

# Introduction

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This work is motivated by the increasing importance of science and technology (S&T) based entrepreneurship as a strategy where regions and nations that acquire better understanding in how to build this capacity will have an enduring advantage in technological innovations, economic growth and ultimately quality of life. A worldwide rise in interest has been shown by political leadership to address the building of S&T based knowledge regions to enhance national economic competitiveness, particularly outside the USA. In recent decades, the regional roots of this high value adding entrepreneurial development strategy were emphasized by the Silicon Valley phenomenon, which has been envied around the world, with efforts to replicate the model in different entrepreneurially conscious regions of the world, with varying degree of success. While the role of innovative S&T based startups, which laid the foundation of new industries that create wealth, can be traced to such successful regions, the race for developing appropriate policy and program mechanisms to help create and grow the enabling regions continues to be elusive for policy makers seeking relevance for their planned interventions.

At the conceptual level a body of knowledge has emerged in the area of national and regional innovation systems (Lundvall, 1992; Nelson, 1993; Cooke et al., 2004), with continued efforts to understand the roles of various economic actors in linking science, technology and innovation in a geographic space (Leydesdorff and Etzkowitz, 1998; Audretsch and Lehmann, 2005; Aghion et al., 2009). However, some scholars (Plosila, 2004; Wessner, 2007; Sternberg, 2009) have identified limitations of the extant literature in understanding these processes, including: (a) the innovation systems concept does not fully cover the evolving nature of dynamic relationships among various actors in the system; (b) policy linkages with the grassroots-level institutional mechanisms along with the programmatic activities intended to address market and/or innovation system failures are not fully explored in the STI (science, technology and innovation) linking literature; and obviously (c) there is an ongoing need

to incorporate lessons gained from experiential efforts in developed as well as the catch-up and emerging economy nations.

This study was undertaken to address these knowledge gaps and better understand policies that lead towards historic evolution and/or planned development of various regional and national systems focused on science and technology oriented entrepreneurial support policies. The book presents a global review of public policy programs employed to support S&T based entrepreneurial economic development in several developed and emerging economy nations from around the world.

The aim is to present examples of varying policies and programs directed towards S&T based entrepreneurial development through national and regional case studies of developed and emerging economy nations with a history of involvement in such efforts. For this purpose, we present cases from 19<sup>1</sup> of the 25 Global Entrepreneurship Monitor member nations representing countries of North America, Europe, Asia, Latin America, Africa and Australia. Thirty-five highly respected scholars and practitioners in the field accepted the invitation to write, and their peer-reviewed chapters are included in this volume. A detailed review of the backgrounds, historic evolutions and contexts of the case studies provides insight into the design and functioning of these modern knowledge regions. Special focus is given to the policies and practices employed to address market and/or system failures by enabling the diffusion of S&T research results through formal enterprise development and commercialization mechanisms such as umbrella organizations, technology and innovation centers, science parks and technology business incubators, among other interventions.

## THE CONTRIBUTIONS

A total of 19 national chapters are organized into three parts. Part I includes chapters on eight industrialized nations with significant populations. They are: the USA (307 million) and Japan (128 million), followed by Germany, the UK, France, Italy, South Korea and Spain (with populations of 81 million down to 46 million).<sup>2</sup> These industrialized countries (including the newly industrialized nation of South Korea) have large pools of developed manpower, higher incomes, developed basic infrastructure and large national markets, which provide them with enabling environments to establish S&T oriented entrepreneurial regions. Table I.1 shows that, due to these strengths, this group of nations has achieved higher standards in knowledge economy indices measured by the provision of appropriate incentives, innovation activity, educational attainment and ICT infrastructure.



Part II consists of chapters concerned with six industrialized nations having smaller populations, Sweden, Singapore and Israel, with only 9, 5 and 7 million respectively, and the Netherlands, Australia and Taiwan, with from 17 to 23 million people. These industrialized nations (including the newly industrialized countries of Singapore, Taiwan and Israel) maintain somewhat similar high levels of knowledge economy characteristics (as in Part I). However, their smaller population size provides them with limited local market potential and hence they generally place more emphasis on the internationalization of their economies.

Part III features chapters from five emerging developing nations with large to very large populations, China and India having over one billion and Brazil, Pakistan and South Africa between 50 to 190 million. In these countries, generally there are pockets of developed manpower with lower yet increasing incomes and large untapped national markets. Their knowledge economy indices are obviously lower than the other two categories, as the pillars of knowledge economy are still weaker and developing (Table I.1).

It is obvious that each of the nations within the three parts has its own unique history and socioeconomic context impacting the S&T based entrepreneurial development efforts, which are summarized below.

### **Part I: Large Developed Countries**

Chapter 1 provides a chronological review of the post World War II history of the US S&T and innovation policy and related entrepreneurial development programs in various states. The chapter reveals that these efforts were primarily driven by the changing national and state/regional needs to sustain global competitiveness. With better understanding of technological innovation as a non-linear process, and with efforts to address perceived market failures, starting in the 1980s newer patterns of collaboration and networking were supported by establishing intermediary umbrella organizations, university–industry linkages, and industry consortia with public–private partnerships. These novel efforts undertaken by the states were supplemented with federal programs (such as SBIR, ATP, TIP, MEP, STEM – see end of book for list of abbreviations), supported by numerous legislative initiatives. Today, most of the states continue to broaden their regional economic development role in addressing technology, talent, capital and entrepreneurial infrastructure issues that are likely to expand in the 2010s and beyond.

Chapter 2 describes Japan's new S&T based entrepreneurial development policy with a model cluster program. The author points out that to cope with the global competitiveness pressures, starting in the mid-1990s,

Japan's economic and industrial policies have shifted toward new business and industry creation. The nation's science, technology and innovation policies in particular have drastically shifted toward regions with emphasis on the utilization of scientific knowledge of universities and research institutions to create and grow S&T based innovative firms. The so called 'cluster policy' forms a core part of this new direction of regional policies in Japan. The unique aspect of the present Japanese cluster development program is demonstrated by the model TAMA (Technology Advanced Metropolitan Area) project being developed in the outskirts of Tokyo. The business clustering approach followed at TAMA is different from the traditional approach (where geographical concentration of a particular industry firms is promoted) in that in this case technology networks in the region promote firms across a variety of industries and support technological innovations of all types – create and grow firms, develop new products and so on.

Chapter 3 describes similar concerns about the UK's loss of competitiveness, which led to efforts in stimulating technical innovation through S&T driven entrepreneurship. The author uses a system failure approach to explore four areas of emphasis in the UK policy framework: innovation and knowledge economy, commercialization of the science base, skills development, regions and S&T based firm clusters. The chapter identifies the lack of entrepreneurial skills at various levels and the need for better policy coordination to attain greater coherence within the regionalized system as the most crucial areas of attention. Consequently, new and improved organizational mechanisms were introduced, and existing government departments were reorganized: the Technology Strategy Board (TSB), an executive non-departmental public body sponsored by the Department for Business, Innovation and Skills (BIS) and other government departments with devolved administrations. The regional development agencies (RDAs) and research councils have been given key roles in providing better coordination of research, innovation and enterprise development.

Chapter 4 provides an overview of the German national innovation system (NIS) and its evolution after World War II and demonstrates that the approach of German governments to S&T based entrepreneurship has changed significantly within this timeframe towards an emphasis on partnerships and diffusion of R&D results. The chapter presents three examples of studies of German policy programs – the BioRegio Contest, the InnoRegio initiative and the EXIST (Existenzgründungen aus der Wissenschaft) program – and illustrates their goals, implementation and achievements. It draws lessons and elaborates future perspectives of the German innovation and entrepreneurship system.

In Chapter 5, the authors assert that France's STI system has traditionally been supervised by the national government, which manages major research institutions and initiates large-scale technological projects. Notwithstanding the long-term tradition of state interventionism and centralized control in such policy matters, called Colbertism (Colbert was General Controller of Finances under King Louis XIV, 1643–1715), more recently (starting in the 1980s) this approach has been increasingly challenged. As a result, the national government now struggles to foster innovation processes that are embedded in local territories. Calling this emerging centralized coordination of decentralized activities 'neo-Colbertism', the authors point out that in this new context, where proximity is key to fostering innovation through new venture creation, regions have been playing a prominent role in the organization of public policy action. Therefore research and innovation based global competitive realities are steering France towards a regionalized neo-Colbertist approach. The authors discuss a number of new regional policy and program initiatives including the public technology incubators program and the 1999 law on innovation and research.

Chapter 6 points out that despite Italy's endemic structural problems such as low investment in R&D, specialization of firms in traditional sectors, prevalence of SMEs (small and medium-sized enterprises) and strict regulations stifling change, innovation and knowledge transfer to entrepreneurial firms are increasingly becoming a priority in the nation, both for public policy makers and for private firms. Positive signals include recent efforts towards improving the transfer of technological innovations into the marketplace by building entrepreneurial mechanisms, such as the creation of scientific and technological parks, and the promotion of technological districts. The development of 25 technology districts including Torino, Lambardi, Etna Valley programs and other skill development and venture capital initiatives are discussed. The authors identify numerous gaps that remain in policy coordination and evaluation, and emphasize the development of new mechanisms and refinements in existing programs aimed at facilitating technology transfer, linkages to public and private funding and access to markets for new firms and SMEs.

Chapter 7 explains that since the middle of the 1980s Spanish regional governments have started to develop significant innovation and entrepreneurship policies. A visible support for the creation of technology based companies began at the beginning of this century, stemming from initiatives in response to spin-off companies emerging from some universities and support programs from regional governments. The launch of the national NEOTEC program and the gradual inclusion of support to technology based companies in the different national and regional R&D

and innovation plans provide evidence of a major development in this respect. The case of the region of Catalonia is presented to illustrate the characteristics of the role played by regional governments and universities in supporting S&T based entrepreneurial development and the degree of interaction between the national and regional innovation systems.

Chapter 8 examines the four key South Korean regional innovation and entrepreneurship policies enacted in the aftermath of the strong growth experienced during the last quarter of the twentieth century. This new policy direction followed the Asian crisis of the late 1990s and envisioned a decentralized national development scenario for the nation through a series of policy initiatives. The first of these was the establishment of a framework for regional innovation system (RIS) by the introduction of regional innovation councils, which coordinate regional innovation strategies and related networks. The second policy is the NURI (New University for Regional Innovation) project, which was planned to strengthen the innovation capacity of the provincial universities by enhancing networking among industry–university–research institutions with the collaboration of local governments, industrial firms, research institutions and NGOs. The third policy was the promotion of S&T in the non-capital regions of the nation by increasing their R&D investments and enhancing the competitiveness of regional strategic industries. The fourth policy was the strengthening of regional networks of industry–university–research institutions by supporting a core set of research universities and strengthening industry–university networks of technology transfer through the ConnectKorea (CK) program. These policies appear to have significantly contributed to addressing the problems of technology bottlenecks often experienced in industrial practice and helped to revitalize R&D activities in the non-capital regions. There remains, however, the need to further these efforts in the regional innovation and entrepreneurship policy agenda, including: attracting talent to the non-capital regions; embedding a regional innovation atmosphere in real industrial practice; and finally, establishing appropriate governance systems required to coordinate the diverse innovation programs including the S&T based firm cluster development and related cooperative networking practices.

A comparative review of the Part I chapters shows an emerging history and considerable level of policy and programmatic activity in the large developed nations. In all of these cases any renewed policy efforts were primarily triggered by national concerns of attaining and/or sustaining global competitive advantage through S&T based high value added innovation and entrepreneurial activity. In the post 1980s scenario most of the efforts have been directed towards more decentralized and grassroots-level S&T research results transfer and diffusion programs. Another common

element is the type of organizational mechanisms developed to address the perceived market or system failures, which predominantly included umbrella organizations, S&T parks, incubators and firm clusters. The efforts to improve talent, technology, capital and entrepreneurial infrastructure issues clearly play a dominant role in the development of policies and their implementation programs.

## **Part II: Smaller Developed Countries**

Chapter 9 offers a broad overview of the development of the Swedish innovation system that served Sweden as an industrially advanced country for more than 100 years. The thesis proposed is that the historic emergence of the Swedish innovation infrastructure and related policy development can largely be attributed to '*la longue durée*' approach where innovative technology procurement made possible by 'development pairs' was the principal regime underpinning growth. However, the more recent search for a policy suited for an innovation based knowledge driven economy has led to radical change of the prevalent model during the last couple of decades. The chapter details 'stylizing' of the 1980s and 1990s popular technology agendas in the Swedish context, describing activities of the umbrella technology development agency VINNOVA and related national programs created to support S&T oriented technology commercialization through entrepreneurial activity.

Chapter 10 states that for some years now the Dutch government has pursued the strategy of making the Netherlands one of the five leading knowledge economies of the world. For that purpose new policies and institutions were established to increase the overall number of fast-growing businesses and encourage universities, public research institutions and larger companies to adopt a more proactive approach in commercializing science and promoting society-wide innovation. To streamline and upgrade the national economy, a generic policy package was initiated by targeting the entrepreneurial community by initiatives to alleviate impediments to startup firms, growth-oriented enterprises and early internationalizing ventures. In addition, a program policy package was launched especially geared towards firms operating in promising S&T based industries allowing for more investments in their educational, research and training needs. Public institutions, like universities, leading technology institutes and applied research organizations, were encouraged to collaborate in public-private R&D partnerships and actively pursue commercialization efforts. To realize all these objectives, in 2003–04 a new umbrella institution, the Innovation Platform, was created in which all the key stakeholders in the areas of science, technology and society are represented.

Chapter 11 reviews recent Australian industrial history and the role of technological innovation, in which estimates were made of the prevalence of S&T based new entrepreneurial ventures. The data suggest that there are about 400 university spin-offs, mainly software companies as part of the government incubator program, very few of which are located outside the main state capital cities. Government programs are generally seen to provide effective financial and other support to S&T based entrepreneurial ventures in their later development stages involving market entry and achieving market share, but there is a shortage of the smaller amounts of money needed at the earlier pre-seed stage involving opportunity identification and evaluation. At the same time pre-seed fund managers are having difficulties in the speedy deployment of their funds due to a shortage of investible opportunities and some lack of flexibility in university attitudes to progressive funding arrangements with milestones. Australia has both a shortage of experienced startup company managers and serial business angels. The authors point out that in spite of the enhanced national commitment to innovation and entrepreneurship in recent times, so far these investments have not yet paid off in terms of establishing Australia as a first-tier innovator nation with significant S&T based entrepreneurial activity. Therefore, over the past quarter century, both public policy and private sector initiatives have moved Australia from a classical imitator to a second-tier innovator economy.

Chapter 12 states that since its political independence in 1965, Singapore has achieved significant economic growth through an evolving national system of innovation and continuous restructuring of public S&T policy to respond to changing national needs. In the first decade following independence, growth was largely propelled through labor-intensive industries, with foreign multinationals leading the success of Singapore's technological manufacturing sector. This manufacturing expansion phase was then succeeded by a period characterized by the influx of multinational corporations (MNCs) to enhance Singapore's export capabilities and productive capacity. Industrial policies were aimed at attracting an inflow of foreign direct investments (FDI) to advance local process technological capabilities and accelerate economic growth. Until the late 1990s, the country's rapid economic growth was accomplished largely through heavy reliance on FDI and leveraging MNCs to transfer and diffuse technology to local companies and employees. In the last decade or so, the national system of innovation has started to shift towards a more balanced approach, with increasing emphasis on developing indigenous R&D capability and promoting technopreneurial startups. This chapter examines the institutional framework of Singapore's national innovation

system and the role it plays in fostering indigenous S&T based entrepreneurial capabilities.

Chapter 13 details recent history, when Taiwan successfully transformed itself from a labor-intensive to a technology-intensive economy. It points out that behind this transformation, the government developed industrial innovation system and subsequent policy measures have played significant roles. Taiwan's industrial structure is predominantly comprised of small and medium-sized enterprises, which lack scale and financial capital to engage in large scale R&D and innovation. To address these challenges the government developed policy tools such as science parks and incubators, industry–university collaboration programs and established state-owned research institutions, provided tax incentives to inspire firms' entrepreneurship and assist them to overcome the market failure phenomenon. Consequently, these measures have facilitated Taiwan's industrial upgrading and transformation to the knowledge economy. However, there had been concerns that the government's considerable involvement in civil R&D might cause failures due to information asymmetries and rent-seeking behaviors. Therefore, the authors recommend government deliberately evaluating priority areas, encouraging private sector participation, designing incentive mechanisms to stimulate collaboration between industry and academia, to prevent economic failure and create sustained growth in the long term.

Chapter 14 describes the evolution of Israel as an innovation region. The author asserts that the founders of the nation and its successive governments firmly believed that only S&T could secure the economic growth and even survival of the Israeli state. Consequently research universities, agriculture research institutes and a defence related research based industry were created, evolving in the 1990s into a high-growth technology based cluster of startup and incumbent companies in ICT and now increasingly in life sciences. The key success factors for creating an S&T based region are described using the case of Israel and it is argued that the sufficient presence of all and each of these factors: knowledge, human, social, entrepreneurial and financial capital is a necessary condition for establishing and growing an S&T based region. The author describes how Israel developed a unique business model as an exploration cluster for its high-tech industry, which evolved from the absence of significant local markets and the quest by multinational incumbent companies for outsourcing exploration by startup companies. Finally a number of government policies and programs to support S&T based entrepreneurial economic development are described.

There are considerable variations in the histories and developmental patterns of this group of developed economies but smaller nations. Unlike

the large developed nations included in Part I, most of whom (with the exception of South Korea) are considered established industrialized economies, a number of the Part II nations are newly industrialized (Singapore, Taiwan, Israel), whose recent speedy development was made possible with significant national resolve and more visible government involvement. These nations may have to endure future sustainability challenges, more so than the market driven developed economies. However, the case histories of these newly industrialized nations present interesting models of the application and adaptation of the several institutional mechanisms and policy tools originally developed and experimented with in the leading industrialized nations.

### **Part III: Large Emerging Economy Countries**

Chapter 15 states that China has made tremendous progress in building its national innovation system (NIS), in general, and restoring its S&T capabilities, in particular, since the country started its 'opening-up' policy and economic reforms in 1978. The authors point out that many recent studies have attempted to identify critical factors that nurture and sustain China's NIS; debate among these studies has centered on the issue of how top-down S&T policies shape the nation's innovative entrepreneurial capacity. By mapping the programs flowing from S&T policies and analyzing the evolution of technology based entrepreneurship in China, the authors conclude that the interplay of policy framework in S&T and technology based entrepreneurial activities has been critical in driving the restoration, re-establishment and fast development of China's NIS. The chapter proposes a co-development model that the authors argue has contributed to China's innovation and economic growth. Lessons are drawn from this model for policy makers in China and other developing countries.

Chapter 16 provides an overview of the development of innovative micro and small firms in Brazil, particularly regarding the national experience in the formulation and implementation of policies for their creation and growth in different regions. It brings in a discussion of the appropriateness of innovation policies and programs, the macroeconomic, legal and regulatory environment, and most importantly policy implementation and coordination. Specific recommendations are highlighted, aiming at contributing to a better understanding of how policy and program design can be improved to promote entrepreneurship, innovation and sustainable social and economic development at the regional/local level. The Brazilian experience shows that policies have to be developed taking into account the specific needs and requirements of the firms and contexts they are targeting, and not forcing reality to adapt to them. Therefore, according to

the authors, it is necessary to modify the prevailing culture in the regional/local environment where policies are formulated and operationalized, with a view to effectively changing the promotion and funding paradigm in order to tailor it to the firm profile.

In Chapter 17 the authors point out that given the S&T based innovation environment, the main objective of their work is to track and explain the evolutionary patterns of entrepreneurial growth of the Indian software industry in its various technology regions. Prior work on the Indian software industry has examined specific macro level aspects such as the skills base, the focus on exports and the involvement of the government. However, only cursory glances have been given to the nature of the entrepreneurial character of the industry and the critical components that generate such entrepreneurship – the people, organizations and the local environment. This chapter builds on work carried out by the authors since 1999 to identify the evolutionary patterns of entrepreneurship underpinning the growth of Indian software firms. The chapter uses multiple data sets from different perspectives to develop a holistic approach to the study of entrepreneurship in the Indian software industry. The presentation is conceptual in scope and the qualitative analysis of the data and issues is supported by critical new insights on the evolutionary patterns of growth based on four processes of variation, retention, selection and struggle for resources. The findings have specific implications for the understanding of entrepreneurial patterns of growth of a key technology industry in the Indian regional contexts through various policy interventions.

In Chapter 18 the author posits that over recent decades many emerging economy nations have focused on developing their science, technology and innovation capabilities aiming at S&T driven entrepreneurial economic development. The results of these efforts have been mixed, and there are very few clear success examples. However, some of the struggling countries such as Pakistan have made notable progress in developing S&T capabilities in focused areas and, despite their socioeconomic and political challenges, are poised for an entrepreneurial takeoff. The author sees the need to develop conceptual frameworks for understanding the related issues and challenges in each particular case. The chapter presents Pakistan's case by developing a framework to help understand the linkages between the evolutions of S&T capabilities and entrepreneurial environment, and the broader socioeconomic and political dimensions to better understand how the co-evolution in these aspects has taken place in the country. The software and IT industry of Pakistan is used to demonstrate how a specific technology industry sector can help develop a deeper understanding of the related issues. The lessons that emerge from

this analysis include: the need to address the three key dimensions of S&T based entrepreneurship development in an emerging economy; creation of a positive momentum through focus on some priority areas and projects; use of a phased approach of implementation of an overall long term strategy; and promotion of a specific sector to serve as a role model and source of learning and inspiration for other sectors.

Finally, Chapter 19 points out that South Africa faces unique challenges balancing needs within the technology ('first') and other ('second') economic sectors. To stimulate entrepreneurship in the 'first' sector has proved to be a daunting task requiring unique development approaches in controlled quantum leaps. The national innovation system endeavors to address this through various systems, strategies and projects. Although these systems are functional, their strategies and project activities are not always integrated in a harmonious manner. A possible reason for this may be the uniqueness of the South African situation, where finding an optimal balance between various extremes is quite challenging. This chapter addresses the various extremes, efforts to develop homogeneous systems, ongoing projects and their relationship to business startup activity. The conclusion is that not enough of these strategies find their way through to an early-stage S&T based entrepreneurship in South Africa.

A comparative review of these emerging nations with some of the world's largest populations show that they are motivated to address their key issue of uneven national development and (with the exception of China) are generally poised to exploit their strengths in one or two more developed industrial sectors to attain global competitiveness advantage. China, Brazil and India have already made significant progress in mobilizing their S&T assets and better leveraging their human resource potential, with tangible results. On the other hand, countries like Pakistan and South Africa are still struggling to set their priorities in establishing clear policy and enabling programs that will show promising results.

## LEARNING

Overall, the legacies of the national and regional/local S&T based entrepreneurial policy and program development efforts featured in this volume offer the reader several valuable insights. There are clear indications of a trend toward better cohesion and coordination of national efforts, but also a trend toward the broadening of the regional agendas to address technology, talent, capital, innovation infrastructure and entrepreneurship

culture issues – considered essential for knowledge based entrepreneurial growth.

The idea of ‘benchmarking’ the policies and practices of nations and regions at different stages of economic development and along varied dimensions may seem attractive; however, the notion that there is one specific model or general set of ‘best practices’ that will fit with the needs of every nation and their regions, with often significant contextual differences, is considered unsound. In fact, a process of successful policy design and implementation infrastructure needs to combine benchmarking with insights into the unique systemic characteristics of each of these geographic units. Therefore one interesting exercise would be to compare how national and regional systems exposed to similar types of transformation pressures cope, given their institutional structures and indigenous entrepreneurial cultures.

The new patterns of collaboration between the state, the private sector and academe – which are manifested in the ways in which government agencies at various levels, national and global firms, non-governmental organizations, educational institutions and R&D centers, and professional bodies relate to each other – are creating a richly interconnected environment for S&T based regional entrepreneurial opportunities by designing innovative policy and program implementation tools and mechanisms. In this globalized competitive environment, it has become imperative to map and understand better a host of these new institutional arrangements for technology transfer and diffusion through these novel experiments in enterprise building, in order to evaluate their impact and consider their broader applicability. Much can be learned about these new processes of stakeholder involvement from the post-1980s experiences in industrialized countries pioneered by the USA, where the tradition and practice of broader public participation has undergone a significant transformation in the last couple of decades, and is still evolving.

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## NOTES

1. Twenty-five member nations from the Global Entrepreneurship Monitor program were targeted to represent all continents. Out of these, five national chapters were dropped either due to space limitations prompted by apparent similarities in national models or delays in submissions.
2. *Source*: Population Division of the United Nations Department of Economic and Social Affairs, 2010 estimates.

## REFERENCES

- Aghion, P., P. David and D. Foray (2009), 'Science, technology and innovation for economic growth: linking policy research and practice in "STIG Systems"', *Research Policy*, **38**(4), 681–93.
- Audretsch, D. and E. Lehmann (2005), 'Does the knowledge spillover theory of entrepreneurship hold for regions?', *Research Policy*, **34**, 1191–202.
- Cooke, P., M. Heidenreich and H. Braczyk (eds) (2004), *Regional Innovation Systems*, London and New York: Routledge.
- Leydesdorff, L. and H. Etzkowitz (1998), 'The triple helix as a model for innovation studies', *Science and Public Policy*, **25**(3), 195–203.
- Lundvall, B.-Å. (ed.) (1992), *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*, London: Pinter Publishers.
- Nelson, R. (ed.) (1993), *National Innovation Systems. A Comparative Analysis*, New York and Oxford: Oxford University Press.
- Plosila, Walter (2004), 'State science and technology-based economic development: history, trends and developments, and future directions', *Economic Development Quarterly*, **18**(2), 113–26.
- Sternberg, R. (2009), 'Regional dimensions of entrepreneurship', *Foundations and Trends in Entrepreneurship*, **5**(6), 211–340.
- Wessner, C. (2007), Editorial Introduction, in *Innovation Policies for the 21st Century: Report of a Symposium*, Washington, DC: The National Academies Press, pp. 3–37.

