity increases, and exports. This link has proven to be robust across multiple units of observation, ranging from individuals, to establishments, enterprises, industries, geographic clusters, regions and even countries. Just as importantly, the positive relationships between entrepreneurship and the various measures of economic performance have been found to hold not just in the context of one country, but consistently for different countries in Europe and North America.

5.3 Enterprise and Establishment

5.3.1 Employment Generation

It was in the area of job generation that the recent emergence of entrepreneurship was first identified. In 1981 David Birch revealed the startling findings from his long-term study of U.S. job generation. Despite the conventional wisdom prevailing at the time, Birch (1981, p. 8) found that, “Whatever else they are doing, large firms are no longer the major providers of new jobs for Americans.” Instead, he discovered that most new jobs emanated from small firms. While his exact methodology and application of the underlying data have been a source of considerable controversy, as have the exact quantitative estimates, his qualitative conclusion that the bulk of new jobs has emanated from small enterprises in the U.S. has been largely substantiated.

More recently, Davis, Haltiwanger and Schuh (1996a and 1996b) correct for the regression to the mean fallacy they claim is inherent in Birch's results in estimating employment generation for the U.S between 1972-1988. While their quantitative results differ from Birch's, their study still indicates that SMEs account for more than their share of new employment. In particular, in their study large firms created 53 percent of the new jobs but their employment share is 65 percent. At the same time, large firms destroyed 56 percent of the jobs, which is greater than their share of new jobs created. Their measure was static in nature and gave no indication whether this share has been increasing or decreasing over time.

Methodologies similar to Birch's were also used in the European context. In one of the first studies Gallagher and Stewart (1986) and Storey and Johnson (1987) found similar results for the United Kingdom, that small enterprises create most of the new jobs.

More recently Konings (1995) links gross job flows in the United Kingdom to establishment size. He finds that the gross job creation rate is the highest in small establishments and the lowest in large establishments. By contrast, the gross job destruction rate is the lowest in small establishments and the highest in large establishments.

Evidence from Sweden (Heshmati, 2001) also suggests that employment creation is negatively related to firm size based on data from the 1990s. Similarly, Hohti (2000) finds that gross employment creation and destruction are negatively related to firm size in Finland. Using data from Finnish manufacturing between 1980-1994, Hohti (2000) finds that the annual job flow rates, in terms of births and deaths, is similar to that identified by Broesma and Gautier (1997, p. 216) for Dutch manufacturing firms and by Klette and Mathiassen (1996) for Norwegian manufacturing firms. In particular, new establishments have the greatest job creation rates as well as the greatest rates of job destruction. Thus, the evidence from Finland, as well as from Sweden and the Netherlands, suggests entrepreneurial dynamics similar to those found in North America.

The evidence is less compelling for Germany. For example, Wagner (1995b) used a unique longitudinal data set covering all manufacturing establishments between 1978 and 1993 in the German federal state of Lower Saxony and found that while small firms account for most of the gross job creation, they also account for most of the job destruction. This confirms the earlier findings of Michael Fritsch (1993), who uses the Census of Business (*Arbeitsstaettenzaehlung*) to examine the long-run trends in the role of German SMEs. Fritsch (1993, p. 50) concludes that, "There is no dramatic job generation by small firms in West Germany." Fritsch finds that, as for other countries, gross job creation and destruction rates tend to decline with firm size. What is different about Germany, is that "net job creation rates and firm size are not systematically related".

Similarly, empirical evidence has suggested that, in the United States, a turbulent industry structure, where there is a high rate of firm births but also exits is associated with greater job creation (Reynolds, 1999). However, Audretsch and Fritsch (1996 and 1994) find that the opposite is true in Germany. They find no evidence that employment growth is associated with a turbulent environment in the case of Germany during the late 1980s. In fact, their evidence suggests that in both the manufacturing and the service

sectors, a high rate of turbulence in a region tends to lead to a lower and not a higher rate of job creation.

There is some evidence suggesting that in the last several years small firms in Germany are emerging as the engine of job creation, as in other developed countries. For example, Haid and Weigand (1998) find that family-owned firms, which are typically small- and medium-sized, increased employment between 1989-1993, while large management-controlled firms decreased employment.

Weigand and Audretsch (1999) use a longitudinal data base consisting of firm level data for Germany where the firms which are tracked over a six year period, 1991-1996. They split the sample into science-based and non-science based industries. They find that in the science-based industries the large firms that are listed experienced a decrease in employment by an average of -0.21 percent per year. By contrast, the SMEs (with fewer than 500 employees) experienced an increase in employment by an average of 3.57 percent annually. Similarly, those large firms which are not listed experienced an annual decrease in employment of –4.21 percent, while the SMEs experienced an increase in employment of 3.17 percent.

For the non-science industries, Weigand and Audretsch (1999) found that the listed large firms experienced a decrease in employment of an annual mean rate of –1.00 percent. Similarly, the SMEs also experienced a decrease in employment of an annual mean rate of –3.97 percent. For the non-listed firms the large firms experienced a decrease in employment of –4.60 percent. The SMEs experienced a decrease in employment of –1.26 percent. Thus, the empirical evidence strongly suggests that downsizing in Germany results in a decrease in employment in (1) large science-based corporations, (2) large non-science based corporations, and (3) small non-science based firms. The most striking finding is that strong job growth is exhibited by the remaining fourth category – small- and medium-sized science based firms.

Thus, the weight of the empirical evidence on employment generation is remarkably robust and indicates that the role of entrepreneurship in employment generation in Europe is not inconsistent with the findings for the United States. Small and new enterprises serve as an engine of employment creation on both sides of the Atlantic. However, it should be emphasized that an important qualification of the “Job Generation” literature, is that it links employment changes of the firm to the size and in some cases the age of the firm. This means that the performance criterion is not focused on employment changes, but employment changes occurring only at the level of the firm. This assumes that there is no externality or spillover from one enterprise to other firms. This also holds for the analyses of employment change by SMEs reported by the European Observatory for SMEs (EIM, 2002a).

5.3.2 Growth & Survival

A different performance measure involves growth and survival. The links between entrepreneurship on the one hand and growth and survival on the other have

been found across a number of social science disciplines, including economics, sociology and regional studies. Within economics a series of survey articles by Sutton (1997), Caves (1998) and Geroski (1995) summaries the findings from a plethora of empirical studies examining the relationship between firm size and growth within the North American context. The early studies were undertaken using data from the U.S. These studies (Mansfield, 1962; Hall, 1987; Dunne, Roberts and Samuelson, 1989; and Audretsch, 1991) established not only that the likelihood of a new entrant surviving is quite low, but that the likelihood of survival is positively related to firm size and age. A *stylized result* (Geroski, 1995) emerging from this literature is that, when a broad spectrum of firm sizes is included in samples of U.S. enterprises, smaller firms exhibit systematically higher growth rates than their larger counterparts. The growth advantage of small and new firms vis-à-vis large enterprises has been shown to be even greater in high technology industries (Audretsch, 1995).

These so-called stylized results between firm size and age on the one hand, and growth and survival on the other hand were subsequently confirmed for a number of Euorpean countries A wave of studies have confirmed these findings for different European countries, including Portugal (Mata, Portugal and Guimaraes, 1994; and Mata, 1994), Germany (Wagner, 1994), Tveteras and Edide (2000) and Klette and Mathiassen (1996) for Norway, and Italy (Audretsch, Santarelli and Vivarelli, 1999). However, the links between firm size and growth and firm age and growth are somewhat more ambiguous within the European context. While some studies have found no systematic relationship to exist between firm size and growth (Wagner, 1992) still there are a few studies that have actually found a positive relationship (Burgel, Murray, Fier, Licht and Nerlinger, 1998). Still, most studies have found results in the European context which are strikingly similar to what has been found in the U.S. (Almus and Nerlinger, 2000; and Harhoff, Stahl and Woywode, 1998). Using a large comprehensive panel data set from the ZEW-foundation Panel (West), "Gibrat's Law"[1] is rejected for the group of young firms belonging to technology intensive branches as well as those operating in non-technology intensive branches (Almus and Nerlinger, 2000), indicating that the smaller enterprises grow faster than their larger counterparts.

Heshmati (2001) has examined the relationship between firm size, age and growth for a large sample of small firms in Sweden between 1993-1998. The results indicate that, in Sweden, firm size and age are negatively related to employment growth, which is consistent with the findings for the U.S. However, in terms of sales growth, a positive relationship emerges, suggesting that, at least over this period, larger firms generated more growth in terms of sales than in terms of employment.

Harhoff and Stahl (1995) use a data base of around 11,000 firms in manufacturing, construction, trade, finance, and services to examine how the post-entry performance of German firms varies across different sectors, in terms of the likelihood of survival and growth. In particular, Harhoff and Stahl find evidence that the likelihood of survival is positively related to firm size. In addition, firm growth is negatively related to firm size. In addition, the likelihood of survival and growth rates differ systematically across different sectors of the economy.

[1] Gibrat's Law states that firm growth is independent of firm size.

The results of Harhoff and Stahl (1995) are not consistent with those found in earlier studies, according to the careful survey by Wagner (1992). After reviewing the most important studies, Wagner concludes that, "Studies using German data tend to show that firm size and firm growth are uncorrelated."

Wagner (2001 and 1995a) analyzed the performance of small (and large) firms prior to exit. He used a longitudinal data base identifying the pre-exit performance of cohorts of firms exiting in 1990, 1991 and 1992. One striking result he found was that more than half of the exiting firms (between 53 percent and 61 percent) were founded prior to 1979, making them over 11 years old. He also found that young firms, which were classified as being younger than five years old, accounted for about a quarter of all exits, and three-quarters of exiting businesses were from middle-aged firms. At the same time he found that the likelihood of survival increases with firm size.

Almus and Nerlinger (2000) also use a large panel data base to examine how the post-entry performance of new firms varies across sectors. In particular, they find that the growth rates of new firms tends to be greater in very high-tech industries than in high-tech industries and other manufacturing industries. This mirrors the results found in the North American context.

In particular, Almus and Nerlinger (1998) examine why entrepreneurial growth varies between what they term as new technology-based firms (NTBFs) and non-innovative startups. They perform multivariate analyses on the impact of characteristics specific to the entrepreneur as well as the industry on subsequent firm growth. They use a database provided by the largest German credit ratting agency, CREDITREFORM. This data base is analogous to the Dun and Bradstreet data base for the United States. Firms enter the CREDITREFORM data base for two reasons. First, a customer or supplier may inquire about the financial situation of the respective firm. Second, credit rating agencies exploit economies of scale by gathering information proactively, systematically recording publicly available information on new firms (Stahl, 1991; Harhoff, Stahl, and Woywode, 1998). The CREDITREFORM data base contains a linked panel data base consisting of more than 580,000 firms in West Germany. The authors find that the growth of new-firm startups is shaped by characteristics specific to the founder, the firm, as well as the industry environment. For example, they find that large and mature firms have lower growth rates than do small and young firms, both innovative and non-innovative. In particular, they find that the greater the degree of human capital of the founder, the greater is the growth rate, especially in innovative industries.

Using firm-level data from Italy, Audretsch, Santarelli and Vivarelli (1999) find that growth rates are negatively related to firm size. In addition, they find that the likelihood of survival is greater in the startup year than in the second year, but subsequently increases over time. Similarly, Tveteras and Eide (2000) provide evidence for Norwegian manufacturing using the estimation technique of a semi-proportional Cox Model that the likelihood of survival is lower for smaller and younger establishments. Bruederl and Preisendoerfer (1998) examine a data base consisting of 1,700 new-firm startups in Germany and find that the subsequent performance, measured in terms of likelihood of survival and growth, is greater for those entrepreneurs that (1) participate in

a network with other entrepreneurs, (2) receive active help from their spouse, and (3) receive emotional support from their spouse. In addition, they find that entrepreneurial success is positively influenced by the ethnic background of the entrepreneur, educational background, type of work experience, and whether the entrepreneur already had entrepreneurial experience. Their most striking finding is that entrepreneurial success is the highest within the context of a network with other entrepreneurs.

The performance of small and new firms is also conditional upon location. Fotopoulos and Louri (2000) examine the impact that location within an agglomeration has on the likelihood of survival for Greek firms. They find that location in the Greater Athens area has a positive impact on the likelihood of survival, particularly for smaller enterprises.

Thus, while there is somewhat more ambiguity in the studies linking growth and survival to firm size and growth, the results for Europe generally mirror the so-called "Stylized Results" found within the North American context:

1. Growth rates are higher for smaller enterprises
2. Growth rates are higher for younger enterprises
3. Growth rates are even higher for small and young enterprises in technology-intensive industries
4. The likelihood of survival is lower for smaller enterprises
5. The likelihood of survival is lower for younger enterprises
6. The likelihood of survival is even lower for small and young enterprises in technology-intensive industries.

In addition, based on a panel data set consisting of firm-level observations, Scarpetta et al. (2002) provide evidence that there is a lower degree of firm turbulence, or what they call "churning" in Europe than in the U.S. In particular, they identify that the distinguishing features of European SMEs from their American counterparts is that they start up at a larger size, have a higher level of labour productivity, and a lower level of employment growth subsequent to entry.

5.3.3 Innovation

Technological change and innovation represent a different dimension of economic performance. Measures of technological change have typically involved one of the three major aspects of the innovative process: (1) a measure of the inputs into the innovative process, such as R&D expenditures, or else the share of the labour force accounted for by employees involved in R&D activities; (2) an intermediate output, such as the number of inventions which have been patented; or (3) a direct measure of innovative output.

These three levels of measuring technological change have not been developed and analyzed simultaneously, but have evolved over time, roughly in the order of their presentation. That is, the first attempts to quantify technological change at all generally

involved measuring some aspects of inputs into the innovative process. Measures of R&D inputs -- first in terms of employment and later in terms of expenditures -- were only introduced on a meaningful basis enabling inter-industry and inter-firm comparisons in the late 1950s and early 1960s (Scherer, 1965). Most of these studies were focused on the R&D activities of U.S. firms. Little measurement was done in the European context.

A clear limitation in using R&D activity as a proxy measure for technological change is that R&D reflects only the resources devoted to producing innovative output, but not the amount of innovative activity actually realized. That is, R&D is an input and not an output in the innovation process. In addition, Kleinknecht (1987), Kleinknecht and Verspagen (1989), and Kleinknecht et al. (1991) have systematically shown that R&D measures incorporate only efforts made to generate innovative activity that are undertaken within formal R&D budgets and within formal R&D laboratories, at least within the European context. They find that the extent of informal R&D is considerable, particularly in smaller enterprises. Not all efforts within a formal R&D laboratory are directed towards generating innovative output in any case. Rather, other types of output, such as imitation and technology transfer, are also common goals in R&D laboratories. Similar results emphasizing the importance of informal R&D have been found for Italy by Santarelli and Sterlacchini (1994).

As systematic data measuring the number of inventions patented were introduced in the mid-1960s, many scholars interpreted this new measure not only as being superior to R&D but also as reflecting innovative output. In fact, the use of patented inventions is not a measure of innovative output, but is rather a type of intermediate output measure. A patent reflects new technical knowledge, but it does not indicate whether this knowledge has a positive economic value. Only those inventions which have been successfully introduced in the market can claim that they are innovations as well. While innovations and inventions are related, they are not identical. The distinction is that an innovation is a process that begins with an invention, proceeds with the development of the invention, and results in the introduction of a new product, process or service to the marketplace.

Besides the fact that many, if not most, patented inventions do not result in an innovation, a second important limitation of patent measures is that they do not capture all of the innovations actually made. In fact, many inventions which result in innovations are not patented. The tendencies of patented inventions to result in innovations and of innovations to be the result of inventions which were patented combine into what Scherer (1983) has termed as the propensity to patent. It is the uncertainty about the stability of the propensity to patent across enterprises and across industries that casts doubt upon the reliability of patent measures.

Thus, even as new and superior sources of patent data have been introduced, such as the new measure of patented inventions from the computerization by the U.S. Patent Office and by the West German Patent Office and European Patent Office (Schwalbach and Zimmermann, 1991; Greif, 1989; and Greif and Potkowik, 1990), the reliability of these data as measures of innovative activity has been severely challenged. In addressing the question, "Patents as indicators of what?", Griliches (1990, p. 1669) concludes that, "Ideally, we might hope that patent statistics would provide a measure of the (innovative) output ... The reality, however, is very far from it. The dream of getting hold of an output

indicator of inventive activity is one of the strong motivating forces for economic research in this area."

It was not before well into the 1970s that systematic attempts were made to provide a direct measure of the innovative output. Thus, it should be emphasized that the conventional wisdom regarding innovation and technological change was based primarily upon the evidence derived from analysing R&D data, which essentially measure inputs into the process of technological change, and patented inventions, which are a measure of intermediate output at best.

One of the earliest important data sources that attempted to directly measure innovation activity was compiled in Europe -- at the Science Policy Research Unit (SPRU) at the University of Sussex in the United Kingdom (Rothwell, 1989). The SPRU data consisted of a survey of 4,378 innovations that were identified over a period of fifteen years. The survey was compiled by writing to experts in each industry and requesting them to identify significant technical innovations that had been successfully commercialized in the United Kingdom, and to name the firm responsible. The U.S. Small Business Innovation Data Base provided an important measure of new products introduced into the market in the U.S. (Acs and Audretsch, 1990)

An important qualification of the measures of innovative output is that they are counts of new products introduced into the market, but are not weighted by relative importance or market value. In order to at least approximate the market value associated with innovative activity, FitzRoy and Kraft (1990 and 1991) analyze a German data set based on a direct measure of innovative activity that is weighted by market value. Based on data for West German firms in the metalworking sector, FitzRoy and Kraft (1990 and 1991) measure innovation as the "proportion of sales consisting of products introduced within the last five years." Presumably the greater the market value of a given product innovation, the higher would be the proportion of sales accounted for by new products.

Similarly, Graf von der Schulenburg and Wagner (1991) are able to provide one of the first applications of a direct measure of innovative activity in West Germany. Their measure is from the IFO Institute and is defined as the "percentage of shipments of those products which were introduced recently into the market and are still in the entry phase." Like the measure of innovative activity used by FitzRoy and Kraft (1990 and 1991), the Graf von der Schulenburg and Wagner measure reflects the market value of the innovation and therefore attempts to overcome one of the major weaknesses.

There is substantial evidence that R&D inputs are, in fact, positively related to firm size. The plethora of empirical studies relating R&D to firm size is most thoroughly reviewed in Acs and Audretsch (1990, chapter three), Baldwin and Scott (1987), and Cohen and Levin (1989).

The studies relating patents to firm size are considerably less ambiguous. Here the findings unequivocally suggest that small firms contribute to patent activity as well as large firms. (Scherer, 1983). Scherer's results for the U.S. were later confirmed by Bound et al. (1984) in the study mentioned above. Basing their study on 2,852 companies and 4,553 patenting entities, they determined that the small firms (with less than $10 million in sales) accounted for 4.3 percent of the sales from the entire sample, but 5.7 percent of the patents.

Such results are not limited to the U.S. Schwalbach and Zimmermann (1991) found that the propensity to patent is less for the largest firms in West Germany than for the small- and medium-sized enterprises included in their sample.

Using the direct measure of innovative output from the U.S. Small Business Administration's Innovation Data Base, Acs and Audretsch (1990) showed that, in fact, the most innovative U.S. firms are large corporations. Further, the most innovative American corporations also tended to have large R&D laboratories and be R&D intensive. At first glance, these findings based on direct measures of innovative activity seem to confirm the conventional wisdom. However, in the most innovative industries, large firms, defined as enterprises with at least 500 employees, contributed more innovations in some instances, while in other industries small firms produced more innovations. For example, in computers and process control instruments small firms contributed the bulk of the innovations. By contrast in the pharmaceutical preparation and aircraft industries the large firms were much more innovative.

Probably the best measure of innovative activity is the total innovation rate, which is defined as the total number of innovations per one thousand employees in each industry. The large-firm innovation rate is defined as the number of innovations made by firms with at least 500 employees, divided by the number of employees (thousands) in large firms. The small-firm innovation rate is analogously defined as the number of innovations contributed by firms with fewer than 500 employees, divided by the number of employees (thousands) in small firms.

The innovation rates, or the number of innovations per thousand employees, have the advantage in that they measure large- and small-firm innovative activity relative to the presence of large and small firms in any given industry. That is, in making a direct comparison between large- and small-firm innovative activities, the absolute number of innovations contributed by large firms and small enterprises is somewhat misleading, since these measures are not standardized by the relative presence of large and small firms in each industry. When a direct comparison is made between the innovative activity of large and small firms, the innovation rates are presumably a more reliable measure of innovative intensity because they are weighted by the relative presence of small and large enterprises in any given industry. Thus, while large firms in manufacturing introduced 2,445 innovations and small firms contributed slightly fewer, 1,954, small-firm employment was only half as great as large-firm employment, yielding an average small-firm innovation rate in manufacturing of 0.309, compared to a large-firm innovation rate of 0.202 (Acs and Audretsch, 1988 and 1990).

Acs and Audretsch (1987, 1988, and 1990) also found that not only does market structure influence the total amount of innovative activity, but also the relative innovative advantage between large and small enterprises. The differences between the innovation rates of large and small firms examined in the previous section can generally be explained by (1) the degree of capital intensity, (2) the extent to which an industry is concentrated, (3) the total innovative intensity, and (4) the extent to which an industry is comprised of small firms. In particular, the relative innovative advantage of large firms tends to be promoted in industries that are capital-intensive, advertising intensive, concentrated, and highly unionized. By contrast, in industries that are highly innovative

and small firms do not have a high employment share in the industry, the relative innovative advantage is held by small enterprises.

The most important and careful study to date documenting the role of German SMEs in innovative activity was undertaken by a team of researchers at the Zentrum fuer Europaeische Wirtschaftsforschung (ZEW) led by Harhoff and Licht (1996). They analyzed the findings made possible by the Mannheim Innovation Data Base. This data base measures the extent of innovative activity in German firms between 1990 and 1992. Harhoff and Licht (1996) use the data base to identify that 12 percent of the research and development expenditures in (West) German firms comes from SMEs (defined as having fewer than 500 employees).

Harhoff and Licht (1996) show that the likelihood of a firm not innovating decreases with firm size. For example, 52 percent of firms with fewer than 50 employees were not innovative. By contrast, only 15 percent of the firms with at least 1,000 employees were not innovative. More striking is that the smallest firms that do innovate have a greater propensity to be innovative without undertaking formal research and development. While only 3 percent of the largest corporations in Germany are innovative without undertaking formal R&D, one-quarter of the innovative firms with fewer than 50 employees are innovative without formal R&D.

The study also shows that even fewer SMEs in the five new German Laender are innovative than is the case in West Germany. Over two-thirds of the smallest SMEs in East Germany are not innovative, and they are less than half as likely to undertake R&D as are their Western counterparts.

Systematic empirical evidence also suggests that the German *Mittelstand* is confronted by considerable barriers to innovative activity. Beise and Licht (1996) analyzed the *Mannheimer Innovationspanel* consisting of 43,300 innovating firms to identify the main barriers to innovative activity confronting German small- and medium sized enterprises. The major barrier to innovation listed in both 1992 and 1994 was too high of a gestation period required for innovative activity. In 1994 nearly 60 percent of German SMEs reported that too long of a high gestation period required to innovate was a very important barrier to innovative activity. Other major barriers to innovative activity include legal restrictions and restrictive government policies, too long of duration required to obtain government approval for a new product, a shortage of finance capital, a lack of competent employees, and too high of a risk.

A number of explanations have emerged why smaller enterprises may, in fact, tend to have an innovative advantage, at least in certain industries. Rothwell (1989) suggests that the factors yielding small firms with the innovative advantage generally emanate from the difference in management structures between large and small firms. For example, Scherer (1991) argues that the bureaucratic organization of large firms is not conducive to undertaking risky R&D. The decision to innovate must survive layers of bureaucratic resistance, where an inertia regarding risk results in a bias against undertaking new projects. However, in the small firm the decision to innovate is made by relatively few people. Innovative activity may flourish the most in environments free of bureaucratic constraints (Link and Bozeman, 1991). That is, a number of small-firm ventures have benefited from the exodus of researchers who felt thwarted by the

managerial restraints in a larger firm. Finally, it has been argued that while the larger firms reward the best researchers by promoting them out of research to management positions, the smaller firms place innovative activity at the center of their competitive strategy (Scherer, 1991).

Scherer (1988, pp. 4-5) has summarized the advantages small firms may have in innovative activity: "Smaller enterprises make their impressive contributions to innovation because of several advantages they possess compared to large-size corporations. One important strength is that they are less bureaucratic, without layers of "abominable no-men" who block daring ventures in a more highly structured organization. Second, and something that is often overlooked, many advances in technology accumulate upon a myriad of detailed inventions involving individual components, materials, and fabrication techniques. The sales possibilities for making such narrow, detailed advances are often too modest to interest giant corporations. An individual entrepreneur's juices will flow over a new product or process with sales prospects in the millions of dollars per year, whereas few large corporations can work up much excitement over such small fish, nor can they accommodate small ventures easily into their organizational structures. Third, it is easier to sustain a fever pitch of excitement in small organization, where the links between challenges, staff, and potential rewards are tight. "All-nighters" through which tough technical problems are solved expeditiously are common."

Within a generation, research has produced theories, evidence and new insights that have dramatically changed the prevalent view about the role of entrepreneurship in innovation and technological change. The conventional wisdom held that small firms inherently have a deficit of knowledge assets, burdening them with a clear and distinct disadvantage in generating innovative output. This view was certainly consistent with the early interpretation of the knowledge production function. As Chandler (1990) concluded, “to compete globally you have to be big.”

More recent scholarship has produced a revised view that identifies entrepreneurial small firms as making a crucial contribution to innovative activity and technological change. There are two hypotheses why scholarship about the role of small firms has evolved so drastically within such a short period. This first is that, as explained above, the measurement of innovative output and technological change has greatly improved. As long as the main instruments to measuring innovative activity were restricted to inputs into the innovative process, such as expenditures on formal R&D, many or even most of the innovative activities by smaller enterprises simply remained hidden from the radar screen of researchers. With the development of measures focusing on measures of innovative output, the vital contribution of small firms became prominent, resulting in the emergence of not just the recognition that small firms provide an engine of innovative activity, at least in some industry contexts, but also of new theories to explain and understand how and why small firms access knowledge and new ideas. This first hypothesis would suggest that, in fact, small firms have always made these types of innovative contributions, but they remained hidden and mostly unobserved to scholars and policy makers.

The alternative hypothesis is that, in fact, the new view towards the innovative capacity of small firms emerged not because of measurement improvements, but because

the economic and social environment actually changed in such a way as to shift the innovative advantage more towards smaller enterprises. This hypothesis would say that the conventional wisdom about the relative inability of small firms to innovate was essentially correct – at least for a historical period of time. Rather, the new view of small firms as engines of innovative activity reflects changes in technology, globalization and other factors that have fundamentally altered the importance and process of innovation and technological change. As Jovanovic (2001, pp. 54-55) concludes, "The new economy is one in which technologies and products become obsolete at a much faster rate than a few decades ago…It is clear that we are entering the era of the young firm. The small firm will thus resume a role that, in its importance, is greater than it has been at any time in the last seventy years or so."

5.3.4 Exports

Performance of success in international markets, such as exports, has been used in several studies. For example, Wagner (1994) employed a longitudinial database consisting of 7,000 manufacturing German firms and found that the probability that a firm is an exporter increases along with firm size. However, an important caveat from his study is that there are many successful exporters among small firms, and non-exporters among larger firms as well.

The export performance of Italian SMEs has also been compared between those SMEs located within a local cluster and those not located within a cluster. Nicolini (2001) uses a gravity model to link SME export performance to geographic location in Italy. She finds SMEs belonging to industrial districts exhibit a stronger export performance, presumably by taking advantage of the competitive advantage generated by the industrial district.

5.3.5 Wages

Even as the positive impact that new and small firms have on employment generation became acknowledged, an important qualification and caveat had to be added about the quality of those jobs. Based on the U.S., Brown, Hamilton and Medoff (1990) provided systematic empirical evidence indicating that SMEs pay lower wages and non-wage compensation than do their larger counterparts. Thus, while SMEs might be the engine of employment generation, and even contribute to innovative activity as well, it was not at all clear that the new jobs created were actually better or even at parity. Rather, this strand of literature from labour economics suggested that the jobs created by small businesses were actually inferior in that employee compensation was at lower levels. These findings led some scholars to rethink the merits of promoting entrepreneurship and small business development. If job growth came only at the cost of lower wages, perhaps entrepreneurship did not hold the promise predicted first by Schumpeter and later by Birch.

For example, in their study, Brown, Hamilton and Medoff (1990, pp. 88 and 89) concluded that, "Workers in large firms earn higher wages, and this fact cannot be explained completely by differences in labour quality, industry, working conditions, or union status. Workers in large firms also enjoy better benefits and greater job security

than their counterparts in small firms. When these factors are added together, it appears that workers in large firms do have a superior employment package."

Systematically lower levels of employee compensation have also been found within the European context. While a number of studies contributing to what has now come to constitute a "Stylized Fact," Nickell et al. (1994) address the question of why small and new enterprises pay systematically lower levels of employee compensation. They provide both a theoretical explanation supported by empirical evidence that (1) workers in large firms are better placed to extract quasi-rents stemming from a firm's competitive strength in the product market (which has nothing to do with unions), and (2) while internal factors play a role in determining wages, there appears to be no marked differences in their importance between SMEs and their larger counterparts. However, using data from the Netherlands, Lever and Werkhooven (1996) subsequently found that a firm's competitive strengths have a positive impact on wages. In particular, they found that market concentration increases the impact of a large firm's internal factors on wages. Lopez-Sintas and Martinez-Ros (1999) analyze Spanish manufacturing firms between 1990-1994 and find that smaller firms pay lower wages. However, those firms that are innovative pay a wage premium. The effect of the innovative activity on wages was greater in SMEs than in large enterprises.

Audretsch et al. (2001) present a theory suggesting that small firms compensate for their size disadvantages by deviating from the manner that productive factors are deployed and remunerated by their larger counterparts. By engaging in a strategy of compensating factors of production differently than large established firms, smaller ones are able to offset, at least to some extent, their size-induced scale disadvantages.

Audretsch (1995) finds considerable evidence that smaller establishments in both the United States and Japan are able to compensate for their size related disadvantages through pursuing a strategy of compensating labour differentials differently than their larger counterparts. There are reasons to expect that a strategy of compensating factor differentials is more difficult to implement in Europe. Not only is protection under unions more widespread in Europe than in either Japan or the United States, but a broad spectrum of legal institutions restricts the ability of individual firms to deviate too far from industry norms.

Using a system of simultaneous equations, Audretsch et al. (2001) test the hypothesis that compensating factor differentials are a mechanism enhancing SME viability using a panel database consisting of 7,716 Dutch manufacturing firms. They find considerable evidence that, even in a European context, a different remuneration to labour serves, at least to some extent, to compensate for the inherent size disadvantages confronting sub-optimal scale firms. The empirical results suggest that the degree to which such a strategy of compensatory factor differentials is implemented depends upon the extent to which the MES level of output exceeds that of the sub-optimal scale firm along with the extent to which efficiency declines with decreasing firm size. The authors speculate that employees may accept lower wages in SMEs because of the prospects of their wages rising over time. This would be particularly true where employees develop firm-specific human capital.

The policy conclusions by Brown, Hamilton and Medoff (1990) that new-firm startups should be discouraged are based on a static analysis. However, when viewed through a dynamic lens by Audretsch et al. (2001), a different conclusion emerges. One of the most striking results is the positive impact of firm age on productivity and employee compensation, even after controlling for the size of the firm. Given the strongly confirmed stylized fact linking both firm size and age to a negative rate of growth (that is the smaller and younger a firm is the faster it will grow), this new finding linking firm age to employee compensation and productivity suggests that not only will some of the small and sub-optimal firms of today become the large and optimal firms of tomorrow, but that there is at least a tendency for the low productivity and wage of today to become the high productivity and wage of tomorrow. Thus, there is at least some evidence suggesting that, at least for the case of the Netherlands, not only can policies promoting the startup and viability of new firms be viewed as instruments of competition policy, but that the impact on wages and productivity from such policies is considerably greater in a dynamic context than in a static context.

5.4 City & Region

A different literature has focused on the impact of entrepreneurship on subsequent economic performance, which can be found in the regional studies and economic geography literature. The unit of observation for these studies is at the spatial level, either a city, region, or state. The most common and almost exclusive measure of performance is growth, typically measured in terms of employment growth. These studies have tried to link various measures of entrepreneurial activity, most typically startup rates, to economic growth. Other measures sometimes used include the relative share of SMEs, and self-employment rates.

Audretsch and Fritsch (1996) analyzed a database identifying new business startups and exits from the social insurance statistics in Germany to examine whether a greater degree of turbulence leads to greater economic growth, as suggested by Schumpeter in his 1911 treatise. These social insurance statistics are collected for individuals. Each record in the database identifies the establishment at which an individual is employed. The startup of a new firm is recorded when a new establishment identification appears in the database, which generally indicates the birth of a new enterprise. While there is some evidence for the United States linking a greater degree of turbulence at the regional level to higher rates of growth for regions (Reynolds, 1999), Audretsch and Fritsch (1996) find that the opposite was true for Germany during the 1980s. In both the manufacturing and the service sectors, a high rate of turbulence in a region tends to lead to a lower and not a higher rate of growth. They attribute this negative relationship to the fact that the underlying components – the startup and death rates – are both negatively related to subsequent economic growth. Those areas with higher startup rates tend to experience lower growth rates in subsequent years. Most strikingly, the same is also true for the death rates. The German regions experiencing higher death rates also tend to experience lower growth rates in subsequent years. Similar evidence for Germany is found by Fritsch (1997).

Audretsch and Fritsch (1996) conjectured that one possible explanation for the disparity in results between the United States and Germany may lie in the role that innovative activity, and therefore the ability of new firms to ultimately displace the incumbent enterprises, plays in new-firm startups. It may be that innovative activity did not play the same role for the German *Mittelstand* as it does for SMEs in the United States. To the degree that this was true, it may be hold that regional growth emanates from SMEs only when they serve as agents of change through innovative activity.

The empirical evidence suggested that the German model for growth provided a sharp contrast to that for the United States. While Reynolds (1999) had found that the degree of entrepreneurship was positively related to growth in the United States, a series of studies by Audretsch and Fritsch (1996) and Fritsch (1997) could not identify such a relationship for Germany. However, the results by Audretsch and Fritsch were based on data from the 1980s.

Divergent findings from the 1980s about the relationship between the degree of entrepreneurial activity and economic growth in the United States and Germany posed something of a puzzle. On the one hand, these different results suggested that the relationship between entrepreneurship and growth was fraught with ambiguities. No confirmation could be found for a general pattern across developed countries. On the other hand, it provided evidence for the existence of distinct and different national systems. The empirical evidence clearly suggested that there was more than one way to achieve growth, at least across different countries. Convergence in growth rates seemed to be attainable by maintaining differences in underlying institutions and structures.

However, in a more recent study, Audretsch and Fritsch (2002) find that different results emerge for the 1990s. Those regions with a higher startup rate exhibit higher growth rates. This would suggest that, in fact, Germany is changing over time, where the engine of growth is shifting towards entrepreneurship as a source of growth. The results of their 2002 paper suggest an interpretation that differs from their earlier findings. Based on the compelling empirical evidence that the source of growth in Germany has shifted away from the established incumbent firms during the 1980s to entrepreneurial firms in the 1990s, it would appear that a process of convergence is taking place between Germany and the United States, where entrepreneurship provides the engine of growth in both countries. Despite remaining institutional differences, the relationship between entrepreneurship and growth is apparently converging in both countries.

The positive relationship between entrepreneurship and growth at the regional level is not limited to Germany in the 1990. For example, Foelster (2000) examines not just the employment impact within new and small firms but on the overall link between increases in self-employment and total employment in Sweden between 1976-1995. By using a Layard-Nickell framework, he provides a link between micro behavior and macroeconomic performance, and shows that increases in self-employment shares have had a positive impact on regional employment rates in Sweden.

Hart and Hanvey (1995) link measures of new and small firms to employment generation in the late 1980s for three regions in the United Kingdom. While they find that employment creation came largely from SMEs, they also identify that most of the job losses also came from SMEs.

Callejon and Segarra (1999) use a data set of Spanish manufacturing industries between 1980-1992 to link new-firm birth rates and death rates, which taken together constitute a measure of turbulence, to total factor productivity growth in industries and regions. They adopt a model based on a vintage capital framework in which new entrants embody the edge technologies available and exiting businesses represent marginal obsolete plants. Using a Hall type of production function, which controls for imperfect competition and the extent of scale economies, they find that both new-firm startup rates and exit rates contribute positively to the growth of total factor productivity in regions as well as industries.

The evidence linking entrepreneurship to growth at the regional level may actually be more compelling in the European context than in the North American context. Only a handful of studies have been undertaken for North America, while the evidence from Europe is considerably more robust and consistent.

5.5 Country

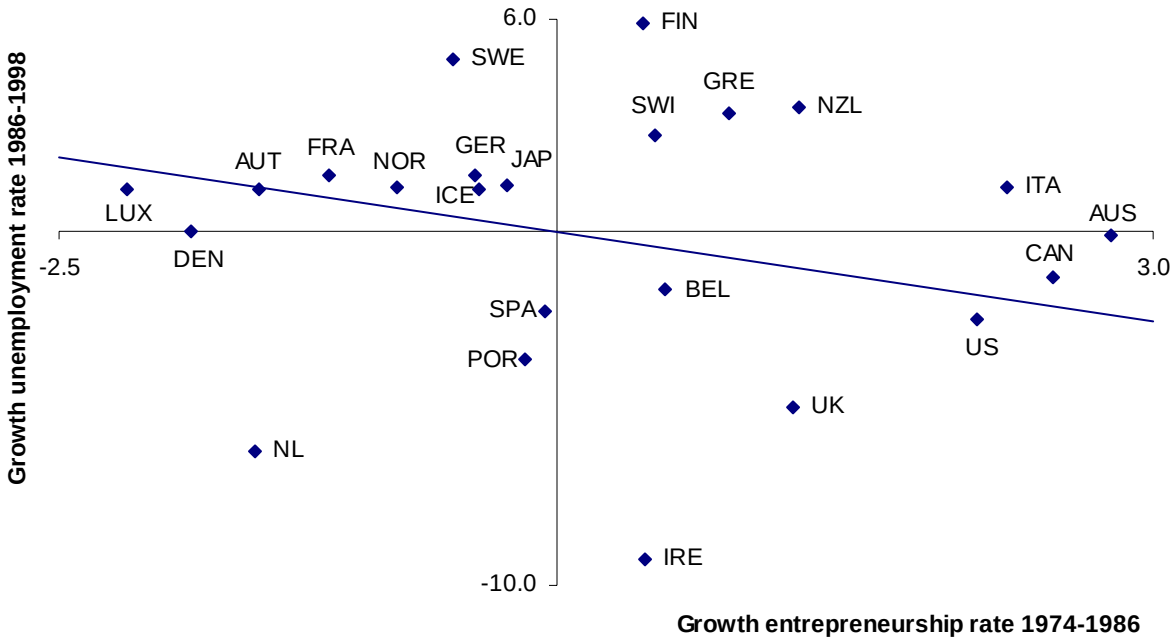
Only recently have scholars begun to try to find an empirical link between entrepreneurship and performance, measured in terms of growth, at the national level. For example, Thurik (1999) provided empirical evidence from a 1984-1994 cross-sectional study of the 23 countries that are part of the Organization for Economic Co-operation and Development (OECD), that increased entrepreneurship, as measured by business ownership rates, was associated with higher rates of employment growth at the country level. Similarly, Audretsch et al. (2002a) and Carree and Thurik (1999) find that OECD countries exhibiting higher increases in entrepreneurship also have experienced greater rates of growth and lower levels of unemployment.

In a study for the OECD, Audretsch and Thurik (2002) undertake two separate empirical analyses to identify the impact of changes of entrepreneurship on growth. Each one uses a different measure of entrepreneurship, sample of countries and specification. This provides some sense of robustness across different measures of entrepreneurship, data sets, time periods and specifications. The first analysis uses a data base measures entrepreneurship in terms of the relative share of economic activity accounted for by small firms. It links changes in entrepreneurship to growth rates for a panel of 18 OECD countries spanning five years to test the hypothesis that higher rates of entrepreneurship lead to greater subsequent growth rates. The second analysis uses a measure of self-employment as an index of entrepreneurship and links changes in entrepreneurship to unemployment at the country level between 1974 and 1998. The different samples including OECD countries over different time periods reach consistent results – increases in entrepreneurial activity tend to result in higher subsequent growth rates and a reduction of unemployment.

The Global Entrepreneurship Monitor (GEM) Study (Reynolds et al., 2000) also established an empirical link between the degree of entrepreneurial activity and economic growth, as measured by employment, at the country level. Thus, there are not only theoretical arguments but also empirical evidence suggesting that the growth of countries is positively associated with an entrepreneurial advantage.

Figure 1 shows that those countries exhibiting a greater increase in entrepreneurship rates between 1974 and 1986 also tended to exhibit greater decreases in unemployment rates between 1986 and 1998. This would suggest a negative relationship between entrepreneurial activity and subsequent unemployment. Unemployment is used here because of its importance as a policy goal. A similar relationship between entrepreneurship and growth rates for a broader spectrum of countries, including both OECD and non-OECD countries is shown by the Global Entrepreneurship Monitor (GEM) Study (Reynolds et al., 2000).

Figure 1: Changes in entrepreneurship and unemployment rates in OECD countries



Source: Audretsch et al., 2002a

6. The Determinants of Entrepreneurship

6.1 An Economic Framework

To understand how public policy can be implemented to promote entrepreneurship, Audretsch et al. (2002b) introduced a framework for analyzing the determinants of entrepreneurship. This framework is useful for not only demonstrating why the degree of entrepreneurship varies across regions and countries, but also in identifying the different ways that public policy can be implemented to increase the amount of entrepreneurial activity.

Entrepreneurship is shaped by many factors, spanning a spectrum range of determinants, ranging from economic to historical, psychological, social, cultural and

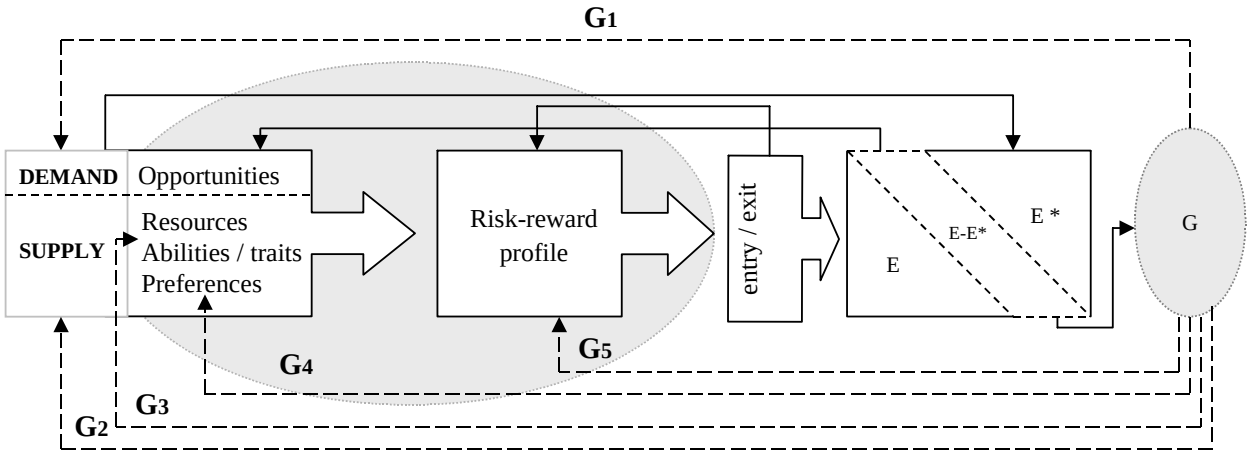
political. Certainly no single research discipline can claim a monopoly to understanding entrepreneurship. For example, the field of psychology has focused on motives and character traits of entrepreneurs and potential entrepreneurs. Sociology has examined the (collective) background of entrepreneurs.

The framework introduced here focuses on the distinction between factors shaping the supply of entrepreneurial activities and those influencing the demand for entrepreneurial activities. The demand for entrepreneurship reflects the opportunities to engage in entrepreneurial activity. It recognizes that the opportunity for individuals and firms to engage in entrepreneurial activity is not at all fixed, but rather varies considerably across regions and countries

By contrast, the supply of entrepreneurship is shaped by characteristics of the population, including the demographic composition, educational attainment, incomes levels and degree of unemployment, and cultural norms. In particular, the resources and capabilities of individuals along with their attitudes towards entrepreneurship are key factors in influencing the supply of entrepreneurship. Both cultural and institutional factors help shape the supply side. Institutional factors include access to finance, administrative burdens, and the degree of taxation.

The framework for analyzing entrepreneurship is depicted in Figure 2. This shows that the interaction of the supply and demand factors for entrepreneurship help to shape the risk-reward profile of individuals. The framework emphasizes that while entrepreneurship is embedded into a broad range of social, economic, political and cultural factors, ultimately it is individuals who make a choice whether or not to engage in entrepreneurial activities. Given all of the factors from both the supply and demand sides, individuals weigh the perceived risks and rewards from engaging in entrepreneurship. As a result, they may choose to enter into entrepreneurship or not to, or even to exit from entrepreneurship.

Figure 2: Framework for the Determinants of Entrepreneurship



Source: Audretsch et al. (2002b)

The actual rate of entrepreneurship (E) is determined by both macro and micro factors. The supply side generates (potential) entrepreneurs that take advantage of entrepreneurial opportunities, to the degree that they have the resources, abilities and personal characteristics to engage in entrepreneurial activity. Entrepreneurial opportunities, which are created on the demand side, are generated by they types of goods and services demanded on the market. An advantage of this framework is that it combines both environmental, or macro, conditions with individual (micro) characteristics.

The risk-reward profile represents the process of weighing alternative types of employment and is based on the opportunities presented by the demand side and the resources and abilities presented by the supply side. The occupational choices of individuals are made on the basis of their risk-reward profile of entrepreneurship when compared to that presented by alternative forms of employment, such as wage employment or unemployment.

If the actual degree of entrepreneurship, E, deviates from the targeted degree of entrepreneurship, E*, government policies may be undertaken to alter the basic forces shaping entrepreneurial activity. In Figure 2, such entrepreneurship policies are implemented by changing the different components shaping either the demand side, the supply side, or else the risk-reward profile directly.

Figure 2 depicts five particular types of entrepreneurship policy. The first type, G1, promotes entrepreneurship by altering the factors shaping opportunity for entrepreneurship. Such policies include the deregulation of entry into markets, the privatization of many services, access to government procurement programs, promoting firm linkages and clusters, and access to global value chains.

G2, G3 and G4 promote entrepreneurship by altering the factors shaping the supply side. Such policies focus on promoting the capabilities of individuals and firms and facilitating access to resources. In particular, this involves increasing the supply of potential entrepreneurs through immigration and diversity policies which facilitate the participation and access by previously excluded minorities (G2). A different type of policy involves enhancing the skills and capabilities of individuals, through education and training, or by provision micro-credit or other types of finance (G3). Policies designed to improve the view towards entrepreneurial activity, including promotional campaigns using the media and the educational system, are represented by G4.

Entrepreneurship policy can also change the risk-reward profile directly. Examples of such policies include taxes, subsidies, labour market rules and bankruptcy regulation (G5).

While the demand side focuses on the opportunities for enterprises and individuals in a developing country to invest in, develop, pursue and ultimately implement entrepreneurial strategies, the supply side focuses on the capabilities and capacity for such entrepreneurial strategies to be developed and implemented. Some of these capabilities and capacities are based on characteristics of the underlying population, some of these emanate from the skill and technological capabilities; and some are based

on the ability of firms and individuals to access ancillary resources, such as finance, inputs and external markets.

6.2 The Individual

One important unit of observation for analyzing the determinants of entrepreneurship has been at the level of the individual. These studies have crossed a broad spectrum of academic disciplines, ranging from psychology to sociology and economics. While the early studies centered in North America, they have also been duplicated and extended to Europe.

Within the economics literature, the prevalent theoretical framework has been the general model of income choice. The model of income choice dates back at least to Knight (1921), but was more recently extended and updated by Lucas (1978), Kihlstrom and Laffont (1979), Holmes and Schmidt (1990) and Jovanovic (1994). In its most basic rendition, individuals are confronted with a choice of earning their income either from wages earned through employment in an incumbent enterprise or else from profits accrued by starting a new firm. The essence of the income choice is made by comparing the wage an individual expects to earn through employment, W*, with the profits that are expected to accrue from a new-firm startup, P*. Thus, the probability of starting a new firm, Pr(s), can be represented as

$$Pr(s) = f(P^*-W^*)$$

The model of income choice has been extended by Kihlstrom and Laffont (1979) to incorporate aversion to risk, and by Lucas (1978) and Jovanovic (1994) to explain why firms of varying size exist, and has served as the basis for empirical studies of the decision to start a new firm by Blau (1987), Evans and Leighton (1989a, 1989b and 1990), Evans and Jovanovic (1989), Blanchflower and Oswald (1990) and Blanchflower and Meyer (1994).

Empirical tests of the model of income choice have focused on personal characteristics with respect to labour market conditions. For example, using U.S. data, Evans and Leighton (1989a, 1989b and 1990) link personal characteristics, such as education, experience and age, as well as employment status, of almost 4,000 white males to the decision to start a new firm. Other studies, such as Bates (1990), also using U.S. data, and Blanchflower and Meyer (1994), emphasize human capital in the income choice. This approach places particular emphasis on the employment status of individuals in making the income choice. Certain ambiguities exist in linking unemployment to the decision to start a new firm (Storey, 1991). In particular, Storey (1991) observed that consistent results tended to emerge from cross-section studies, just as consistency is found in time series analysis. That is the discrepancy in results appeared to be along the lines of methodology, i.e., whether a time series or cross-sectional approach was undertaken. Storey (1991, p. 177) concludes that, “The broad consensus is that time series analysis point to unemployment being, ceteris paribus, positively associated with

indices of new firm formation, whereas cross-sectional, or pooled cross-sectional studies appear to indicate the reverse. Attempts to reconcile these differences have not been wholly successful. They may reflect possible specification errors in the estimating equations, since none include all the independent variables which have been shown to be significant in the existing literature. In particular we suggest that more attention is given to the issue of taxation, savings and state benefits than has been the case in the past."

Evans and Leighton (1990) found unequivocal evidence that, for U.S. young white males, the probability of starting a new firm tends to rise as a worker loses his job. In the European context, Foti and Vivarelli (1994) analyze self-employment data in Italy and find that unemployment has a positive impact entry into self-employment. Ritsila and Tervo (2002) use panel data models and micro-level data at the level of the individual to link three different levels of unemployment – at the level of the country, the region and for the individual, to the decision to start a new firm for Finland between 1987-1995. Their results suggest the existence of a positive and non-linear effect of personal unemployment on the likelihood of an individual to become an entrepreneur. However, as for the national unemployment rate, the relationship is reversed – low unemployment and high levels of macroeconomic growth increase the likelihood of starting a new firm. The evidence linking regional unemployment to the likelihood of starting a new firm is ambiguous.

De Wit and van Winden (1989) analyze a panel data started of individuals making a decision between employment and self-employment in the Netherlands. Their main findings suggest that the probability of self-employment is positively influenced on the earnings differential between self-employed and wages from employment, having a relatively high score on an IQ test applied at the age of 12, and the employment status of the father (being self-employed).

A series of studies (Klandt, 1984 and 1996; Kulicke, 1987; and Boegenhold, 1985) have identified fundamental characteristics possessed by the typical German entrepreneur who starts a new firm (*Gruender*). These studies have consistently identified the start-up decision to be based on these entrepreneurial characteristics. According to these studies, the character profile of German entrepreneurs varies considerably from their countrymen who choose to remain employed by a firm or the government. Among the most prominent entrepreneurial characteristics is independence. Entrepreneurs generally place a higher value of independence in career than those people who do not start new firms. Similarly, responsibility and leadership rank very highly in entrepreneurs when compared to the general population.

Using data from the United Kingdom, Westhead and Birley (1995) find that owner-manager characteristics at startup, including human capital factors, do not have much influence on the employment growth of the firm.

A study by the ADT (1998) found that the number of spinoffs from research institutes has increased dramatically in Germany, from 30 in 1990 to 167 in 1997. The study classifies scientific workers at the main German scientific research institutes as being either a "potential entrepreneur" or not a potential entrepreneur. The work values for potential entrepreneurs working at scientific research institutes differ considerably from their colleagues who are not classified as being a potential entrepreneur. Potential

entrepreneurs place a higher value on being responsible for their own future, having a position of responsibility, having less of a hierarchical organization, and independence than do those scientific workers with no entrepreneurial interest. By contrast, the potential entrepreneurs place less of an importance on the work values of a secure income and a secure pension than do those with no entrepreneurial potential.

Colombo and Delmastro (2001) examine the characteristics of high-tech entrepreneurs in Italy. In particular, they identify differences in the characteristics found between the internet sector and other ICT industries. Their findings suggest that entrepreneurs who started firms in internet based businesses are systematically younger than their counterparts in other ICT industries.

Klofsten and Jones-Evans (2000) compare academic entrepreneurship, or the process by which professors and university researchers start and develop technology-based firms in the European context. They find that personal characteristics such as gender, age, previous entrepreneurial experience, work experience and the university environment all contribute to academic entrepreneurial activities in Sweden and Ireland.

6.3 The (New) Firm

A different strand of literature, primarily in economics, has focused on the determinants of new-firm startups. These studies have typically been at the industry level of aggregation and have tried to link industry-specific factors to startup rates. Early studies, mostly done in the North American context, tried to identify a link between measures of entry barriers, such as the extent of scale economies, advertising intensity, R&D, and capital requirements and entry into industries. These studies, found primarily in the industrial organization literature within economics, reached mostly inconclusive and ambiguous results (Geroski, 1995). The only industry-specific characteristic that was consistently related to entry was industry growth. Audretsch (1995) attempted to reconcile these ambiguous results through an evolutionary lens. What had been assumed to constitute a barrier to entry was actually more of a barrier to growth and survival.

A wave of studies have also been undertaken linking new-firm startup activity to industry-specific characteristics within the European context. While some of these studies (Fotopoulos and Spence, 1997) follow the earlier American methodology of only measuring net entry (in their case, Greece), other studies actually analyze new-firm startups. For example, Wagner (1994) has found that the industry environment plays an important role in shaping the amount of entrepreneurial activity in Germany. Based on a longitudinal database between 1979 and 1989, he finds that the startup of new small firms tends to be greater in those industries experiencing high growth and which are highly concentrated. He finds that startup activity is not significantly influenced by the importance of capital intensity and R&D in the industry. These non-significant statistical results are important because they suggest that entrepreneurs are not deterred from starting new firms even in industries which are capital intensive and where R&D plays an important role.

Santarelli and Sterlacchini (1994) use the database made available by the National Institute of Social Security in Italy, which measures all firms with at least a single

employee. They distinguish new-firm startups from incumbent enterprise entry and find that the determinants are significantly different. While industry growth positively affects both types of entry, the presence of small firms only has an impact on new-firm startups but not on incumbent entry.

6.4 The Spatial Level – Cities & Regions

An important strand of literature has developed linking entrepreneurship activity to characteristics specific to a spatial unit of observation, typically the city or region. This literature emerged first in the regional studies field (Reynolds, Storey and Westhead, 1994), but more recently has expanded to geography and economics as well. In proposing a new theory of economic geography (Krugman, 1991, p. 5) asks, "What is the most striking feature of the geography of economic activity? The short answer is surely concentration...production is remarkably concentrated in space." What explains such an asymmetric distribution of economic activity? Here Krugman (1991), along with Romer (1986), is unequivocal – the existence of increasing returns to scale in production. By increasing returns, however, Krugman and Romer do not necessarily mean at the level of observation most familiar in the industrial organization literature – the plant, or at least the firm – but rather at the level of a spatially distinguishable unit, say a region or area. In fact, it is assumed externalities across firms and even industries that yield convexities in production. In particular, Krugman (1991) focuses on convexities arising from spillovers from (1) a pooled labour market; (2) pecuniary externalities enabling the provision of nontraded inputs to an industry in a greater variety and at lower cost; and (3) information or technological spillovers. The contemporary theories linking geography to entrepreneurship are based on these three factors, but in particular the role that spillovers play. These theories are important because they help to explain why a predominant amount of startup activity occurs within geographic clusters.

Most of these studies have focused on new-firm startup activity as a measure of entrepreneurship. This has generated a series of studies trying to identify those geographic-specific characteristics conducive to new-firm startups. The focus of this literature has been on the impact of regional characteristics, such as the unemployment rate, population density, population growth, levels of labour skills and human capital, and enterprise structure on startup rates.

For example, the collection of European country studies included in the special issue of Regional Studies on "Regional Variations in New Firm Formation" (Reynolds, Storey and Westhead, 1994), along with the survey by Storey (1991) suggest that the empirical evidence has been generally unambiguous with respect to the findings for population density (a positive impact on startup rates), population growth (positive impact on startup rates), skill and human capital levels of the labour force (positive impact), and mean establishment size (negative impact on startup rates). By contrast, the empirical evidence about the impact of unemployment on startup rates is considerably more ambiguous.

Audretsch and Fritsch (1994), examined the impact that location plays on entrepreneurial activity in (West) Germany. Using a data base derived from the social

insurance statistics, which covers about 90 percent of employment, they identify the birth rates of new startups for each of 75 distinct economic regions. These regions are distinguished on the basis of planning regions, or *Raumordungsregionen*. They find that, for the late 1980s, the birth rates of new firms are higher in regions experiencing low unemployment, which have a dense population, a high growth rate of population, a high share of skilled workers, and a strong presence of small businesses.

Similarly, Pfirrmann (1994) has found that the innovative activity of small- and medium-sized firms in West Germany is shaped by regional factors. He uses a database consisting of innovative small and medium-sized firms and finds that the innovative activity of small- and medium-sized enterprises tends to be greater in those regions where there is a strong presence of knowledge resources. However, his results also indicate that factors internal to the firm are more important for the innovation efforts of a small firm than is the regional environment.

6.5 The Role of Key Factors

6.5.1 Finance

A growing literature on both sides of the Atlantic has focused on the role that access to finance plays in determining entrepreneurship. A key theoretical contribution by Stiglitz and Weiss (1981) is that the propensity for an enterprise to be subject to credit rationing is not neutral with respect to firm size. Rather, as a result of adverse selection in a market with asymmetric information the likelihood of credit rationing tends to systematically increase as firm size decreases.

There are compelling reasons why liquidity constraints become more severe as firm size decreases. Stiglitz and Weiss (1981) pointed out that, unlike most markets, the market for credit is exceptional in that the price of the good -- the rate of interest -- is not necessarily at a level that equilibrates the market. They attribute this to the fact that interest rates influence not only demand for capital but also the risk inherent in different classes of borrowers. As the rate of interest rises, so does the riskiness of borrowers, leading suppliers of capital to rationally decide to limit the quantity of loans they make at any particular interest rate. The amount of information about an enterprise is generally not neutral with respect to size. Rather, as Petersen and Rajan (1992, p. 3) observe, "Small and young firms are most likely to face this kind of credit rationing. Most potential lenders have little information on the managerial capabilities or investment opportunities of such firms and are unlikely to be able to screen out poor credit risks or to have control over a borrower's investments." If lenders are unable to identify the quality or risk associated with particular borrowers, Jaffe and Russell (1976) show that credit rationing will occur. This phenomenon is analogous to the lemons argument advanced by George Akerloff (1970). The existence of asymmetric information prevents the suppliers of capital from engaging in price discrimination between riskier and less risky borrowers. But, as Diamond (1991) argues, the risk associated with any particular loan is also not neutral with respect to the duration of the relationship. This is because information about the underlying risk inherent in any particular customer is transmitted over time. With experience a lender will condition the risk associated with any class of customers by characteristics associated with the individual customer.

In the pioneering empirical study, based on the United States, Fazzari, Hubbard and Peterson (1988), found systematic evidence that liquidity constraints tend to be more binding as firm size decreases. The early empirical evidence linking liquidity constraints (inversely) to firm size was restricted to the United States, the United Kingdom and a few other countries. Not only was little known about liquidity constraints within the European context, but there are reasons to believe that liquidity constraints are different within the European context (Deeg, 1999). This is because the unique institutional structure of the European financial systems are different. For example, the German institutional structure has, among other traits, financial intermediaries that have close long-term relations to German firms in a way that do not exist in other countries such as the United States. Based on these institutional differences, the German system has been characterized as being bank-based, while the U.S. and United Kingdom represent prototypical market-based financial systems. Whether liquidity constraints can be avoided or at least mitigated under Germany's unique system of finance remains an empirical question.

Germany's financial infrastructure is not like other countries. In fact studies have suggested that the institutional structure of Germany precludes liquidity constraints from occurring (Cable, 1985). There are two institutional features of the German financial system that sharply contrast with practices in the United States, both of which may impact the extent to which liquidity constraints occur. First, companies in Germany typically rely almost exclusively upon banks for external sources of finance. The external capital market remains relatively under developed. And second, not only do the banks represent the major financial intermediary supplying capital to firms, but they are also extensively represented on the firm's supervisory boards. Cable (1985, p. 119) refers to this peculiarity of the German financial system which links finance to supervision as a "quasi-internal capital market".

Audretsch and Elston (2002) argue that something of a paradox has emerged with respect to the system of financing for the German *Mittelstand*, or small- and medium-sized enterprises in Germany. On the one hand, there is reason to believe that through the development of a finely layered system of institutions linking together financial institutions, governments, and private firms, that the system of finance in Germany serves as a model for providing funds to small- and medium-sized enterprises. Not only was the *Mittelstand* the backbone of the German *Wirtschaftswunder*, or economic miracle, and subsequent rise to economic power, but it also appears to have played a more important role in German economic development than in either the United States or the united Kingdom.

On the other hand, while the German *Mittelstand* has provided the backbone for Germany's economic success, one aspect has been noticeably lacking in recent years – the emergence of small high-technology companies in the emerging industries such as software, biotechnology, and computers. The evidence suggests that the lack of entrepreneurial activity in high-technology industries is directly attributable to rigidities and constraints in providing liquidity and access to finance to new firms in new industries imposed by the very same system of finance in Germany.

In the Audretsch and Elston (2002) study the extent of financial constraints is linked to firm investment behavior through the lens of the Q theory of investment. The Q

framework is based on the assumption that in the absence of capital market imperfections (and taxes), the value-maximizing firm will continue to invest as long as the shadow price of a marginal unit of capital, Q, exceeds unity. One of the greatest impediments to measuring the impact of liquidity constraints on investment behavior across firm size in Germany has been the lack of a reliable and comprehensive panel data set. Audretsch and Elston (2002) employ a database consisting of a collection of financial reports of German firms quoted on the German stock exchange over a long period of time. The authors find no evidence that the institutional structure of finance in Germany has been able to avoid the impact of financing constraints. In particular, they find that the impact of financing constraints on investment behavior tends to increase systematically as firm size decreases. Smaller enterprises tend to be more vulnerable to financing constraints than their larger counterparts, even under the German model of finance where the spread between the large- and small-firm lending rates is relatively low. Audretsch and Elston (2002) do, however, find evidence that the German model of finance was able to avoid financing constraints on German enterprises prior to the mid-1970s. A particularly striking feature of this era in West Germany was a relative abundance of cheap credit. This era, however, seems to coincide with the *Wirtschaftswunder*, or economic miracle, in Germany. Since the mid-1970s there is no evidence that German firms, and in particular the smaller enterprises, have been able to avoid finance constraints.

Haid and Weigand (2001) find that family-owned firms in Germany are not liquidity constrained in that they have sufficient access to finance. Based on a database consisting of 109 reporting firms, they find that German family-owned firms may have better access to finance than do small-and medium-sized firms in the United States.

A different study, undertaken by Egeln, Licht and Steil (1997) finds that, in fact, small and young firms in high-tech industries in Germany do experience finance constraints. Forty-two percent of firms which are less than five years old perceive that access to capital is “an important obstacle to innovation activity”, while only 35 percent of firms older than 20 years experience a finance constraint. Similarly, only 2.2 percent of firms with fewer than 50 employees received a credit rating of “excellent”, while 41 percent of firms with employment exceeding 1,000 received a credit rating of “excellent.”

Winker (1999) uses the IFO firm panel data set in Germany to estimate the Stiglitz-Weiss model to identify the impact of firm age, firm size, and the business relations of firms on the probability of being subjected to liquidity constraints. A special feature of his study is that the IFO Institute’s micro data set enable him to construct a variable reflecting the extent of information asymmetries between the firm and possible sources of finance. The results indicate that (1) firms are liquidity constrained in Germany, and (2) the degree of liquidity constraints is inversely related to firm size.

Weigand (1998) analyzes an important longitudinal database from the German Bundesbank consisting of 18,281 firms over the period 1978-1989. She finds that the share of internal finance by the large firms rose from about 26 percent in 1978 to about 28 percent in 1989. By contrast, the share of total finance accounted for by internal finance by small firms decreased from about 22 percent in 1978 to 18 percent in 1989. Similarly, the share of total finance accounted for by internal finance in medium-sized enterprises fell from about 21 percent in 1978 to 18 percent in 1989. Weigand (1998) also

shows that (1) smaller firms tend to have longer-term relationships with financial institutions than their larger counterparts, and (2) this has become more important over time.

Pfirrmann, Wupperfeld and Lerner (1997) undertook an exhaustive study comparing the venture capital in Germany with that in the United States. They identified three major differences in venture capital between the U.S. and Germany: (1) the size and rate of growth of venture capital; (2) the legal structure of venture capital funds; and (3) the market structure of venture capital. In addition, they find that German venture capital managers typically do not specialize in certain high technology sectors or industries. Instead, they prefer a broad distribution of industries in their portfolios in order to minimize risk. While this German strategy of diversification serves to reduce risk it also reduces the ability of fund managers to accumulate expertise in any particular industry.

Evidence from other European countries also suggests that small and new firms, particularly in the new and high technology sectors suffer from liquidity constraints. For example, Guidici and Paleari (2000) analyze a data set consisting of Italian firms and identify that traditional sources of finance are inadequate to finance innovative projects. Lopez-Garcia and Aybar-Arias (2000) analyze the financial behavior of SMEs in Valencia, Spain, and find evidence of liquidity constraints. Their results find that liquidity constraints are inversely related to firm size in the Spanish context. Reid (1996) analyses data from the Federation of Small Businesses in Scotland to analyze the extent and impact of liquidity constraints. He finds a positive relationship between liquidity constraints and firm size. In particular, the results indicate that a ten percent increase in part-time employees will reduce the probability of experiencing funding shortages by 2.5 percent.

Whether small and new European enterprises are more finance constrained than in North America is uncertain. What is certain is that studies on both sides of the Atlantic have provided thorough documentation that small and new enterprises face significant constraints in obtaining finance.

6.5.2 Taxes and Administrative Burden

Taxes can serve as a barrier to entrepreneurship. A number of studies have identified that taxes have a negative impact on the startup, survival, growth and general viability of businesses within a European context (Rees and Shah, 1994; Poutziouris et al., 2000). Poutziouris et al. (2000) provide evidence that the tax burden of small firms exceeds that of their larger counterparts. This is particularly exacerbated in high technology sectors. Their study, based on data from the United Kingdom, shows that small high technology companies pay proportionately higher taxes, as a percentage of total assets than do their low-technology counterparts. They conclude that the British tax system disproportionately affects the financial development of high-tech startups and constrains their growth potential. Storey (1994) points out that since investment capital for expanding business is primarily generated through retained profits, taxation reduces the funds available to small business owners for investment.

A different factor impacting entrepreneurial activity is government restrictions and administrative burdens. For example, according to Krauss and Stahlecker (2001), one

of the main factors underlying the slow development of biotechnology in Germany was government restrictions and administrative burdens. As these restrictions were loosened, they document a dramatic increase in biotechnology startups in the BioRegion Rhine-Neckar Triangle. The number of biotechnology firms, and the growth of those firms, increased greatly as a result of the easing of administrative restrictions.

As Cook et al. (2001) point out, legal frameworks for dealing with troubled companies vary across Europe. In Great Britain, for example, four broad options are available:

- Liquidation, where the proceeds from winding up are distributed to creditors
- Enforcement of collateral by a secured creditor by a process known as receivership
- Rehabilitation structures outlined in the law and
- Informal arrangements

Based on a study of small business in Great Britain, Cook et al. find that the way that rehabilitation structures are made impact the viability of SMEs. In particular, they find that lowering the fixed costs facilitate SME viability.

6.5.3 Immigration

Another factor determining entrepreneurship involves the role of immigration. Just as self-employment has increased within Europe and North America over the past quarter century, the role that immigrants and ethnic minorities play in entrepreneurial activities has also increased. In the U.S. a series of studies (Wilson, 1996; Bates, 1998a) have attempted to identify whether the determinants of entrepreneurial activity differ for different immigrant and ethnic minority groups. In one of the most important studies, Saxenien (2001) documents that the decision to become an entrepreneur is shaped by immigrant group status. In particular, she provides evidence that the fastest-growing groups of immigrant engineers in Silicon Valley are from Mainland China and India. Chinese, in particular, are increasingly visible in the computer science and engineering departments on university campuses located in the Silicon Valley region. Saxenien (2001) suggests that these immigrant entrepreneurs provide a mechanism for a two-way flow of ideas and knowledge between Silicon Valley and their home regions in Asia.

There is also systematic evidence identifying the determinants of immigrant and ethnic minority entrepreneurship within the European context. For example, Borooah and Hart (1999) analyze data from the 1991 Census in Great Britain to explain the relatively low self-employment rates of black Caribbean males as resulting from both push and pull factors. In particular, the results of their study attribute the low self-employment rates to social attributes relating to family formation, the welding of the family into a cohesive economic unit and educational and human capital levels.

Basu and Goswami (1999) use a multivariate model including cultural and social factors, as well as economic ones to identify the determinants of growth in immigrant owned firms in Great Britain. Their results suggest that moving away from a style of

management based on immigrant culture has a positive impact on growth. This requires greater delegation of responsibilities to non-family employees. At the same time, strengthening links with the country of origin has a positive impact on growth. While the commitment to work hard at startup is essential, human capital factors such as the entrepreneur's educational attainment and employee training appear to be more crucial than financial resources in contributing to growth.

6.5.4 Female Entrepreneurship

A different influence on entrepreneurial activity involves the participation of women. Empirical evidence from the U.S. indicates that the increase in entrepreneurial activity has been fueled by female entrepreneurship. In particular, the growth in the number of female owned businesses in the U.S. increased considerably during the 1990s (Mukhtar, 2002). Similarly, throughout most of the E.U. female self-employment has increased between 14% and 37%. Mukhtar (2002) uses data from the United Kingdom and finds that there are significant differences between male and female owner-managers in the way that they manage their businesses, in terms of managerial style, organizational structure and the degree of delegation within the organization.

Another important difference distinguishing female entrepreneurship involves finance. According to Verheul and Thurik (2001, p. 329), "Female start-ups may also experience specific barriers when trying to acquire start-up capital." They use a panel of 2000 Dutch entrepreneurs starting new firms, including 500 females, and find that female entrepreneurs do indeed use a smaller amount of start-up capital. However, there is no difference between the type of start-up capital between the female and male entrepreneurs. On average, the proportion of equity and debt capital (bank loans) is the same between the females and males.

Cowling and Taylor (2001) use the fifth wave of the British Household Panel Survey (BHPS), a nationally representative data set consisting of 5,500 British households and 9,000 individuals to identify ways that female entrepreneurs differ from their male counterparts. In particular, they find that the female entrepreneurs are better educated than their male counterparts and that flows into self-employment were considerably higher for men than women in the 1990s.

Du Rietz and Henrekson (2000) analyze a large Swedish sample of 4,200 entrepreneurs, including 405 females to test whether female entrepreneurs underperform relative to their male counterparts. The empirical evidence reveals sharp structure differences between male and female entrepreneurs. In an extensive multivariate regression with a large number of controls they find that female underperformance disappears for most of the performance criteria, including profitability. The one area where female entrepreneurs do underperform is in terms of sales growth.

Thus, there is compelling empirical evidence that (1) female entrepreneurship is increasing significantly in both Europe and the U.S., and (2) there are significant differences between male and female entrepreneurship in both the U.S. and Europe.

6.5.5 Clusters, Networks and Linkages

Geography and spatial location also influences entrepreneurship. The important role that geographic clusters and networks play as a determinant of entrepreneurial activity was identified in Europe and only recently has been discovered within the North American context (Porter, 1990 and 2000; Saxenien, 1994). By contrast, there is a longer and richer tradition of research linking entrepreneurship to spatial clusters and networks in Europe. However, most of these studies have been in social science fields other than economics. For example, Becattini (1990) and Brusco (1990) identified the key role that spatial clusters and networks play in promoting SMEs in Italy. While such networks and clusters were generally overlooked or ignored in North America, with publication of Saxenien's book, *Regional Advantage* (1994), which documented how spatial networks generated entrepreneurial activity in Silicon Valley and Route 128 around Boston, it became clear and accepted that spatial agglomerations were also important in the North American context.

An important distinction between the European literature and studies and the emerging literature in North America was the emphasis on high technology and knowledge spillovers in the North American context. By contrast, the European tradition focused much more on the role of networks and clusters in fostering the viability of SMEs in traditional industries, such as textiles, apparel and metalworking. For example, seminal studies by Becattini (1990) and Brusco (1990) argue that small and new firms enjoy a high degree of stability when supported by networks in Italy. A rich literature has provided a compelling body of case studies, spanning the textile industries of northern Italy to the metal working firms of Baden Wuerttenberg (Piore and Sabel, 1984), documenting the long-term viability and stability of small and new firms embedded in the so-called industrial districts of Europe. Pyke and Sengenberger (1990) argue that through the support of an industrial district, small firms in European spatial clusters have been able to compensate for what would otherwise be an inherent size disadvantage. According to Pyke and Sengenberger (1990), an industrial district is a geographically defined production system, involving a large number of enterprises engaging in production at a wide range of stages, and typically involved in the production of a homogeneous product. A particularly significant feature of Italian industrial districts is that almost all of the firms are small or even micro-enterprises. Examples of such industrial districts include Prato, Biella, Carpi and Castelgoffredo, which specialize in textile (coolants in Castelgoffredo); Vigevano, Montebellune and Montegranaro where shoes are manufactured (ski boots in Montebellune); Pesaro and Nogara which manufacture wooden furniture; Sassuolo where ceramic tiles are produced.

Brusco (1990) emphasizes the cooperation among network firms within an industrial district. Such cooperation presumably reduces any size-inherent disadvantages and improves the viability of small firms operating within the network. According to Pyke and Sengenberger (1990, p. 2), "A characteristic of the industrial district is that it should be conceived as a social and economic whole. That is to say, there are close inter-relationships between the different social, political and economic spheres, and the functioning of one, say the economic, is shaped by functioning and organization of the others." Grabher (1993) similarly argues that the social structure underlying industrial

networks contributes to the viability of small firms that would otherwise be vulnerable if they were operating in an isolated context.

The role of knowledge spillovers were discussed in Section 4 of this paper. However, there is also a key spatial dimension to knowledge spillovers that was not addressed in Section 4. In fact, the geographic range of such knowledge spillovers is greatly contested. In disputing the importance of knowledge externalities in explaining the geographic concentration of economic activity, Krugman (1991) and others do not question the existence or importance of such knowledge spillovers. In fact, they argue that such knowledge externalities are so important and forceful that there is no compelling reason for a geographic boundary to limit the spatial extent of the spillover. According to this line of thinking, the concern is not that knowledge does not spill over but that it should stop spilling over just because it hits a geographic border, such as a city limit, state line, or national boundary.

Krugman [1991a, p. 53] argued that economists should abandon any attempts at measuring knowledge spillovers because "...knowledge flows are invisible, they leave no paper trail by which they may be measured and tracked." But as Jaffe, Trajtenberg and Henderson [1993, p. 578] point out, "knowledge flows do sometimes leave a paper trail" -- in particular in the form of patented inventions and new product introductions.

Studies identifying the extent of knowledge spillovers are based on the knowledge production function. Jaffe (1989) modified the knowledge production function approach to a model specified for spatial and product dimensions:

$$I_{si} = IRD^{\beta_1} * UR_{si}^{\beta_2} * (UR_{si} * GC_{si}^{\beta_3}) * \varepsilon_{si} \qquad (1)$$

where I is innovative output, IRD is private corporate expenditures on R&D, UR is the research expenditures undertaken at universities, and GC measures the geographic coincidence of university and corporate research. The unit of observation for estimation was at the spatial level, s, a state, and industry level, i. Estimation of equation (1) essentially shifted the knowledge production function from the unit of observation of a firm to that of a geographic unit.

The research laboratories of universities provide a source of innovation-generating knowledge that is available to private enterprises for commercial exploitation. Jaffe (1989) and Acs, Audretsch, and Feldman (1992), Audretsch and Feldman (1996) and Feldman and Audretsch (1999), for example, found that the knowledge created in university laboratories "spills over" to contribute to the generation of commercial innovations by private enterprises. Acs, Audretsch, and Feldman (1994) found persuasive evidence that spillovers from university research contribute more to the innovative activity of small firms than to the innovative activity of large corporations.

Within the European context, Braunerhjelm and Carlsson (1999) identify the existence of seven clusters in Sweden. They find that these clusters generate more than a proportional share of the high-technology startups in Sweden.

6.5.6 Culture & Social Capital

Culture and social capital have also been identified as promoting entrepreneurial activity. The network approach to entrepreneurship has its roots in sociology (Aldrich and Zimmer, 1986). According to this literature, social capital is an essential determinant of entrepreneurial activity. At the heart of these theories is the personal network perspective that has the premise that entrepreneurship is a social role, and is thus embedded in a social, political, and cultural context. In order to start a new business, social relationships must be activated and new ones created. Thus, "entrepreneurship is a relational task, and is inherently a networking activity" (Dubini and Aldrich, 1991, p. 306). Granovetter (1983) emphasized the importance of weak ties within a network. Such weak ties are assumed to provide valuable information.

Most of the empirical studies based on the network approach have tested one of two hypotheses. The first involves the startup process and tries to link newtwork resources, networking activities and network support to the startup of new firms. The second involves the performance of those startups. For example, based on a sample of 1,700 new businesses in Upper Bavaria (Germany) Bruederl and Preisendoerfer (1998) find evidence supporting the hypothesis that network support facilitates the growth and survival of new enterprises.

Berggren, Olofsson and Silver (2000) analyze a database of 281 SMEs to identify impediments to growth. They find that the use of new technologies, financial strength and the perceived need to grow all influence post-entry growth. In particular, the aversion of Swedish firms to yield control has limited external financing and ultimately growth of Swedish firms. They conclude that cultural factors limit the growth of Swedish SMEs.

Hofstede et al. (2002) combine data on entrepreneurial and economic variables with data on cultural variables. First, they consider cross-sectional relationships between the cultural and psychological attitude variables and level of entrepreneurship. The results yield evidence that, across nations, dissatisfaction with society and with life in general are the main determinants of the level of entrepreneurship. In particular, countries where people are less satisfied have more self-employed individuals, their indicator for level of entrepreneurship. These are often societies with larger power distance, stronger uncertainty avoidance, more bureaucracy and corruption, and which are relatively poor.

Subsequently, they test a model that predicts levels of entrepreneurship using economic and dissatisfaction variables for which time series data are available. Results indicate a U-shaped relationship between prosperity and the level of entrepreneurship. In addition, unemployment is positively associated with the level of entrepreneurship, suggesting that it is a significant push factor. A series of different analyses also support the conclusion that dissatisfaction with life and with society are key determinants of level of entrepreneurship across nations. Finally, by using the Hofstede indices of national culture to form country clusters, they substantiate the conclusion that culture may serve as an important moderator variable in relationships between economic factors and level of entrepreneurship.

Uhlaner et al. (2002) study the determinants of entrepreneurship at the country level, and note that most traditional explanations have been dominated by economic influences. The relative stability of differences in levels of entrepreneurship across

countries suggests that other forces such as certain institutional and/or cultural factors are at play. Their paper explores how post-materialism explains differences in entrepreneurial activity across countries. Entrepreneurial activity is defined as the percent of a country's population that is self-employed, using a broad definition that also includes CEOs of both unincorporated and legally incorporated establishments. The measure for post-materialism is based upon Inglehart's four-item post-materialism index. Because of the known interactions between economic and cultural factors found in previous research, a set of economic and cultural factors is included to provide a clearer picture of the independent role post-materialism plays in prediction of self-employment levels. In particular, education, life satisfaction, church attendance and political (left or right) extremism are used as control variables in our analyses using data of 14 OECD countries over in recent period. Findings confirm the significance of post-materialism in predicting strong covariation between post-materialism and other cultural factors makes it difficult to clearly discriminate between the effects.

Thus, there is growing evidence supporting the hypothesis that culture and social capital influence entrepreneurial activity. This evidence seems to hold across countries, although significantly more research is needed to ascertain the exact manner in which culture and social capital shape entrepreneurship.

7. The Role of Public Policy

During the Post World War II era, there was considerable concern about what to do about the existing firms and industrial structure, but little attention was paid to where they came from and where they were going (Audretsch and Thurik, 2001). Oliver Williamson's classic 1968 article "Economies as an Antitrust Defense: The Welfare Tradeoffs," became something of a final statement demonstrating what appeared to be an inevitable trade-off between the gains in productive efficiency that could be obtained through increased concentration and gains in terms of competition, and implicitly democracy, that could be achieved through decentralizing policies. But it did not seem possible to have both, certainly not in Williamson's completely static model.

The fundamental policy issue confronting Western Europe and North America during the post-war era was how to live with this apparent trade-off between concentration and efficiency on the one hand, and decentralization and democracy on the other. The public policy question of the day was, *How can society reap the benefits of the large corporation in an oligopolistic setting while avoiding or at least minimizing the costs imposed by a concentration of economic power?* The policy response was to constrain the freedom of firms to contract. Such policy restraints typically took the form of public ownership, regulation and competition policy or antitrust. At the time, considerable attention was devoted to what seemed like glaring differences in policy approaches to this apparent trade-off by different countries. France and Sweden resorted to government ownership of private business. Other countries, such as the Netherlands and Germany, tended to emphasize regulation. Still other countries, such as the Untied States, had a greater emphasis on antitrust. In fact, most countries relied upon elements of all three policy instruments. While the particular instrument may have varied across countries, they were, in fact, manifestations of a singular policy approach – how to

restrict and restrain the power of the large corporation. What may have been perceived as a disparate set of policies at the time appears in retrospect to comprise a remarkably singular policy approach (Audretsch and Thurik, 2001).

In Europe Servan-Schreiber warned of the "American Challenge" in the form of the "dynamism, organization, innovation, and boldness that characterize the giant American corporations" (1968, p. 153). Because giant corporations were considered to be the engine of growth and innovation, Servan-Schreiber advocated the "creation of large industrial units which are able both in size and management to compete with the American giants" (1968, p. 159). According to Servan-Schreiber (1968, p. 159), "The first problem of an industrial policy for Europe consists in choosing 50 to 100 firms which, once they are large enough, would be the most likely to become world leaders of modern technology in their fields. At the moment we are simply letting industry be gradually destroyed by the superior power of American corporations." Ironically, the 1988 Cecchini Report identified the gains from European integration as largely accruing from increases in scale economies.

Public policy towards SMEs was oriented towards preserving what was considered to be inefficient enterprises, which, if left unprotected, might otherwise become extinct. Preservationist policies were clearly at work in the creation of the U.S. Small Business Administration. In the Small Business Act of July 10, 1953, Congress authorized the creation of the Small Business Administration, with an explicit mandate to "aid, counsel, assist and protect…the interests of small business concerns."[2] The Small Business Act was clearly an attempt by the Congress to halt the continued disappearance of small businesses and to preserve their role in the U.S. economy

By contrast, entrepreneurship policy is a relatively new phenomenon. An important distinction should be made between the traditional SME (small business) policies and entrepreneurship policies. SME policy typically refers to policies implemented by a ministry or government agency charged with the mandate to promote SMEs. The actual definition of SMEs varies considerably across countries, ranging from enterprises with fewer than 500 employees in some countries such as the United States and Canada, to fewer than 250 employees in the European Union, to 50 employees in many developing countries. The actual SME policy takes the existing enterprises within the appropriate size class as exogenous, or given, and then develops instruments to promote the viability of those enterprises. Thus, SME policy is almost exclusively targeted towards the existing stock of enterprises and virtually all of the instruments included in the policy portfolio are designed to promote the viability of the SMEs.

By contrast, entrepreneurship policy has a much broader focus. The definition introduced by Lundstrom and Stevenson (2001, p. 19) for OECD countries is certainly applicable in the context of the European Union, "Entrepreneurship policy consists of measures taken to stimulate more entrepreneurial behavior in a region or country…We define entrepreneurship policy as those measures intended to directly influence the level of entrepreneurial vitality in a country or a region."

[2] http://www.sba.gov/aboutsba/sbahistory.html

There are at least two important ways that distinguish entrepreneurship policy from SME policy (Lundstrom and Stevenson, 2002). The first is the breadth of policy orientation and instruments. While SME policy has a focus on the existing stock of SMEs, entrepreneurship policy is more encompassing in that it includes potential entrepreneurs as well as the existing stock of SMEs. This suggests that entrepreneurship policy is more focused on the process of change, regardless of the organizational unit, whereas SME policy is focused exclusively on the enterprise level. Entrepreneurship policy also has a greater sensitivity to framework or environmental conditions that shape the decision-making process of entrepreneurs. While SME policy is primarily concerned with one organizational level – the enterprise, entrepreneurship policy encompasses multiple units of organization and analysis. These range from the individual to the enterprise, and to the cluster or network, which might involve an industry or sectoral dimension, or a spatial dimension, such as a district, city, region, or even an entire country. Just as each of these levels is an important target for policy, the interactions and linkages across these disparate levels are also important. In this sense, entrepreneurship policy tends to be more systemic than SME policy. However, it is important to emphasize that SME policy still remains at the core of entrepreneurship policy.

The second way distinguishing entrepreneurship policy from traditional SME policy is that virtually every country has a ministry or governmental agency charged with promoting the viability of the SME sector. These ministries and agencies have by now developed a well established arsenal of policy instruments to promote SMEs. However, no such agencies exist to promote entrepreneurship. Part of the challenge of implementing entrepreneurship policy is that no country has yet to introduce an agency mandated with the charge of promoting entrepreneurship. Rather, aspects relevant to entrepreneurship policy can be found across a broad spectrum of ministries and agencies, ranging from education to trade and immigration. Thus, while SMEs have agencies and ministries that champion their issues, no analogous agency exists for entrepreneurship policy.

Just because entrepreneurship is positively linked to performance does not automatically justify public policy intervention. Rather, the mandate for public policy intervention is the result of three fundamental sources of market failure – network externalities, knowledge externalities, and learning externalities.

Network externalities result from the value of an individual's or firm's capabilities being conditional upon the geographic proximity of complementary firms and individuals. As Porter (2000) pointed out, local proximity is essential for accessing these knowledge spillovers. This makes the value of an entrepreneurial firm greater in the (local) presence of other entrepreneurial firms. The value of any individuals or firms capabilities is therefore conditional upon the existence of partners in a network. Firms and workers place a greater value on locations within clusters which contain complementary workers and firms than on those outside of clusters. Such market failure can occur where there is a potential for geographic clustering, sectoral linkages, or networks.

The second source of market failure involves knowledge externalities. As Arrow (1962) documented, knowledge, which involves new ideas, is inherently a public good, so that its production generates externalities. The third source of market failure

emanating from entrepreneurship is that positive economic value for third-party firms and individuals is created even in entrepreneurial firms that fail. The high failure rate of new-firm startups has been widely documented and described above in this paper, and the failure rates in knowledge-based activities are especially great. This is not surprising since knowledge activities are associated with a greater degree of uncertainty. However, the failure of a knowledge-based firm does not imply no value was created by the firm; evidence suggests that ideas created by failed firms and projects often become integral parts of successful products and projects in successful firms.

The externalities sometimes associated with failed firms, also creates a market failure in the valuation of (potential) new enterprises by private investors and policy makers. Whereas the private investor can only appropriate her investment if the particular firm succeeds, a failed firm that generates positive externalities contributes to the success of other third-party firms. The private investor, however, does not appropriate anything from the original investment. Likewise, individual firms and workers would have no incentive to invest in the development of a cluster, which is the creation of other entrepreneurial firms, due to their inability to appropriate returns from such a cluster.

From the public policy perspective, on the other hand, it does not matter which firm succeeds, as long as some firm(s) do, and growth, along with the other benefits accruing from entrepreneurship, is generated for the locale.

The third source of market failure involves the learning or demonstration effect emanating from entrepreneurial activity. This is particularly valuable in regions where entrepreneurship has been noticeably absent and no strong entrepreneurial traditions exist. Entrepreneurial activity involves not just the firm or individual responsible. Rather, others will observe this activity and the results of entrepreneurship. Other people will learn that entrepreneurship is a viable alternative to the status quo. As a result of this demonstration effect, others will be induced to also develop entrepreneurial strategies. Thus, there is a strong and compelling positive externality associated with entrepreneurship, particularly in areas with no strong entrepreneurial traditions.

Thus, the market failures inherent in entrepreneurship – network externalities, knowledge externalities and demonstration or learning externalities --result in a gap in the valuation of entrepreneurial activities between private parties and the local public policy makers. Entrepreneurial activity, combined with the propensity for knowledge to remain localized, results in a new policy mandate for cities, regions, provinces and countries. It also results in a fundamental mandate for the role to serve as a partner to business, enabling and fostering the development of new and small entrepreneurial firms. By filling these gaps left by market failure, public policy can create a virtuous entrepreneurial circle, where entrepreneurs become networked and linked to each other, and strong role models of entrepreneurship exist for others to emulate.

As the comparative advantage has become increasingly based on new knowledge, public policy has responded in two fundamental ways. The first has been to shift the policy focus away from the traditional triad of policy instruments essentially constraining the freedom of firms to contract – regulation, competition policy or antitrust in the U.S., and public ownership of business. The policy approach of constraint was sensible as long as the major issue was how to restrain large corporations in possession of considerable

market power. That this policy is less relevant in a global economy is reflected by the waves of deregulation and privatization throughout Europe and North America. Instead, a new policy approach is emerging which focuses on enabling the creation and commercialization of knowledge. Examples of such policies include encouraging R&D, venture capital and new-firm startups.

While the different types of entrepreneurship policies being implemented in the EU and US are two numerous to be identified and listed here, David Storey (2003) has identified examples of different types of entrepreneurship policies being undertaken in the EU and the U.S. In addition, he provides an assessment of the efficacy of the various types of policies undertaken. Illustrations of these policies are provided in Table 1.

Table 1: ILLUSTRATIONS OF PUBLIC PROGRAMMES TO ASSIST SMEs AND ENHANCE ENTREPRENEURSHIP

Problem	**Programme**	**Description**	**Country**	**Success**
Access to Loan Finance	Loan Guarantee Scheme	SMEs without access to own collateral obtain access to bank loans by state acting as guarantor	UK USA Canada France Netherlands	Yes, generally viewed as helpful, but small scale impact on the overall financing of SMEs in most countries
Access to Equity Capital	Enterprise Investment Scheme	Tax breaks for wealthy individuals to become business angels	UK	Unknown
Access to Markets	Europartenariat	Organisation of Trade Fairs to encourage cross-border trade between SMEs	EU	General satisfaction amongst firms that participated
Administrative Burdens	Units established within government to seek to minimise administrative burdens on smaller firms	Sunsetting Legislation deregulation Units	Netherlands Portugal, UK	The view of small firms themselves is that bureaucratic burdens have increased markedly in recent years
Science Parks	Property based developments adjacent to Universities	Seek to promote clusters of new technology based firms	UK, France, Italy and Sweden	Conflicting findings on impact of SPs on performance of firms
Managed Workspace	Property provision to assist new and very small firms	Often called business incubators, these provide premises for new and small firms on “easy- terms”	World-wide	General recognition that such initiatives are of value
Stimulating Innovation and R&D in small firms	Small Business Innovation Research Program	$1 billion per year is allocated via a competition to small firms to stimulate additional R&D activity	USA	Lerner implies SBIR enhances small firm performance, but Wallsten is unable to show it leads to additional R&D
Stimulating Training in small firms	Japan Small Business Corporation (JSBC)	JSBC and local governments provide training for owners and managers of small firms. The training programme began in 1963	Japan	Unknown
Entrepreneurial Skills	Small Business Development Corporations (SBDCs)	Counselling is provided by SBDC mentors to small business clients who may be starting a business or be already trading	USA	This study finds SBDC clients have higher rates of survival and growth than might be expected. Reservations over these findings are found in the text
Entrepreneurial Awareness	Entrepreneurship Education	To develop an awareness of enterprise and/or an entrepreneurial spirit in society by incorporating enterprise into the school and college curriculum	Australia, Netherlands, but leading area was Atlantic Canada	Conventional assessments are particularly difficult here because of the long “lead times”
Special Groups	Law 44	Provides finance and mentoring advice to young people in Southern Italy, where enterprise creation rates were very low	Southern Italy	This is an expensive programme, but most studies show the survival rates of assisted firms to be well above those of “spontaneous” firms

Source: Table taken (modified) from Storey (2003)

The policy shift to enabling the creation and viability of knowledge-based entrepreneurial firms is evidenced by passage by the United States Congress of the Small Business Innovation Research (SBIR) program in the early 1980s. Enactment of the SBIR was a response to the loss of American competitiveness in global markets. Congress mandated each federal agency with allocating around four percent of its annual budget to funding innovative small firms as a mechanism for restoring American international competitiveness (Wessner, 2000). The SBIR provides a mandate to the major R&D agencies in the United States to allocate a share of the research budget to innovative small firms. In 2001 the SBIR program amounted to around $1.4 billion. The SBIR consists of three phases. Phase I is oriented towards determining the scientific and technical merit along with the feasibility of a proposed research idea. A Phase I award provides an opportunity for a small business to establish the feasibility and technical merit of a proposed innovation. The duration of the award is six months and can not exceed $70,000. Phase II extends the technological idea and emphasizes commercialization. A Phase II Award is granted to only the most promising of the Phase I projects based on scientific/technical merit, the expected value to the funding agency, company capability and commercial potential. The duration of the award is a maximum of 24 months and generally does not exceed $600,000. Approximately 40 percent of the Phase I Awards continue on to Phase II. Phase III involves additional private funding for the commercial application of a technology. A Phase III Award is for the infusion and use of a product into the commercial market. Private sector investment, in various forms, is typically present in Phase III. Under the Small Business Research and Development Enhancement Act of 1992, funding in Phase I was increased to $100,000, and in Phase II to $750,000.

The SBIR represents about 60 percent of all public entrepreneurial finance programs. Taken together, the public small-business finance is about two-thirds as large as private venture capital. In 1995, the sum of equity financing provided through and guaranteed by public programs financing SMEs was $2.4 billion, which amounted to more than 60 percent of the total funding disbursed by traditional venture funds in that year. Equally as important, the emphasis on SBIR and most public funds is on early stage finance, which is generally ignored by private venture capital. Some of the most innovative American companies received early stage finance from SBIR, including Apple Computer, Chiron, Compaq and Intel.

There is compelling evidence that the SBIR program has had a positive impact on economic performance in the U.S. (Wessner, 2000; Lerner, 1999). The benefits have been documented as:

- The survival and growth rates of SBIR recipients have exceeded those of firms not receiving SBIR funding
- The SBIR induces scientists involved in biomedical research to change their career path. By applying the scientific knowledge to commercialization, these scientists shift their career trajectories away from basic research towards entrepreneurship.
- The SBIR awards provide a source of funding for scientists to launch start-up firms that otherwise would not have had access to alternative sources of funding.

- SBIR awards have a powerful demonstration effect. Scientists commercializing research results by starting companies induce colleagues to consider applications and the commercial potential of their own research.

Sternberg (1996) has shown that a number of government-sponsored technology policies in four countries – Great Britain, Germany, the U.S. and Japan – has triggered the startup of new firms. The majority of the startup programs are targeted towards eliminated particular bottlenecks in the development and financing of new firms. Sternberg (1990) examines the impact that 70 innovation centers have had on the development of technology-based small firms. He finds that the majority of the entrepreneurs find a number of advantages from locating at an innovation center.

The second fundamental shift involves the locus of such enabling policies, which are increasingly at the state, regional or even local level. The downsizing of federal agencies charged with the regulation of business in many of the OECD countries has been interpreted by many scholars as the eclipse of government intervention. But to interpret deregulation, privatisation and the increased irrelevance of competition policies as the end of government intervention in business ignores an important shift in the locus and target of public policy. The last decade has seen the emergence of a broad spectrum of enabling policy initiatives that fall outside of the jurisdiction of the traditional regulatory agencies. Sternberg (1996) documents how the success of a number of different high-technology clusters spanning a number of developed countries is the direct result of enabling policies, such as the provision of venture capital or research support. For example, the Advanced Research Program in Texas has provided support for basic research and the strengthening of the infrastructure of the University of Texas, which has played a central role in developing a high-technology cluster around Austin (Feller, 1997). The Thomas Edison Centers in Ohio, the Advanced Technology Centers in New Jersey, and the Centers for Advanced Technology at Case Western Reserve University, Rutgers University and the University of Rochester have supported generic, precompetitive research. This support has generally provided diversified technology development involving a mix of activities encompassing a broad spectrum of industrial collaborators. The Edison Technology Program of Ohio was established by the State of Ohio, as a means of transferring technology from universities and government research institutes to new firm startups. Carlsson and Brunerhjelm (1999) explain how the Edison BioTechnology Center serves an important dual role as a “bridging institution” between academic research and industry and between new startups and potential sources of finance. The Edison Centers in particular, try to link the leading universities and medical institutions, businesses, foundations, to civic and state organizations in Ohio in order to create new business opportunities. Numerous centers exist across the state. Similarly, the Edison Program has established a bridging institution to support polymer research and technology in Ohio. Carlsson and Brunerhjelm (1999) credit the program for the startup of new high technology firms in Ohio.

Other examples of enabling policies are evidenced by the plethora of science, technology and research parks. Lugar and Goldstein (1991) conducted a review of research parks and concluded that such parks are created in order to promote the competitiveness of a particular region. Lugar (2001, p. 47) further noted that, “The most

successful parks…have a profound impact on a region and its competitiveness." A distinct exemplar of this effect is found in the Research Triangle Park in North Carolina.

The traditional industries in North Carolina - furniture, textiles, and tobacco - had all lost international competitiveness, resulting in declines in employment and stagnated real incomes. In 1952, only Arkansas and Mississippi had lower per capita incomes. According to Link and Scott (forthcoming, p. 2), a movement emerged to use the rich knowledge base of the region, formed by the three major universities – Duke University, University of North Carolina-Chapel Hill and North Carolina State. This movement, though it initially consisted only of businessmen looking to improve industrial growth, ultimately fell into the hands of the Governor's office, who supported the efforts through fruition (Link, 1995). Empirical evidence provides strong support that the initiative creating Research Triangle has led to fundamental changes in the region. Link and Scott (forthcoming), document the growth in the number of research companies in the Research Triangle Park as increasing from none in 1958 to 50 by the mid-1980s and to over 100 by 1997. At the same time, employment in these research companies increased from zero in the late 1950s to over 40,000 by 1997. Lugar (2001) attributes the Research Triangle Park with directly and indirectly generating one-quarter of all jobs in the region between 1959 and 1990, and shifting the nature of those jobs towards high value-add knowledge activities.

Such enabling policies are not restricted to the U.S. One of the most interesting examples of the new enabling entrepreneurship policy involves the establishment of five EXIST regions in Germany, where startups from universities and government research laboratories are encouraged (BMBF, 2000). The program has the explicit goals of (1) creating an entrepreneurial culture, (2) the commercialization of scientific knowledge, and (3) increasing the number of innovative start-ups and SMEs. Five regions were selected among many applicants for START funding. These are the (1) Rhein-Ruhr region (bizeps program), (2) Dresden (Dresden exists), (3) Thueringen (GET UP), (4) Karlsruhe (KEIM), and (5) Stuttgart (PUSH!).

These programs promoting entrepreneurship in a regional context are typical of the new enabling policies to promote entrepreneurial activity. While these entrepreneurial policies are clearly evolving, they are clearly gaining in importance and impact in the overall portfolio of economic policy instruments.

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