Chapter 1

Introduction

The introduction examines what is new about innovation in the 21st century and the role played by SMEs and entrepreneurship. An important shift has occurred from the "managed" to the "entrepreneurial" economy, associated with a fall in the importance of economies of scale in production, management, finance and R&D. It is characterised by a series of trends encompassing the emergence of the knowledge economy, open innovation, global connections, non-technological innovation, the "Silicon Valley Business Model" and social entrepreneurship and social innovation. SMEs and new business ventures are important players in this new environment. They have a key role in processes of creative destruction, knowledge exploitation, breakthrough and incremental innovation, and interactive learning. Ensuring they reach their full potential requires a new innovation policy approach that facilitates entrepreneurship and SME innovation. Priorities include inserting new and small firms in knowledge transfer networks, strengthening entrepreneurship skills, and improving institutional environments for social entrepreneurship.

The creation of new business ventures and innovation in existing small and medium-sized enterprises (SMEs) are critical parts of today's innovation process, and should take a central place in government strategies to promote innovation. Despite their importance, however, SME and entrepreneurship support is not yet fully embedded in innovation policy, and the requirements for effective policies in this area are still not well enough understood.

New firms and innovating SMEs are best seen as agents of change in the economy, introducing new products and services and more efficient ways of working. They underpin the adaptation of our economies and societies to new challenges and drive economic development.

Not all new and small firms are equal in innovation, of course. On one hand, there is a small group of highly innovative and high-growth-potential firms with important individual impacts on jobs and productivity. But their numbers from the Entrepreneurship Indicators Project should not be exaggerated. They make up only a small minority of all SMEs. OECD figures for eleven OECD countries suggest for example that "high-growth enterprises" account for between only 2 and 8 per cent of all enterprises with 10 or more employees, while "gazelles" account for less than 1 per cent of such enterprises.[1] They nonetheless generate large impacts. Anyadike-Danes *et al.* (2009) calculate, for example, that the six per cent of UK businesses with the highest growth rates generated half of the new jobs created by existing businesses between 2002 and 2008. Innovation is a source of the growth of these types of firms (Mason *et al.*, 2009).[2] The Global Entrepreneurship Monitor survey in 53 countries suggests that only 6.5% of new entrepreneurs are "high-expectation entrepreneurs", who expected to create 20 or more jobs in five years time. Almost 90% of all expected new jobs were foreseen by less than one-quarter of nascent and new entrepreneurs (Autio, 2007). On the other hand, there is the vast majority of SMEs that innovate very little compared to large firms and are associated with only modest growth or decline. Yet these firms should not be neglected either, since even small innovations and small differences in growth amount to a lot when multiplied by the number of firms involved. This book addresses itself to both components of new and small firm innovation.

Many empirical studies have shown the aggregate relationships between entrepreneurship and SME activity and economic growth and job creation. These growth and job creation effects happen through innovation, as new firm creation and SME growth increase productivity and bring new or under-utilised resources into use. Various studies have shown how greater small business numbers and business start-up rates are associated with more rapid economic growth (Audretsch and Thurik, 2001; Audretsch and Keilbach, 2005; Acs *et al.*, 2005; Erken *et al.*, 2008). There is also an important link between new and small firm activity and job creation, as new and small firms take up labour released by downsizing elsewhere in the economy and increase national and local competitiveness (Neumark *et al.*, 2008; Haltiwanger, 1999; Daviddson *et al.*, 1999; Halabisky, 2006; Henrekson and Johansson, 2008). Stangler and Litan (2009) for example show that from 1980-2005 nearly all net job creation in the United States occurred in firms less than five years old, while in

2007 two-thirds of the entire pool of new jobs were created by firms aged between one and five years (hence excluding the very newest and most vulnerable to closure).

This job creation function of entrepreneurship and SME development is of great relevance to the recovery from the global financial and economic crisis since it is clear that policies enabling innovation in new and small businesses will have benefits not just for improving products and services and increasing efficiency but also for meeting the job creation challenge of high unemployment. In the short to medium term there is a real opportunity for governments to use policies for entrepreneurship and SME innovation to meet productivity and job creation objectives at the same time.

There is growing, if still insufficient, recognition that entrepreneurship and small firm development promotes innovation and in so doing meets fundamental economic and social objectives. What is still lacking, however, is a solid and comprehensive understanding of what policy needs to do to release the innovation capacity of new and small firms. This book addresses the issue. It is intended to offer an "*Innovation Strategy for SMEs and Entrepreneurship*", aimed at policy makers and their advisors with direct responsibility for entrepreneurship and SME policy or working in other policy domains such as education, innovation and social policy who could better realise their goals by adopting strategies that are more aware of and sensitive to the needs and opportunities of SMEs and entrepreneurship.

This chapter sets the context. It focuses on two key questions and draws out the policy implications of each: What is different about innovation in the 21st century (and has SME innovation become more important)? What role do new and small firms play in today's innovation processes? The major argument presented here is also the leitmotif of the book: A new type of innovation has emerged in recent years, which relies much more strongly than in the past on entrepreneurship and SMEs, but institutions and policies have yet to fully adapt to this new reality. To do so, a wider agenda must be adopted that encompasses stimulating SME participation in knowledge networks, developing entrepreneurial human capital and bringing about social entrepreneurship and social innovation.

The chapter starts by examining how global trends towards the knowledge economy, open innovation, global connections and non-technological innovation and the emergence of national and regional economic models and new types of social innovation have increased the importance of SMEs and entrepreneurship to innovation. It then discusses how SMEs and entrepreneurship contribute to innovation by driving processes of creative destruction, commercialising research, making break through and incremental innovations, participating in interactive learning processes and working in different modes of innovation. The major policy implications are then pulled out. The final section sets out how the main themes are developed further in the rest of book.

What is new about innovation in the 21st century?

The innovation process of the 21st century is radically different to that of the preceding one. Perhaps the most important difference is the new or renewed importance of new and small firms. The change can be resumed as a shift from the "Managed Economy" to the "Entrepreneurial Economy" (Thurik, 2009; Audretsch and Thurik, 2004). In the former, science and systematic large firm R&D was the key. In the latter, entrepreneurship is one of the foundations of innovation.

New and small firms have become critical innovation players because of their ability to recognise and exploit the commercial opportunities emerging from technological, competitive and market changes. Furthermore, economies of scale in research and development are no longer the barriers they once were to small firm participation in innovation. Rather, innovation today tends to be carried out in collaborations among universities, research organisations, customer, supplier and competitor firms and consumers, with costs and roles shared, while the massive shift from manufacturing to services is bringing with it new types of non-technological innovation that render economies of scale in R&D far less significant.

In presenting the shift from the "managed" to the "entrepreneurial economy", Thurik (2009) distinguishes between three major historical phases of innovation and contrasts the importance of SMEs and entrepreneurship in each.

1. *The Schumpeter Mark I regime*. Schumpeter's initial view was developed in the first decades of the 20th century. Schumpeter in this period saw the entrepreneur as playing a major role in challenging incumbent firms by introducing new inventions rendering current technologies and products obsolete, thus replacing obsolete businesses with new ones in a process of industrial reorganisation or "creative destruction" (Schumpeter, 1934).
2. *The Schumpeter Mark II regime or the "Managed Economy"*. Schumpeter later revised his view as the power of large firms began to grow, exploiting high price elasticities of demand (Schumpeter, 1942). Innovation from the 1940s to the 1970s fits this model: dominated by large corporations able to exploit large economies of scale in production, distribution, management and R&D (Chandler, 1977; Galbraith, 1972). Studies suggested that SMEs participated only to a limited degree in innovation in this period, reflecting their low R&D expenditures (Scherer, 1991; Acs and Audretsch, 1990). These years correspond to what Thurik refers to as the Schumpeter Mark II regime, or the "Managed Economy". In this new environment, established and large firms were seen to outperform new and smaller firms in innovation because of a close link between in-firm R&D spending and innovation.
3. *The "Entrepreneurial Economy"*. From the late 1970s to today the structures and operations of advanced economies have again been changing. Now, the importance of economies of scale has reduced and the role of new and small firms in innovation and economic development has grown again.

The key to understanding the renewed role of SMEs and entrepreneurship in today's economy is the reduced importance of economies of scale and scope in production, management, finance and R&D. This has occurred for a number of reasons. As incomes have risen, consumers have developed an increasing taste for variety. This is associated with the emergence of multiple market niches, which new and small firms are quick to fill. Changing markets, increased competition and new technologies have reduced product life times, demanding more rapid creation of products and their more rapid destruction. New technologies such as computer-numerically-controlled production tools have made it possible for small firms in many industries to produce small batches as efficiently as large firms once produced large batches. These trends have favoured the new and small firm, or at least taken away much of one of the main advantages that large firms enjoyed in the past – namely producing standardised products in large volumes at low cost. Thus a major force in the emergence of the "entrepreneurial economy" has been a reduction in the product standardisation that was the force of large firms in the middle of the 20th century. New information and communications technologies also appear to have played a role, by

reducing the transaction costs associated with managing different parts of the production process, hence reducing the importance of co-ordination by hierarchies (within vertically- and horizontally-integrated firms) as opposed to co-ordination by markets (Williamson, 1975). All this has been associated with what has been termed "flexible specialisation", *i.e.* the capacity of firms and economies to specialise, able to produce output for niche markets, at the same time as to be flexible, and adapt their output rapidly as markets change (Piore and Sabel, 1984; Hirst and Zeitlin, 1992). This does not mean that large firms have been supplanted. They too can practise flexible specialisation and may play important roles in flexibly-specialised industrial districts for example (Chiarvesio *et al.*, 2010; Sabel, 1989). Nevertheless, what has emerged is an environment in which entrepreneurship and SMEs have moved up the agenda.

A number of further associated trends have changed the way that innovation is carried out in the 21st century, with significant implications for the importance of new and small firm innovation and how it operates: the knowledge economy; open innovation; global connections; non-technological innovation; the "Silicon Valley Business Model", and social innovation and social entrepreneurship. These are discussed in turn.

The knowledge economy

One of the features of the transition from the 20th to the 21st century has been the emergence of the knowledge economy, which has significant implications for the importance of new and small firms in innovation and how they innovate. One of the reasons for its arrival has been the out-sourcing of standardised production from high- to low-labour-cost countries and hence a shift in the specialisation of advanced-economy firms towards more knowledge-based activities that are more closely tied to local knowledge resources and capabilities. However, the knowledge economy is not just an advanced world phenomenon. Emerging economies as well are engaging more with science and technology and ideas-based production as firms around the world all seek to achieve product differentiation and greater productive efficiency. In this new environment, it is the creativity and adaptability in applying knowledge provided by SMEs and entrepreneurship that have made them essential drivers of innovation, growth and employment creation.

The major feature of the knowledge economy is the increased importance of knowledge as a factor of production. As Romer (1986) points out, there is something particular about knowledge as a factor: It is non-rival, cheap to share, pervasive and generates an aggregate learning curve effect that increases the productivity of new knowledge investments. This is what is now generally seen by economists to be the major factor behind the bulk of economic growth, the growth that is not due to additions to capital and labour stocks. It is therefore critical for policy to stimulate knowledge creation and exploitation in firms.

Some of the ideas driving economic growth may be the result of scientific breakthroughs in large firms and universities, but the capacity of entrepreneurs to commercialise this type of invention through spin-off enterprises and knowledge transfers is critical. Others may be small ideas, but they still require entrepreneurs and SME workforces that are able to generate and exploit them by applying creativity and problem-solving approaches. Indeed, one of the reasons that new start-ups and small firms have become more important today is that innovation in the knowledge economy is coming from creativity and the unexpected, and this is more likely to be found in new and small operations than in the systematic research that characterises large firm R&D laboratories.

Open and distributed innovation

Innovation today involves going beyond exclusive reliance on internal ideas from within any one business for development ("closed innovation") to innovation that leverages internal *and* external sources of ideas and paths to market, *i.e.* "open innovation" (Chesbrough, 2006). This has put an end to the "knowledge monopolies" of large firm R&D laboratories and opened up innovation to new enterprises and SMEs that participate in knowledge transfer networks with universities, large firms and other players.

Not all firms and sectors are heavily involved in open innovation and some activities remain in-house, but as a general trend there is increasing collaboration among external actors in the innovation process, as demonstrated for example by growing numbers of joint patent applications (OECD, 2008). The collaborations involved range from joint ventures and joint development contracts to contract R&D, licensing and venturing, including small firms as well as large ones.

External ideas for innovation can come from many places – from collaborations with universities and other firms or business angels, from labour mobility among firms and organisations and from informal social capital contacts. A further increasingly important source is the consumer or user. Users and consumers are playing a growing role in innovation, for example in helping to test new products. New ICT in particular helps users and consumers to input into decision making about product design.

The key consequences are the increased importance of collaboration and the opening of innovation to SMEs. It implies, however, the need for better insertion of new and small firms in knowledge networks, in turn requiring both connections with other players and capabilities to exploit these connections by absorbing innovation.

Global connections

Many recent shifts in innovation processes are bound up with globalisation. Trade barriers have reduced and transport and communications have improved. Cross-national trade and investment have therefore increased, escalating competition and specialisation. This puts a premium on innovation. At the same time, innovation itself is globalising (Archibugi and Iammarino, 1997). This has important consequences for innovation in new and small firms. Above all, globalisation has increased the importance of cross-border collaboration in innovation – both in obtaining inputs for innovation (ideas, finance, skills, technologies) from abroad and in exploiting its outputs (products and services, patents, licenses, etc.) in foreign markets. It has become important for new and small firms to collaborate internationally with other SMEs, multinationals, universities and research organisations, requiring both innovation competencies and international connections. One of the ways of achieving this is through participating in globalised value chains and networks of innovation.

Non-technological innovation

One of the key messages of the OECD Innovation Strategy as a whole is that innovation is not just about science and technology. It is also about other forms of innovation. The implementation of new organisational methods in firms' business practices, workplace organisation and external relations can have substantial impacts on firms' competitiveness, productivity growth and value creation. Marketing innovations can also

make a major difference, such as changes in product design or packaging, product placement, product promotion or pricing.

Non-technological innovations involve a wider range of actors, processes and settings than technological innovation and can be very important for SMEs. For example, it may involve SMEs in tracking competitors' actions through electronic monitoring of news and information services or the introduction of total quality management techniques on the work floor. It may also be the source of rapid growth for some firms. Certainly, high-growth firms seem to be just as present in low-technology as high-technology sectors (OECD, 2010b forthcoming; Anyadike-Danes *et al.*, 2009). This does not necessarily mean that SMEs are relatively specialised in non-technological innovation compared with larger firms. Rather the evidence suggests that they tend to lag larger firms in both (see Acs and Audretsch, 1990; and Audretsch, 1995, for R&D intensities and Chapter 2 for non-technological innovation rates), although this view must remain tentative, since evidence is less reliable for non-technological innovation and data is not commonly available for non-technological innovation as a proportion of firm employment or turnover. Instead, the major conclusion to be drawn is that the drivers of SME innovation may vary between technological and non-technological innovation, but both are important, suggesting new ways to stimulate innovation. For example, for SMEs, the use of knowledge-intensive service activities offered by consultants and other firms often brings new non-technological ideas into the firm with respect to business practices, workplace organisation and marketing (OECD, 2010a, forthcoming).

Another issue is that whereas technological innovation tends to be more associated with manufacturing, non-technological innovation is equally important to services and manufacturing (European Commission, 2007). This is very significant because the services sector has seen a dramatic rise in its share of economic value added in recent years (rising for example from 55% to 70% of Japanese and from 63% to 77% of United States value added from 1975 to 2007) and now accounts for more than two-thirds of total OECD-area GDP. It has not however been given its full due of attention by policy makers until recently, perhaps because of mistaken views about its status as a "dependent" rather than a "propulsive" economic sector. The new European Union Services Directive is part of a move to redress the balance in Europe by removing legal and administrative barriers to the full tradability of services within the European Single Market. One of the keys to releasing its growth potential will be facilitating non-technological innovation as well as more technology-based product and process innovation.

NESTA (2007) examines how such innovation ("hidden innovation") occurs in so-called "low-technology sectors" such as construction, retail banking, and education. It is seen, for instance, to include the development of new drilling techniques in oil production, back-office technologies in financial services, and new, more successful programmes for the rehabilitation of criminal offenders. As a further example, non-technological innovation is very important in driving productivity improvements in tourism. What appears most important in that sector is intimate familiarity with consumer needs and preferences in particular specialised markets and speedy and imaginative responses to how these needs might be catered to. Typical tourist industry innovations include new forms of business alliance, electronic commerce and co-operative marketing and individualising mass market products by product differentiation (OECD, 2006).

Many non-technological innovations are small, "everyday" innovations. But whether they are small or more radical combinations of existing technologies, the major policy problem is that they take place "under the radar", *i.e.* are not picked up by traditional science and R&D-based innovation measures. Indeed, if SMEs were relatively specialised in this type of innovation, as appears intuitively to be the case, this might explain relatively low measured innovation rates in small versus large firms on traditional science and R&D-based indicators. Clearly this is an area where measurement needs to be improved to properly inform policy.

The "Silicon Valley Business Model"

There have been changes in the entrepreneurship environment in some very dynamic national and local innovation environments that have made it easier for new start-ups to gather the resources required to become viable businesses and grow them to scale. In the past, the large firm was in a privileged position to obtain or put up finance to develop ideas, construct plant, apply engineers and staff to the task, test and develop the product or service and find and negotiate with distributors and suppliers. In many places today, however, the new company can get to market with its idea – *quickly and at scale* – by mobilising under its own control what formerly only the big company could dispose of: capital; teams of engineers; competitive quality and cost manufacturing capabilities; logistics, product service and ancillary corporate services.

Cohen (2010) calls this the "Silicon Valley business model", for where it first developed into a significant economic force. The Silicon Valley environment has not been replicated in its intensity, but many of its important features have been taken up to a significant degree in the most innovative national and local environments of the 21st century. Venture capital firms can now provide capital quickly to the most promising ventures whether or not they are in a large firm context. Their initial contributions can release further funding downstream if important milestones are met. Venture capitalists can also, if needed, help round up teams of engineers and other key staff from other firms. Engineers and other key staff may shift as groups, responding to equity stakes which for them could result in fortune, and which on the other side dramatically lower cash costs for the start-up. There also exists an array of contract manufacturers available to new and small firms who can manufacture the product – at any volume – to the same norms as they produce for established companies. The onerous costs and huge time delays of setting up own manufacturing can thus be circumvented, while the contract manufacturers can also provide invaluable assistance on designing the product for manufacturability, durability, and so on, of the sort that only a mature producer is capable of obtaining. And packaging, shipping, product support and servicing can similarly be resolved in the market in highly entrepreneurial environments.

Whilst this favours the SME, large corporations are adapting to become important players within this type of business model rather than treating it solely as a threat. Many are involved in buying the firms with the most promising technologies and markets in their areas, hence providing an exit to the original innovators and venture capital investors. They may also be even more closely involved for example in venture investing, provision of complementary assets and technologies, and even the provision of key people, including the would-be innovating entrepreneur. In this way a more symbiotic relationship is emerging between small and large firms, significantly increasing the prospects of major innovation in small firms.

Social entrepreneurship and social innovation

So far, the discussion has been implicitly oriented around the creation of economic value added. But a further ramification of a broader notion of innovation is the need to consider its social contribution. Social entrepreneurship is defined by its paramount logic of providing entrepreneurial business solutions to *social* challenges. Social innovation shares the same logic of providing answers to *social* problems but can occur either through or independent of business ventures.

Social entrepreneurship and social innovation are of fundamental importance today because welfare states are changing. New social needs are emerging as people live longer, healthcare possibilities improve, income distributions become more unequal and growing economic development generates greater expectations for social support. But state budgets are not keeping pace with the growing needs and expectations, particularly with the consequences of the global financial and economic crisis, which has opened up a gap for the entrepreneurial supply of social goods and services.

This too can be seen as part of the above-mentioned shift from the managed to the entrepreneurial economy. The managed economy was a mass production society based on stable employment in large firms and a central role of unions and employers in regulating the economy and society in partnership with government. The social contract included regulation of labour markets and a strong welfare state. The reduced power of large firms and unions, and arguably the reduced capacity of government to raise taxes in an era of mobile capital, resulted in a pulling back of the welfare state at the same time as greater turbulence and labour market flexibility increased the strain upon it.

Social entrepreneurs and social enterprises such as non-profit organisations have stepped into this breach (OECD, 2003; Noya and Clarence, 2007). They generate new goods and services such as environmental protection and services to the individual. At the same time many address problems of unemployment and the social problems of poor neighbourhoods. This is of great relevance in the current post-crisis context in which unemployment rates are high and societies are struggling to adapt to economic change. Furthermore, whilst many of the goods and services offered through social enterprise and social innovation seek to fill gaps in purely public provision by welfare states, social entrepreneurship is also now usefully entering fields where there is some public or private sector provision, but where new forms of delivery can improve efficiency or quality.

Social entrepreneurs of course are still entrepreneurs. They share many needs and behaviours with their commercial counterparts. But there are also some differences in opportunities and constraints. Social enterprises may have greater problems accessing capital markets, for example, since they are not well understood by traditional banks. They may also need special support for human capital development, since they are often driven by people with different motivations and capacities.

Taken together, the trends outlined above – the shift from the managed to the entrepreneurial economy, the growth of the knowledge economy, open innovation, increased global connections, non-technological innovation, the Silicon Valley business model, and social innovation and entrepreneurship – represent an important change in the environment in which innovation takes place. What has emerged is an economy in which SMEs and entrepreneurship are now critical players in a broader, more distributed innovation process. The next section looks more closely at the role that SMEs and entrepreneurship now play in innovation, before we examine the implications for policy.

What is the role of SMEs and entrepreneurship in innovation?

The major function of SMEs and entrepreneurship in innovation is the introduction of advances in products, processes, organisational methods and marketing techniques into the economy. This occurs at two basic levels: making breakthrough innovations that push forward the technological frontier; and adopting incremental innovations that bring the economy closer to its technological frontier. The ideas for these innovations may be developed internally by the SME or start-up, or they may be accessed from external sources. Another function of SMEs and entrepreneurship in innovation is to provide ideas and inputs to ideas generation that are exploited by large firms, universities/research organisations and other small firms.

There are nonetheless several ways of thinking about these contributions, revealing different aspects of the innovation process. It is useful to start by considering how a number of seminal authors have seen the connection between entrepreneurship and innovation (see also Ahmad and Seymour, 2008, p. 7):

- *The entrepreneur as a disruptor*. Schumpeter (1934) saw entrepreneurs as the principal actors in innovation. It is entrepreneurs who bring about change in an economy by providing "new combinations": new or improved goods, methods of production, markets, sources of supply of inputs, organisation of an industry, or management processes within a firm. They disrupt markets, leading to long-run evolutionary growth in the economy.
- *The entrepreneur as an opportunity identifier*. Kirzner (1973, 1997) stressed the role of entrepreneurs as discoverers and early exploiters of previously-unnoticed profit opportunities. They gain temporary monopolies until the attention that they draw to the opportunity leads to competitor entry, which eliminates the profit. Innovation occurs as entrepreneurs discover new opportunities. But as opposed to Schumpeter's view of the entrepreneur as a disruptor of markets and instigator of evolutionary economic development, this is a static view: the entrepreneur facilitates matching of supply and demand and the achievement of equilibrium following shocks.
- *The entrepreneur as a risk taker*. Knight (1921) focused on a related aspect of the role of entrepreneurs in innovation. Entrepreneurs take risks by offering new solutions in the market in the face of uncertainty about whether their solutions will be profitable. Here the entrepreneur is seen as facilitating economic adjustment by predicting where new profit opportunities will open up and providing products, processes and business models to fit – at the risk of failure. The entrepreneur innovates by experimenting.
- *The entrepreneur as a resource shifter*. Drucker's (1985) interest was in how entrepreneurial managers within firms shift resources from lower to higher productivity activities. In this way, entrepreneurs endow existing resources with new wealth-creating capacity. This will clearly support productivity increases over time, although Drucker's main focus is more on firm strategy and competitiveness than aggregate economic growth.
- *The entrepreneur as a breakthrough innovator*. Like Schumpeter, Baumol (2002) adopts a dynamic framework examining the relationship between entrepreneurship, innovation and economic growth. However, unlike Schumpeter (1934), who took the entrepreneur rather than the large firm to be the central actor in innovation, Baumol considers that small and large firms both play critical and complementary roles. Start-ups and small firms are seen to generate disruptive or breakthrough innovation thanks to their lack of

ties to existing technologies. Large firms are seen to undertake more incremental innovation, based on systematic research in their existing development channels.

All of these authors identify essential roles for entrepreneurship in innovation: in both static and dynamic frameworks; with the entrepreneur as either the sole or principal source of innovation, or simply one source among others. Clearly, there is a range of roles – combining in new ways, discovering opportunities, taking risks, shifting resources and creating breakthrough innovations – and these roles moreover are not mutually exclusive. Rather, it is better to think of them as different aspects of a multi-faceted process, with a number of implications for policy support.

But in which settings is entrepreneurship to be found? There are many competing views and some degree of confusion in this area. To provide clarity, the OECD offers a definition with the three following components (Ahmad and Hoffman, 2008)[3]:

- *Entrepreneurs* are those persons (business owners) who seek to generate value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.
- *Entrepreneurial activity* is the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.
- *Entrepreneurship* is the phenomenon associated with entrepreneurial activity.

The definition of entrepreneurship is therefore not synonymous with either SMEs or business start-up, but reflects instead the human action behind innovation. Entrepreneurial activity may occur in start-up enterprises, SMEs, large firms or public sector organisations. What is important is that people are enterprising in the creation of value through innovation.

Our emphasis in this book is on two parts of the spectrum, namely the new start-up venture (which is generally but not always of small size) and the small and medium-sized enterprise. Our focus in both cases is on entrepreneurship and innovation – *i.e.* the generation of value from the identification and exploitation of new products, processes and markets. We are not then concerned with new firm and SME operation and management per se, but with innovation-oriented entrepreneurship within new firms and SMEs. It is this innovation-oriented activity that promotes economic growth and solves social problems.

In order to understand more fully how start-up enterprises and SMEs contribute to innovation and identify the public policy implications, it is useful to consider the following (overlapping) aspects of the modern innovation process in more detail: creative destruction; knowledge spillovers and entrepreneurship; large and small firm roles in breakthrough and incremental innovation; distributed and open innovation; and the Science-Technology-Innovation (STI) and Doing-Using-Interacting (DUI) modes of innovation. These are addressed in turn below.

Creative destruction

Venture creation and SME growth renew economies by forcing the contraction, exit or upgrading of incumbent competitors. It is this process that Schumpeter (1934) called "creative destruction". It is creative in the sense that new and growing firms carry innovation with them. New firms that succeed in sustainably entering the market and

SMEs that grow clearly have some productivity advantage that enables them to compete (either from greater productive efficiency or from the greater value of output for given inputs that results from product differentiation). As they enter and grow they displace less productive firms, thus increasing the average productivity of the economy and driving economic growth. There is also an indirect impact, since the mere competitive threat of new and small firms, or contestability of their markets, may force incumbents to upgrade. Empirical evidence across 24 countries confirms the relationship between productivity growth and "enterprise churning" (measured for example by net entry: entry minus exits) (Bartelsman *et al.*, 2009).

The creative destruction process is particularly important in recession and recovery, and is therefore of great interest today. Now the concern is not just about productivity but is also about employment. As unemployment rates rise, it is critical that new firms are able to enter and grow so that recent job destruction is balanced by job creation in the short to medium term. At the same time productivity may be enhanced as new firms bring better products and services and better technologies into the economy.

Knowledge spillovers

New venture creation and knowledge exchanges between knowledge-generating organisations and SMEs also enable the commercialisation of knowledge that would otherwise remain un-commercialised in large corporations, universities and research organisations. This type of knowledge spillover process is at the heart of the logic of endogenous growth theory, the lens through which many economists understand economic growth. Investments in new knowledge are seen to spill over in part to other agents, increasing their returns to innovation and driving further investment and growth. Knowledge built up in universities, large firms and research organisations does not spill over automatically, however. It may remain unexploited.

The new start-up enterprise is one of the significant players in commercialising knowledge. This largely occurs as individuals leave universities, research organisations and large corporations to start enterprises based on knowledge they developed there in the form of "spin-off" companies, but also as external entrepreneurs commercialise ideas from these sources. Both public policy makers and firms and research organisations themselves have become increasingly interested to support such commercialisation, seeing spin-offs as one of the key ways to exploit untapped knowledge, alongside the more traditional patent and licensing routes and the publishing and teaching activities of universities. In the USA, for example, the Bayh-Dole Act of 1980 increased incentives to universities to invest in the commercial exploitation of their knowledge by giving them control of the intellectual property arising from the federal government funded research they undertake. In Canada, the University of British Columbia has a venture fund, the University of Guelph has raised money for commercialisation by listing its intellectual property portfolio on the stock market, and a range of "entrepreneurship boot camps", mentoring programmes, entrepreneurship resource centres and entrepreneurship courses for researchers have been introduced (McNaughton, 2008).

It should nonetheless be recognised that spin-off numbers are not high and represent only a small proportion of new enterprise starts. Callan (2001) reports that academic spin-offs accounted for no more than 2% of new firm creation across eight OECD countries, and that even in the United States, which seems to have one of the highest rates of university spin-offs, only two spin-offs were created per research institution per year. Neither are university spin-

offs high-growth firms on average, while they also tend to grow slowly (Lindholm-Dahlstrand, 2008). Moreover, a small proportion of institutions are responsible for a large proportion of spin-offs. While forefront research establishments like Oxford University in the UK, the University of Wisconsin, Madison, in the USA, and the University of Waterloo in Canada are key drivers of entrepreneurship in their areas through spin-offs (84 spin-offs in Madison; 64 spin-offs and 50 "founder affiliates" in Oxfordshire; 106 spin-offs in Waterloo) (Potter and Miranda, 2009), the contribution of other types of institutions tends to be more in upgrading existing local firms and effecting local technology transfers (Malecki, 2008). On the other hand, whilst spin-offs represent only a small proposition of all new starts, they nonetheless represent a higher proportion of new technology based start-ups. Almost half of all new technology based firms in Sweden are corporate spin-offs and an additional one-sixth are spin-offs from universities. They also appear to be increasing in frequency over time and tend to be more innovative than other new technology-based firms (Lindholm-Dahlstrand, 2008).

Considering entrepreneurship as all venture start-ups, Audretsch *et al.* (2006) and Acs *et al.* (2004, 2005, 2009) suggest that commercialisation of knowledge by new start-ups explains part of the link between entrepreneurship and economic growth through their role in promoting knowledge spillovers. The relationship may involve not just the role of new start-ups in exploiting knowledge themselves but also the role of new enterprises and SMEs as participants in knowledge exchange networks within innovation systems, stimulating knowledge transfers from universities and other sources to a broader group of firms. There is cross-country empirical evidence from 20 OECD countries of a link, with entrepreneurship acting to convert knowledge into growth by exploiting spillover originating in a country's R&D stock (Acs *et al.*, 2004).

Breakthrough and incremental innovation

There is lively debate over the relative roles and importance of SMEs and large firms in innovation. It does not appear to be the case that small firms generally are responsible for proportionately more innovation, even after allowing for their size, *i.e.* comparing innovation rates per employee not per firm (Audretsch, 1995). On the other hand, there is a strong suggestion that SMEs are particularly associated with bringing forward so-called breakthrough innovations.

Baumol (2002) has been the main promoter of the idea that new start-ups and SMEs play a different role to large firms in innovation. He introduces a dual characterisation of innovation: breakthrough and incremental. Breakthrough innovations are discontinuous, representing revolutions in technologies and markets (*e.g.* the assembly line, the integrated circuit, the personal computer). Incremental innovations are the opposite: small improvements on existing products and processes. While there are relatively few breakthrough innovations, their individual impacts are very large. On the other hand, while the impact of each individual incremental innovation is small, they represent a significant step forward in aggregate.

Baumol's argument is that the majority of breakthrough innovations in recent decades have come from new or small firms, while large firms have concentrated on incremental innovations. He further argues that this pattern is to be expected considering that new firms and SMEs often work outside of dominant paradigms, without strong ties to existing products and technologies, while large firms are constrained by the need to incrementally improve their existing products and processes, even though they spend proportionately more on R&D.

There is certainly evidence that small firms and new ventures are active in breakthrough innovation in sectors such as biotechnology and information and communication technologies. Baumol himself provides a convincing account of the small-firm origins of many breakthrough innovations. The empirical evidence is not entirely clear-cut, however. The association between small size and breakthrough innovation does not hold in all sectors. In pharmaceuticals, for example, large firms have dominated the breakthroughs. Furthermore, some empirical work casts doubt on a general characterisation of small firms as breakthrough innovators and large firms as incremental innovators (Chandy and Tellis, 2000).

It nonetheless appears fair to argue that there are differences in the specialisations of new and small firms and large firms with regard to breakthrough and incremental innovations, even if they are not entirely distinct. But both types of innovation are of importance in the new and small firm sector, requiring differentiated support. Moreover, the attention to contrasting small and large firms in this way should not be allowed to obscure another key point, namely that the interactions between them are critical. New and small firms may develop a high proportion of breakthrough innovations, but large firms often acquire and imitate them, securing their mass exploitation. Indeed, large firms often deliberately use SMEs as laboratories, acquiring and integrating the technologies that interest them the most. One of the mechanisms is spin-in, *i.e.* the acquisition by large firms of new technologies or ways to access markets through the purchase of SMEs or their intellectual assets.

Interactive learning

One of the major developments in innovation in recent years is the increasing importance of networks. By tapping into distributed knowledge networks and open innovation methods, firms are using a wider variety of knowledge inputs from a wider range of sources. This is interactive learning.

SMEs and start-ups are important participants in interactive learning networks – both exploiting knowledge developed elsewhere and contributing to knowledge development. Their role is documented by a substantial literature on SMEs and inter-firm and university-industry linkages (*e.g.* Branscomb *et al.*, 1999; Etzkowitz and Leydesdorff, 2000; Freel, 2003; Mansfield, 1995; Potter, 2008; Potter and Miranda, 2009; Shane, 2004). The links may be both formal, *i.e.* underpinned by deliberate market transactions and contracts, and informal, *i.e.* driven by social capital networks or networks stemming from location in clusters.

It is particularly important for new and small firms that they draw on networks because this helps them to compensate for their relatively limited internal resources in areas such as technology, financing and skills as compared with large firms. It is reflected in evidence indicating better innovation and growth performance in SMEs with external innovation linkages compared to those without (Powell and Grodal, 2005; Stuart, 2000; Baum, Calabrese and Silverman, 2000; Davenport, 2005; OECD 2010b, forthcoming).

There are some important potential barriers to the efficient operation of innovation networks, however. One way of assessing them is through the national, local and sectoral innovation system concept (Chaminade and Edquist, 2006). This framework examines the interactions among sets of organisations including firms, universities, venture capitalists and public agencies mediated by institutions that set the rules of the game, such as intellectual property regulations and rules and norms influencing the relations between universities and firms. Within any innovation system, a close articulation is needed

between what is known as the knowledge exploration subsystem, in which universities and research organisations are the central players, and the knowledge exploitation subsystem, in which new and small firms are key players along with larger firms. These two subsystems must fit together well for successful innovation to take place. This requires appropriate knowledge-generation assets, good connections among actors, and significant capabilities of the players involved to disseminate and absorb knowledge (Asheim and Gertler, 2005). Such knowledge transfer relationships tend to be particularly strong in local industry clusters (Potter and Miranda, 2009).

The use of the innovation systems approach permits the identification of a range of potential policy problems or system failures affecting interactive learning (Potter, 2005). For example, they may include lack of infrastructure for knowledge generation and transfer (*e.g.* universities and science parks); lack of adaptability of firms, individuals, institutions and policies to change (*e.g.* to move into new technologies and markets or include new players); lack of capabilities in firms to absorb external knowledge (*e.g.* workforce skills for identifying and collaborating with partners and using external information about promising markets and technologies); and lack of complementarity between the knowledge exploration and exploitation sub-systems (*e.g.* lack of fit between university research and teaching specialisms and the specialisms of firms).

Modes of innovation

A key distinction needs to be made between the role of SMEs and entrepreneurship in the Science, Technology and Innovation (STI) mode of innovation and the Doing, Using and Interaction (DUI) mode (Jensen *et al.*, 2007). The STI mode is based on the production and use of R&D and codified scientific technical knowledge in breakthrough innovations. It is essentially a "science-push" approach in which R&D in universities and large firms is critical and exploitation through knowledge-based spin-offs and high-technology collaborations between firms and universities and research institutes has an important role to play. The result is innovation that in principle could be applied in other firms and contexts and protected through intellectual property rights such as patents and licenses. The DUI mode, on the other hand, is a user-driven approach that relies on experienced-based know-how and informal processes of adaptive learning. Learning by doing, using and interacting occurs on the job as employees face ongoing changes that confront them with new problems and can be fostered by organisational practices within the firm, such as project teams, problem-solving groups, and job and task rotation, and by closer interaction with users of products and services outside the organisation. The result is innovation with localised usability in addressing problems faced by the firm. The "ordinary" SME has a more important role in this mode, making incremental innovations that upgrade traditional sectors (Asheim, 2009).

While the two modes of innovation are not mutually exclusive and both firms and economies combine them to varying degrees, the distinction serves to highlight the need for a holistic innovation approach that recognises the importance of both kinds of processes and differences in the types of barriers that affect SMEs and start-ups under each. Whereas typical problems for STI-based innovation are under-investment in scientific research, lack of connections between science and industry and poor access to finance for knowledge-based start-ups, the major barrier to incremental innovation in ordinary SMEs is lack of knowledge networks and human capital to absorb knowledge.

Policy implications

As is clear from the above discussion, SMEs and entrepreneurship are fundamental to the modern innovation process. Yet their place is not fully established in today's innovation policies. This state of affairs arises as a consequence of the shift from the managed to the entrepreneurial economy and the lag involved in adapting policies to the new needs. As Thurik pertinently points out (2009, p. 227), "using the wrong lens leads to the wrong policy choice". Whereas the managed economy implied an innovation policy that could be focused on encouraging basic research in universities and R&D spending in large firms, innovation policy in the entrepreneurial economy must expand to include new types of actions for entrepreneurship and SMEs. This book seeks to correct the policy lens.

The root of the predicament is that while government policy agendas around the world have a strong focus on promoting innovation, this is still too often understood as being about investment in science and R&D policies, leaving aside the crucial issues of diffusion and exploitation of research and excluding large parts of the non-technology economy. It is typified by the European Union Barcelona Summit headline goal of achieving an increase in the proportion of European GDP invested in research and development from 1.9% in 2002 to 3.0% in 2010. The problem is not so much that the target is not being achieved, but more that it is wrongly placed. The emphasis is on R&D inputs to the innovation process whereas it is the exploitation of R&D and non-R&D-based types of innovation that will make the difference to growth and welfare (particularly when global knowledge flows make it possible to capture research results paid for in other countries). New firms and SMEs have a major role to play in the latter – through both breakthrough and incremental innovations – although they also face problems and barriers to meeting their potential.

Government policy, then, has not yet adjusted to the new reality. Large-scale research subsidies to national champions, other large firms and basic-research silos in national universities and research organisations are not the most effective way to generate innovation in an environment where knowledge flows globally, where collaborations, networks and absorption capabilities are required and where innovation can emerge from unexpected as much as from predicted research channels. Policy is slowly reacting against the one-sided focus on R&D. To be successful it will need to meet a number of challenges:

- *Entrepreneurship cultures*. With entrepreneurship at a premium, it is important for policy to engender conducive cultures and attitudes where possible. For example, education systems, the media and business support organisations can help foster entrepreneurial motivations (Potter *et al.*, forthcoming, 2010).
- *SME and entrepreneurship framework conditions*. There should not be unnecessary obstacles to SMEs and entrepreneurship in the institutions of the economy such as taxation, social security, bankruptcy legislation, competition policy, product market regulation, labour market regulation, finance markets and intellectual property protection. OECD research shows for example how unbalanced taxes on company profits and losses and high average tax rates on SMEs relative to large firms can diminish SME and entrepreneurship activity (OECD, 2009).
- *Firm dynamics*. Since the entry and growth of SMEs drives productivity improvements by replacing less productive contracting and exiting firms, policy should promote entry and exit and competition in the market. Furthermore, the process of creative destruction is most pronounced in periods of economic crisis and recovery, as the global economy is

experiencing today. As the incumbent firm stock is contracted, room is created for innovative firms to enter and grow when demand picks back up. It is critically important that incumbents are not over protected at such a time, since this would block the potential for new business models and technologies to emerge in the new and small firm sector. This illustrates a timely opportunity for well-designed policies to achieve two objectives at the same time: the creation of jobs in SMEs in response to an aggregate demand stimulus or targeted employment and investment subsidies and the improvement of productivity by helping new and small firms to carry innovations into the economy.

- *Access to finance*. Research clearly identifies a finance gap in many locations for new and small firms involved in the early stages of innovation, especially in the market for high-risk capital. This represents a potentially serious barrier to innovation. Policy responses such as grants, loans, loan guarantees, mezzanine finance, seed capital, venture capital, business angel finance and investor readiness programmes need to be explored (OECD, 2006b, 2007).
- *High-employment-growth firms*. One of the contributions of new firms and SMEs to the economy is breakthrough innovation. It involves a small minority of firms that are highly innovative, often exploiting new science developed in universities and research laboratories. They make up an important component of the high-employment-growth firm sector. Facilitation and support for breakthrough innovation in this group may promote both innovation and jobs, including facilitation of both spin-offs and spin-ins (OECD, 2002, 2010b forthcoming).
- *Innovation in the bulk of SMEs*. Baumol may have seen large firms as the archetypal incremental innovators, but it seems clear that the concept of incremental innovation does not apply exclusively to large firms but must also characterise a large proportion of the SME population. Moreover, innovation is not just about technology but is about non-technological innovation as well. This implies that policy should recognise the latent potential of the bulk of SMEs, which could contribute more to the economy if they begin to innovate incrementally and strengthen their non-technological innovation. They require a different type of innovation support to high-growth-potential enterprises, focused more on increasing their capacity to *absorb* knowledge from outside the firm. It suggests the need for DUI-mode policy support focused on a wider set of institutions affecting learning and innovation, to accompany more traditional STI support. Embedding SMEs in knowledge exchange networks and increasing workforce skills to draw in and exploit innovations from elsewhere is a key policy priority in the DUI mode.
- *Knowledge transfer*. One of the key drivers of SME innovation and innovative entrepreneurship is knowledge exchange between and among explorers and exploiters, particularly for the exploitation of new, science-based knowledge. This implies the need for strong policy attention to knowledge transfers and overcoming networking problems in innovation systems. Examples of relevant policy approaches include creation of science parks and business incubators, encouraging mobility of staff between universities and industry, and facilitating knowledge exploitation through licenses, patents and university and corporate spin-offs, and shared foresight and strategy development activities (OECD, 2004; OECD, 2009; OECD, 2008).
- *Workforce skills in SMEs*. The typical SME needs to upgrade its skills to participate in DUI innovation and hence make incremental improvements in its products, processes,

organisational methods and marketing approaches. This may be achieved through better access to formal training, but also through informal methods such as the creation of problem-solving work teams and engagement with external knowledge intensive service activity providers such as consultants (OECD, 2010a, forthcoming).

- *Entrepreneurship skills*. Another often overlooked factor affecting the propensity for successful business start-up is the degree to which motivated people possess adequate entrepreneurship skills. This includes small business management skills (such as business planning and accounting), strategic skills (such as decision-making and opportunity recognition), and entrepreneurial traits (such as leadership and creativity). It implies the need for a change in curriculums, pedagogies, structures and strategies in education and training systems to better import these skills (Potter, 2008).
- *Social entrepreneurship and social innovation*. Entrepreneurship is not only about profit-making. Social entrepreneurship and social innovation are important features of a broader vision of innovation and are expanding at a rapid pace. Institutional arrangements, however, are often not well adapted to the needs and modus operandi of these organisations and approaches. National legal, financial and fiscal frameworks for social enterprises therefore need to be reviewed and adjusted and accompanied by capacity building, skills development and network creation for social entrepreneurs.

This is not a comprehensive account of all areas of policy intervention for SMEs, entrepreneurship and innovation, but rather a form of "priority list" for policy in adapting to new forms of innovation.

Plan of the book

This book examines the importance of new and small firm innovation in the 21st century and the major features of how this innovation occurs. It calls for governments to introduce an *innovation strategy for SMEs and entrepreneurship*, recognising both the potential of SMEs and entrepreneurship in innovation and the barriers that policy needs to overcome (see Annex A).

The next chapters will examine the major issues in more detail. Evidence is presented on what can be measured in this new area. Three themes are then explored, which are of major importance but merit more attention than traditionally received: inserting SMEs in knowledge flows; improving the skills of new start-up entrepreneurs and SME workforces; and facilitating social entrepreneurship and social innovation.

Chapter 2 provides data on SME innovation performance and constraints across 40 economies and examines the major and new policies that have been introduced. Among the issues identified, it underlines the relevance of three major policy areas highlighted in this introduction, namely access to finance and access to skills as barriers to SME innovation and the relevance of support for knowledge exchange.

Chapter 3 examines the latter issue in detail, namely how new firms and SMEs are embedded in local, national and international knowledge flows and the barriers that still exist. It shows that new and small firms do not innovate alone but in interaction with suppliers, competitors, customers, research organisations and others. It also shows that the quality of local environments for knowledge generation and transfer counts and that they are particularly favourable in innovation clusters. Policy can reinforce this. But it is also important to connect local innovation clusters to global knowledge pipelines, for

example through embedding of foreign direct investment, attraction of highly-skilled labour from overseas and building cross-national SME alliances.

Chapter 4 examines the skills issue. It shows that while entrepreneurship skills are needed to start successful firms, they are not well understood or supported. They may be imparted through school education, universities and vocational training colleges. Training in SMEs is also very dependent on relationships with the public sector because while large firms have in-house training mechanisms SMEs generally do not. Thus while SME skills may be imparted by in-house training and other skills-upgrading activities, small enterprises tend to do less than large firms and there is a particular SME skills gap among older and routine workers. These problems need to be addressed.

Finally, Chapter 5 examines social innovation and social entrepreneurship. While there is a growing interest in the area, it is still not yet well understood. Social innovation involves conceptual, process or product change, organisational change, changes in financing etc., focused on improving the welfare of individuals and communities through employment, consumption or participation. The social entrepreneur is an agent of social innovation but not the only one. The chapter provides better definitions and clarity, and gives some telling examples of social entrepreneurship and social innovation that offer inspiration for wider adoption. It also highlights improvements needed in surrounding institutions to facilitate the further growth of a sector that is fundamental to addressing the social challenges of today.

Notes

1. "High-growth enterprises", as measured by employment, are enterprises with average annualised growth in employees greater than 20% a year over a three year period and with ten or more employees at the beginning of the observation period. "Gazelles", as measured by employment, are enterprises which have been employers for a period of up to five years, with average annualised growth in employees greater than 20% a year over a three-year period and with ten or more employees at the beginning of the period.
2. See also NESTA (2009).
3. The OECD/Eurostat Entrepreneurship Indicator Programme is developing internationally-comparable indicators of entrepreneurship based on this definition.

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