Part II

Policy Functions

3

Supporting Innovators

Innovators are, first and foremost, entrepreneurs, and they need marketing intelligence and basic support, as the product or process they seek to introduce is new. Yet linking knowledge and creativity to the market requires skills they often do not possess. Their potential customers are increasingly demanding and globalized, and quality control is crucial, especially in less developed countries where competition among producers is often insufficient. These entrepreneurs will require good industrial organization if they are to succeed in solving the development issues raised by the generation of new products. More generally, they need accurate information and the capacity to communicate about innovation.

Innovations, in the form of new products and processes, are introduced in the marketplace because of these dynamic entrepreneurs, the development of successful projects, and efforts to respond to demand from consumers and from manufacturing and service industries. They require market-relevant investment in research and development (R&D), creativity, and often cooperation with institutions of higher education and firms. Because the outcomes of innovation are highly uncertain, however, firms and entrepreneurs are often reluctant to invest sufficiently in R&D, and risk-averse behavior often stifles creativity. In addition, the lack of an enabling environment and the difficulty of appropriating the economic benefits of investment in innovation hamper the development of collaboration between firms and between firms and research institutions.

Governments are therefore often called on to bridge the gap and address these issues. Public policies that support innovation have most often been based

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on the assumption that market failures lead to significant underinvestment in research and innovation across the economy. Other sources of suboptimal outcomes include potential innovators' inability to act in their own best interests, institutional rigidities that prevent institutions from contributing to innovation, and network and coordination problems. Yet innovation is increasingly considered a product of systems that involve not only firms but also institutions and intermediaries. Innovation policy and support for innovators therefore need to respond to these systemic failures.

At a more practical level, the generation and diffusion of new technology and knowledge, government efforts to transfer technology, and the educational system's ability to produce science and engineering graduates influence a country's innovation capability. Moreover, the absorptive capacity of firms is crucial for translating innovative ideas into productivity gains. The proximity of firms to each other helps bind these various dimensions into an innovation system. As a result, support for innovators is often the result of initiatives by local or regional governments, which have more knowledge and better information about local firms with high potential and can better assess the risks linked with local or regional innovation than the national government. Innovation is also increasingly considered a crucial driver of regional development.

Central and subcentral governments have a range of business assistance programs to support innovators. The following five sections discuss particular examples of these programs with illustrative practices from both industrialized and developing and emerging economies:

- Sector-oriented entities and technology transfer centers, serving mainly new and small enterprises
- National or regional small business policies that seek to meet the needs of firms at various stages of the innovation process (design, development, diffusion)
- Access to equity and (venture) capital to help develop new products and processes and to mitigate the risks of commercialization
- Government support of clusters and networks as they become major actors in innovation
- New policy approaches to intermediaries and bridging institutions.

Provision of Business Services

The public sector makes certain business services available to companies, generally in return for payment. To a certain extent, these services can be considered (partially) public goods, because they add to the country's or region's endowment, induce learning, and generate positive externalities. They are particularly important in developing countries because the market is often unable to offer the necessary service infrastructure owing to low demand, lack of supply, and information asymmetries. These business services aim to increase

the competitiveness and market opportunities of user firms—notably of innovative firms—by transferring new knowledge to firms and triggering their learning processes to improve their organization of production and their relation to the market. Such services are expected to contribute to the speed and quality of economic development.

Often, private enterprise does not supply these services for a number of reasons: the necessary expertise may not be available in the social environment in which firms operate; the investment needed to produce the required service is high, and return on this investment may be slow to materialize; the private sector may be ill placed to provide these services, because they may rely on what is essentially a public good, such as knowledge; and, finally, such market failures are particularly widespread in low- and medium-income countries.

Business Services That Support Innovation

The following services have strategic relevance for innovation policy.

- *Basic industrial services (promotion, marketing, and internationalization):* assistance for tenders of the European Union (EU), World Bank, and other development organizations; assistance for direct investment abroad; assistance for inward investors; legal and financial assistance; financial services, including accounting and tax assistance; market information or other economic data; organization of and participation in trade fairs and other promotional events; partner search.
- *Technology extension services:* assistance for patenting and licensing, grant applications, in-house R&D activities, and subcontracting to research institutes; competitive intelligence, including technological benchmarking, technology maps, and information on emerging technologies; innovation diagnosis; review of current or proposed manufacturing methods and processes; participation in and organization of technology exhibitions; technology brokerage.
- *Metrology, standards, testing and quality control:* calibration of equipment; quality certification; domestic standard; ISO (International Organization for Standardization) compliance; technical assistance; demonstration centers and test factories; energy audits; materials engineering.
- *Innovation in organization and management:* assistance for enterprise creation; interim management; logistical assistance; organizational consultancy, quality and training; productivity assistance; incubation services.
- *Information and communication:* advanced services for data and image transmission; assistance on communication strategies, telecom network connections, and the implementation of electronic data interchange systems; database search.

Government bodies or independent public agencies can provide these services, along with public-private partnerships that can, at least in theory, combine the advantages of the legitimacy and neutrality of public bodies and the business efficiency and management styles of the private sector. Consortia and specialized agencies sponsored by industrial associations, as well as private companies acting according to government guidelines or within government projects or subsidization schemes, can also provide such services.

The performance of the different providers will depend on several factors, some of which relate to their institutional nature. Legitimacy and ability to build consensus may favor government agencies or associations. When services imply disclosure of sensitive information or honest brokerage between potentially conflicting interests, public actors may again be perceived as offering better guarantees of neutrality and confidentiality. Although the public nature of the provider may often be an essential feature, a variety of providers can be instrumental in effective business service policies. It is generally acknowledged that the private sector delivers too few services, while political actors deliver too many.

As different types of service are often needed, firms find one-stop shops practical. Usually, the more packages of services are targeted to specific types of firms, the more likely such services are to be useful. Excellent services or service providers can help concentrate resources, drive efficiencies (especially in government and quasi-government agencies), and clarify the market for small and medium enterprise (SME) clients. A number of criteria can be used to do so (see box 3.1). Networking is the most efficient way for business services to maximize their contribution, and experience with cooperation substantially widens the scope of possible links. It is possible, but difficult, to transfer best practices. They are more easily reproduced when there is no need for substantial interaction with the local environment and when some strategic functions, especially those that are crucial for guaranteeing quality standards, are controlled by a central body.

Industrialized countries offer many examples of multipurpose services that are provided publicly (by government) or collectively (by industry associations). In the United States and the United Kingdom, which have a tradition of networking (for example, by industry and research associations) and constantly diminishing subsidies, those who provide business services tend to become more market oriented and inclined to take less risk when deciding to support projects. In Germany, many technology centers are part of national organizations, and science and technology policy is closely linked to institutions such as the Fraunhofer Society. As for France, the regional network of technical centers there is funded through the payment of a specific tax, public aid, and services revenue. In Italy, such services include market information, testing, and export support, which are often provided on a regional basis. In Spain, publicly provided multipurpose

Box 3.1 Priorities for Business Services Support Schemes

Policies in support of business services require a *significant degree of consensus*. They are by no means an "obvious" policy option, which can be decided simply on technical grounds, as they must take account of the socioeconomic structure of the context and be an explicit part of an accepted economic strategy.

Such policies also require a *significant degree of participation by clients* in the supplier-company relationship. By definition, consumers take an active role to some degree in the production of the service. To the extent that they seek to reduce costs, firms will look for routine or "compulsory" services, such as accounting. More proactive, but still cost-oriented strategies, will require specialized services that provide technical, financial, or training skills. Such services can be defined as "strategic."

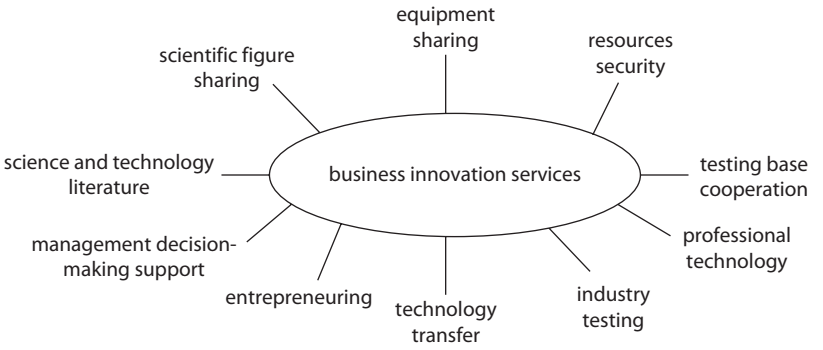
The functions of business service providers involve certain skills that need to be available to the provider's organization, even if they are not part of it: *awareness building*, which requires sophisticated "industrial marketing" skills; *problem framing*, which implies the ability to provide tailored diagnoses, based on comprehensive knowledge of company behavior and organization; *problem solving*, which implies the ability to carry out specific improvement projects, based on technical expertise; *search for resources* (financial and nonfinancial), which requires expertise and connections with public and private institutional sources; and finally *alliance building*, which implies the ability to identify and create innovative links between companies and between companies and other actors, as well as the credibility necessary to guarantee the value and the trustworthiness of the partners.

Source: Bellini 1998.

services take the form of technology and business development centers. In these countries, as well as in Australia, Ireland, Japan, and Portugal, studies indicate participation rates of some 20–30 percent of the universe of SMEs, but there are very significant differences among sectors and locations (very different rates are reported in the United Kingdom and the United States, for example).[1]

In emerging and less developed economies, private supply of business services is generally in very early stages. In China, the public sector takes the lead in providing collective and support services to provide for the innovation needs of firms and other actors in local and regional innovation systems. Figure 3.1 shows that Shanghai's R&D public service platform seeks to address a wide range of services similar in principle to those found in developed countries. These services cover the innovation development process, from the sharing of scientific information to the technology testing and transfer services that support entrepreneurship and management. In Mexico, although the public research centers of Mexico's National Council for Science and Technology agency, CONACYT, remain institutionally under presidential authority, its degree of autonomy with respect to the orientation and organization of its activities has recently risen, enabling it to increase the share of self-financing in its total

Figure 3.1 Shanghai R&D Public Service Platform



Source: Shanghai Municipality Science and Technology Commission 2006.

budget. This growth has led to a more market-oriented approach and greater cooperation with the private sector and other institutions to which CONACYT provides technological services.

Specialized Service Infrastructure

Specialized service infrastructure comprises a number of components, including basic investment promotion services, technology extension services, standards and metrology, productivity centers, and information and communication services.

Basic Investment Promotion Services. Attracting foreign direct investment (FDI) or enhancing domestic investment requires a wide range of efforts, such as the identification of suitable inward investment prospects and the active servicing of the strategic needs of foreign-invested firms once they are established. Skills development, recruitment services, and identification and upgrading of local suppliers are crucial not only to attract investors but also to create synergy with the local environment.

For these reasons, investment promotion agencies need to be in a position to ensure the cooperation of the different entities in charge of strategic resources such as infrastructure, training and skills resources, and SME promotional bodies. National agencies should supervise regional entities not only to ensure an appropriate degree of efficiency through regular audits and continuous monitoring but also to avoid duplication of effort, incentive "wars," and costly interagency competition.

Studies of successful agencies in developed and developing countries show that investment promotion programs entail a vast number of activities, such as establishing the policy context and the priorities and form of interventions, building up a promotional campaign for potential investors, meeting the

needs of interested investors, and implementing a strategy based on past promotional activity.

Industrialized countries practice a highly sophisticated form of investment promotion designed to achieve strategic industrial or regional development objectives. For example, Scottish Enterprise, the chief investment promotion agency in Scotland, coordinates initiatives that encourage entrepreneurship through efforts to attract and retain inward investment. A Scottish Enterprise audit in 2003 estimated that the agency added some £1.6 billion to Scottish gross domestic product (GDP) over three years, as a result of its activities in 2001–02. In Italy, the Piedmont Agency for Investment, Export and Tourism is organized as a one-stop shop for companies investing in the Piedmont. It is also in charge of regional investment contracts, a financial instrument unique to Italy, which foster the internationalization of the region through increased investment. Within this framework, research entities, science parks, and innovative companies can apply for specific grants.[2]

Many emerging countries have established similar investment promotion agencies that often have a good performance record. In Thailand, for example, the Board of Investigators, the agency responsible for attracting foreign inward investment, has designed a strategy that builds on the country's ability to provide cost-effective local inputs and on the competitiveness of domestic parts manufacturers. The availability of a large pool of labor that can be trained, natural resources, and government protection for fledging industries have also been instrumental in contributing to the increase in FDI. At the same time, differences in incentives for central and peripheral regions have helped reduce the pressure on the capital and on congested areas. Given this favorable context, FDI increased from less than 0.6 percent of GDP in the 1980s to an average of 1.5–2 percent of GDP in the 1990s and early 2000s.

Technology Extension Services. The aim of technology extension is to create small but profitable improvements by extending established technology to smaller firms. While the designs of technology extension organizations differ, all have relations with small firms and with sources of technology. Technology extension programs either provide resources that enable firms to identify needs and find appropriate technological solutions or identify and provide solutions through targeted assistance.

Particularly well known is the U.S. Manufacturing Extension Partnership (MEP), a network launched in 1988 that covers the entire country, with some 400 offices offering public and private industrial assistance. Technical assistance is often provided by the engineering applications programs of local universities, where engineering staff work with clients at the clients' site. Some of these university programs are industry specific. Others are "teaching factories"

to which clients travel to receive assistance. While MEP was intended to bring leading-edge technology to clients, in practice it focuses on giving help for more traditional technologies and management.

The success and longevity of MEP rely on a combination of public and private funding. On average, partnership financing is ensured by state (35 percent), federal (35 percent), and private funds (30 percent). Firms receiving assistance pay at most 40 percent of the cost. MEP assists about 25,000 firms a year and generates US$280 million in revenue (Shapira 2007). A five-year pilot study and an unpublished update show that clients assisted by MEP have up to 5.2 percent higher productivity growth than comparable firms not served by MEP (NIST 2007).

In Japan, about 170 technology upgrading centers (*kosehtsushi*) provide support for small firms. Unlike extension services in the United States, they deliver only technological services. Other services (management or financial) are offered by other agencies. *Kosehtsushi* centers conduct (very applied) research; have labs for training, testing, and examining products for compliance with industry standards; and promote technology diffusion. Most services are free of charge for SMEs. Each year, 900,000 tests are carried out, and around 3,900 technological advisers are mobilized to meet the 500,000 problem-solving requests addressed by client firms. Prefectures and local governments provide most of the funding; the private sector contribution is limited (6 percent of the total). The strength of the *kosehtsushi* is due to the stable relationship established by the centers' personnel and staff with clients and their knowledge of SME needs. Users seem to rank *kosehtsushi* centers' services higher than those provided by universities on their ability to perform promised services and to communicate about them. Success at diffusing technical knowledge to clients, however, is considered equal (Izushi 2005).

Emerging economies also recognize the need for efficient extension services. For example, Chile's Technical Cooperation Service, SERCOTEC, a branch of the Chilean Economic Development Agency (CORFO), is charged with the promotion of micro and small enterprises. Central to its strategy to assist SMEs are its Web site and online advice provided at no charge to 30,000 registered firms and its support to CORFO's mainstream activities. SERCOTEC has partnered with many other institutions to give expert advice and diffuse information to clients. The system is low cost, is easy to implement, and requires low maintenance. CORFO also operates the Technical Assistance Funds, which aim to integrate modern business management techniques and new commercialization technology and strategies.

Standards and Metrology. The globalization of value chains—with a multitude of firms acting as interconnected suppliers, intermediaries, and marketers—has occurred in parallel with the drive toward the standardization

of practices and procedures. Firms' interactions along the value chain require meeting agreed standard business practices in contracting, accounting, project management, and the communication of product design and engineering information.

Standards would be meaningless in the absence of the ability to measure precisely the various attributes—chemical, electrical, physical, and so forth—of outcomes at each stage of the value chain, using common modes of measurement, with the assurance that the measured magnitudes are correct within agreed tolerances for error. Metrology is thus the foundation of standardization processes, maintained through a carefully linked hierarchy of metrology agencies: some are autonomous and responsible only for metrology, while others are embedded in organizations with related responsibilities (UNIDO 2002).

In the United States, the National Institute of Standards and Technology (NIST) is an example of good practice because of its wide variety of services, its focus on research, and its systematic self-assessment processes. Through its regional network, NIST provides access to technical and standards databases and sets excellence guidelines for U.S. subcontractors and manufacturers. It offers calibration services, special tests, and a measurement assistance program to monitor parameters and ensure appropriate quality control. NIST also funds industrial and academic research and offers grants to encourage work in precision measurement, fire research, and materials science. In addition, NIST has a traceability policy, provides answers to clients' requests, and sells standard reference material (NIST 2007).

In less developed countries, metrology, standardization, and industrial quality systems are integrated only to some degree, and their services are often limited. Standards are modeled primarily after ISO standards, but quality certification is slow and insufficient. These countries need to increase their capacities in metrology, testing, and quality assurance to underpin their ability to innovate and export. At the same time, they face new challenges, such as an accelerated market cycle, new regulatory demands for a sustainable society, and the shift toward global markets.

In these countries, weaknesses in the standard-setting and accreditation processes are major problems. In South Africa, for example, shortages of human resources in the field of standardization have hampered the country's participation in international standard setting. A fund for bridging the standardization gap has been set up to mobilize efforts, especially in the information and communication technology (ICT) sector. In Brazil, technical regulations are decentralized through different line ministries and regulators. Inmetro, the national standards agency, maintains an updated technical regulations database on its Web site and makes available regulations and government resolutions on products subject to compulsory certification.[3] The country's agencies that certify quality management systems operate

independently, and controversies sometimes arise about the "subjective" character of their assessments.

Productivity Centers. These centers are broadly focused and geared more to industrial than to strictly technological development. They work with firms to promote efficiency and productivity in manufacturing and change their focus to fit the changing nature of the problems to be studied. They are generally initially funded by the central government to promote awareness of the need to enhance productivity. Most campaigns focus on the positive relations between employment and productivity growth to combat fears that increased productivity will displace workers.

The Japan Productivity Center, founded to bring together labor, management, and academia, merged with the Socio-Economic Congress of Japan in 1994. The principles of the new organization, known as the Japan Productivity Center for Socio-Economic Development, are that productivity gains increase employment, that labor and management must work together, and that productivity gains should be shared by labor, management, and the public (UNIDO 2002).

Productivity centers can provide private firms with vital information and services. For example, the Hong Kong Productivity Council provides information on international standards and quality and provides training, consultancy, and demonstration services to small firms at subsidized rates. Serving over 4,000 firms a year, the council acts as a technology import, diffusion, and development agent for the economy's main industrial sectors. It identifies relevant new technologies in the international market, builds its expertise in those technologies, and then introduces them to local firms.

In Mexico, state centers stress the management and organization of small firms. For example, the Instituto Poblano para la Productividad Competitiva, located in Puebla, aims at accelerating the growth of firms by helping small enterprises become medium sized and medium-sized enterprises become large. To this end, the institute establishes a mentor relationship with firms that pay a fee to join. At present, 3,150 SMEs are registered. The concept is based on the idea that talented entrepreneurs often fail to act in ways that maximize their talent. The program tries to help firms amass an appropriate combination and organization of skills. In 2007, it trained 3,000 microenterprise leaders, chief executive officers, and business people, with a view to creating 1,230 new positions and conserving 1,600 others. It has identified 150 champion SMEs. Over two years, 100 microenterprises became SMEs; over three years, 40 small firms moved to the medium-sized group, and 10 medium-sized firms became large ones.

Information and Communication Services. Providing information services requires technically competent specialists. These services are the least dependent

on prior targeting of specific groups of firms. Serving as an "intelligent" gateway to globally available, searchable knowledge bases, they offer a truly generic service of potential use to all. As such, they are the service organizations that come closest to providing a public good that has universal value. Many information centers also routinely produce materials to disseminate the results of their continuing research.

There are advantages to centralizing these activities in organizations with special capabilities for carrying them out. Offshoots of the National Association of Chambers of Commerce and Industry, France's regional agencies for scientific and technological information, for example, advise on SMEs' development projects in their technological and competitive environment. They help firms exploit information (technological intelligence, regulatory regimes, standards, markets), advise them on intellectual property and innovation, and warn them about counterfeiting risks. They also sponsor innovation workshops.

Most development agencies worldwide have established information services on their Web sites. In Singapore, for example, the "technopreneurs" (technology entrepreneurs) service portal is a platform for information exchange between technopreneurs and investors. Technopreneurs can obtain information regarding, and even create links with, business angels, venture capitalists, investment bankers, business consultants, and other relevant agents. Aspiring technopreneurs can also put their business plans on the Web site where investors can easily access this information. The portal even provides a complete guide to the various support services available to high-technology start-ups. Because it was sufficiently publicized, the portal has contributed significantly to overcoming the information deficiencies that tend to deter new ventures (UNIDO 2002).

Entrepreneurship and New Innovating Firms

In theory, all firms are concerned with innovation, but in practice policies tend to focus on particular categories of firms. Assistance to large firms can stimulate their commitment to precompetitive research and facilitate their involvement in large-scale R&D projects, but direct support to big business operations can distort market competition. The situation is different for small and new firms, which are at a disadvantage because of their size and problems of access to input markets. While governments tended in the past to underestimate the role of SMEs in innovation, they have rebalanced their priorities in the past decades, significantly increased support for small firms, and added preferential benefits for SMEs to their programs. This shift of emphasis has two sources.

First, innovation increasingly takes place in small new companies. Recent research by the Organisation for Economic Co-operation and Development

(OECD) on three global industries (ICT, automotive, and pharmaceuticals) clearly shows that in major global industries, the role of SMEs has not diminished (OECD 2006d). In fact, they are often the source of new ideas that are integrated into other products or brought to the market in their own right by large firms. Second, there is significant untapped potential for developing new products and processes in small businesses. Although SMEs play an important part in national economies, notably in employment, they have limited access to technological expertise, have difficulty mobilizing large-scale resources, and are generally slow to adopt new technology. These limitations have a negative effect on their potential for growth and, in many cases, their survival. Furthermore, small enterprise managers are often not aware of new technology, do not recognize the potential for improvements, or lack the financial, organizational, and managerial capabilities to incorporate new technology or to obtain external advice from consultants. For consultants and technology providers, the costs of reaching small firms with relevant information are relatively high, as are the costs of tailoring equipment to their needs. As a result, technology markets suffer from problems of information asymmetry, transaction costs, and lack of scale economies. These factors warrant policy intervention, both to improve the infrastructure for technological services and to encourage their use. They also imply adapting assistance to the different phases of the life cycle of new products and processes from design to maturation and internationalization and providing a local framework for incubating new firms.

Policy Initiatives in Support of Small, Innovative Firms

The establishment of new businesses is increasingly seen as a primary source of the revitalization and expansion of the local and regional economic fabric. Beyond the start-up phase, support to innovators takes into account subsequent stages of the firm's life cycle, including the globalization stage. In most industrialized countries, governments increasingly aim to provide comprehensive support from incorporation to internationalization. In the United Kingdom, for instance, the main goal of innovation policy is to help more businesses start up and survive. Through coaching and mentoring, free advice, and guidance, the goal is to increase the number and quality of new businesses by enabling people with an interest in starting a business to take the step and helping those from underrepresented groups and disadvantaged communities overcome the barriers they face. It is also to ensure that U.K. businesses, especially high-productivity innovative businesses, are able to identify and successfully exploit opportunities in overseas markets. The policy targets SMEs that are new to exporting, are innovative, and are between one and five years old. Cofunding for certain export projects may be provided in addition to information and advice.

Recent policy initiatives in industrialized countries offer some examples of best practice. The United Kingdom's Small Business Research Initiative, for instance, aims to raise productivity and business innovation by providing R&D contracts to technologically based small business.[4] The government is also working to embed innovation in public sector procurement policy.[5] The Netherlands has devoted attention to bridging the gap between SMEs' use of knowledge and innovation by granting special vouchers to small firms (see box 3.2). In France, a new scheme reduces taxes and social charges for small innovative firms less than eight years old that devote more than 15 percent of their total expenditures to R&D, providing that they are truly new ventures, and not the result of restructuring or the extension of preexisting activities, and have an ownership structure that reflects their independence from larger firms. The Republic of Korea has recently expanded technical and financial assistance for SMEs and start-ups by introducing new policies for accepting technology as collateral (knowledge asset) for bank loans, providing SMEs with subsidies for employing R&D personnel, and making available technical information and services to SMEs.

Emerging economies share these concerns, although their budgetary efforts on behalf of SMEs vary considerably. Since 1999, China has provided grants to small firms through a fund for small technology-based firms. Beneficiaries are requested to match the grant amount. This is not China's only program for SMEs, but it is the only one with an innovation focus. In Brazil, the federal government created a number of new programs targeting the SME sector in the late 1990s to help small business with technology transfer and innovation through loans and training and reinforced these initiatives in the framework of the 2004 law on innovation. Malaysia also adopted an integrated approach to increasing local SMEs' capabilities for technology acquisition and global competitiveness. Its SME Development

Box 3.2 Knowledge Vouchers

The Netherlands has observed that the general quality of business knowledge is good but that companies, especially SMEs, do not fully exploit it. The government therefore established knowledge vouchers (also called innovation vouchers, research vouchers, or simply vouchers) as a special incentive for linking SMEs to knowledge providers. The knowledge voucher is a coupon that entitles SMEs to a number of free consultancy or research visits to large, knowledge-intensive organizations (companies, research institutes, educational institutions). The vouchers have been a success, and many firms have used them.

Source: OECD 2007a.

Plan (2001–05) emphasized the strengthening of advisory services, the creation of new ones, and the fine-tuning of existing broad-based programs.

Incubating Firms

The business incubator is the instrument most widely used to support these various policy initiatives. To nurture the development of firms, business incubators offer, on a temporary basis and at relatively low cost, the use of shared premises, capital equipment, and business and technological services.[6] Incubators have diverse sponsors and stakeholders, including government agencies, universities, chambers of commerce, and nonprofit organizations. Private for-profit agents also sponsor business incubators, generally as part of a business estate venture. The convergence of innovation and enterprise policy and business estate initiatives is an area over which local authorities have significant control. Incubators increasingly tend to specialize (see box 3.3) so that they can provide tailored responses

Box 3.3 Types of Incubators

- *General/mixed-use incubators:* The main goal of these incubators is to promote regional industrial and economic growth through general business development. While they include knowledge-intensive firms, they also include low-technology firms in services and light manufacturing. A main focus of support is local and regional access to technical, managerial, marketing, and financial resources.
- *Economic development incubators:* These are business incubators with specific economic objectives such as job creation and industrial restructuring. Often the result of local government initiatives, their main goal is to help create new firms and nurture existing firms that create jobs. In some countries, they may target specific groups such as youth, the long-term unemployed, women, and minorities. In the United States, examples include "empowerment and microenterprise" incubators.
- *Technology incubators:* The primary goal of technology incubators is to promote the development of technology-based firms. Usually located at or near universities and science and technology parks, they are characterized by institutionalized links to knowledge sources such as universities, technology-transfer agencies, research centers, national laboratories, and skilled R&D personnel. They may also target specific industrial clusters and technologies, such as biotechnology, software, or information and communications technologies. A main aim is to promote technology transfer and diffusion while encouraging entrepreneurship among researchers and academics. In some countries, technology incubators not only focus on new firms but also help existing technology-based small companies to thrive.

Source: OECD 2006c.

to a wide variety of small innovative firms ("gazelles"), small firms in specific sectors or clusters, microenterprises in need of mentoring, and small firms with a narrow customer base, among others.

According to the EU, supporting incubators is a cost-effective way for national and subnational authorities to facilitate the development of entrepreneurship. The impact of business incubation has been highly favorable, as 90 percent of firms in incubators are still active after three years. Furthermore, the 900 business incubators operating in Europe have helped create 29,000 firms annually, a rate higher than that for nonincubated enterprises.

Support to incubators is often justified on the grounds of systemic market failures (because of weak links in the innovation system), which can impede commercialization and diffusion of technologies by new firms. In addition, entrepreneurs face significant obstacles for starting businesses: high fixed and entry costs, lack of access to equity capital, insufficient technical and market information, and weak management skills. Incubator services can address most of these issues and thus help reduce uncertainty and increase chances for survival. When located in science parks, incubators can provide a significant stimulus to local development and help stabilize job creation. They are also a means of enhancing returns to public R&D spending by promoting commercialization and diffusion. To be efficient, incubators nevertheless need to respect a number of principles: flexibility, quality of management and services, local support, and sound financing (see box 3.4).

In the United Kingdom and the Netherlands, business incubators were developed in the late 1970s. They took the form of "managed workplaces," whereby small firms were located in unused buildings and offered common services as a means of regenerating declining regions. In France, local governments and community actors have sponsored business incubators to stimulate local job creation. Over the period 2000–2003, the French government, in partnership with the EU and regional and local authorities, provided €25 million to 31 incubators. While these have performed relatively well, they have so far failed to attract significant private investment. In Italy, business incubators are a recent development and generally target the creation of manufacturing and innovative firms in the southern part of the country and in depressed industrial regions of the north.

In a number of emerging countries, in the wake of the creation of science parks and the renewal of science and technology policies, incubators have gained in popularity. In China, the inclusion of innovation centers and incubators in the Torch programs (see box 3.5) has led to a considerable increase in their number. They have been particularly effective for linking actors—entrepreneurs, researchers, financers—and for supporting firm spin-offs. The creation of 40 university science parks has also encouraged the establishment of incubators close to universities.[7] In the Persian

Box 3.4 Good Practices for Business Incubators

- Maintain the building and the surrounding environment.
- Deliver high-quality, reliable central services, such as telephone answering, mailing, conference, and meeting facilities.
- Provide technical support, either physical or online assistance.
- Keep the workspace flexible, so that businesses may expand if they wish to do so and so that businesses of different sizes can be accommodated.
- Ensure security for the business.
- Establish flexible terms of occupancy, with easy conditions for entry and exit.
- Develop meeting opportunities to encourage businesses, especially young ones, to learn from one another. Experience shows that social interaction can lead to greater trading opportunities. Workspace managers can facilitate this interaction.
- Work toward achieving high occupancy rates, following the lead of commercial workspaces. Those funded from public sources may place more weight on moving tenants out after perhaps two years to make space available for new businesses seeking their first location. There is a clear trade-off between commercial returns and social objectives, which policy makers should recognize.
- Make careful tenant selections to avoid clashes or to focus on particular "types" of tenants, such as those in technology sectors.
- Consider excluding charges for support services in the rent. Some tenants value this support highly, whereas others prefer less support and lower rent. Normally, this issue is resolved by not including support services in the rent.

Given the above considerations, it is not surprising that the most successful workspaces are public-private partnerships.

Source: OECD 2006c.

Gulf, the Bahrain Business Incubator, which provides capacity building and training to young entrepreneurs, has been very successful. Its services focus on counseling, assessment of project viability, and arrangement of links with banks. This model is currently being replicated in other locations in Bahrain as well as in Kuwait, Lebanon, Saudi Arabia, and Syria. Since its inception in 2006, Mexico's program has created 254 business incubators, most of which specialize in intermediate technologies, and has led to the creation of 10,042 firms. An infrastructure for "business accelerators" has also emerged in Mexico since 2004.

In certain countries, incubators are seen as a crucial instrument for internationalization and innovation. Singapore describes itself as a global "entropolis," a hub where entrepreneurs and enterprises converge, create innovations, forge partnerships, and create value in manufacturing and service industries. Singapore's policy is based on the understanding that relations are the essence of business. That country implements the policy mainly through the establishment of foreign incubators.

Box 3.5 Singapore: Incubators Underpinning a Relationship Hub

In Singapore, the number of business incubators and accelerators increased from 37 in 2001 to 101 in 2005. Foreign business incubators and accelerators increased from 3 to 35 during the period and now nurture and support foreign enterprises from Europe, the United States, and the Asia-Pacific and, more recently, from emerging growth areas such as Dubai and Saudi Arabia. The current 101 incubators have more than 1,100 enterprises. One is the China Torch Center, established in 2003 by China's Ministry for Science and Technology to facilitate the internationalization of Chinese enterprises. Another is the Japan External Trade Organization, which set up business support centers in 2001 to help start-up SMEs from Japan establish and grow their operations in Singapore.

Foreign incubators aid Singapore in establishing itself in regional growth patterns, as the country seeks to influence the behavior of Singaporean and foreign companies and make Singapore into a natural nexus of business ideas and deal making. The countries setting up incubators in Singapore are also showing recognition that internationalization requires more than assisting domestic companies in exporting from their domestic base.

Another example of Singapore's focus on internationalization is the Vietnam Singapore Investment Park, located in Vietnam and managed by Singapore. Singapore encourages domestic firms and others to locate operations at the business park in Vietnam to leverage Singapore's and Vietnam's complementary strengths: Singapore's in R&D, advanced manufacturing, and logistics and Vietnam's in low-cost manufacturing and market potential.

Source: Singapore Economic Development Board 2006.

Finance for New and Innovative Firms

Governments increasingly recognize that business innovation is more than just research and development. They know that providing incentives, promoting a good environment through diversified business services, and nurturing innovators are necessary but not sufficient. Beyond access to R&D and physical facilities such as incubation, commercialization of technology requires access to adequate capital for dealing with the uncertainties of the innovation process and providing a robust financial base. Early development of new products and processes generates little and often no profit. Bridging the financing gap is therefore crucial for new firms or for autonomous development of innovation projects.

From R&D to Venture Capital

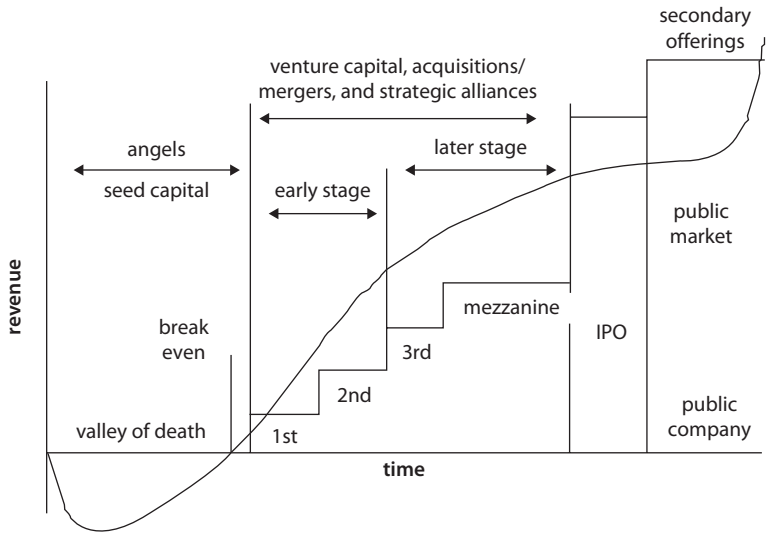
Finance for innovation usually comes from internal sources (cash flow), but when substantial investment is required, external investment may be needed. Owing to the highly uncertain nature of such projects, outside investors may not have confidence in entrepreneurs' ability to manage risky ventures, or they

may find it difficult to identify good projects. Long-term perspectives may give way to "short termism." This myopia in the innovation market warrants government intervention and the use of public money to provide grants and incentives to innovating firms and entrepreneurs.

A key constraint to the successful commercialization of research outcomes is the lack of early-stage investment capital, because private venture capitalists are reluctant to invest in the uncertain stages of new product development. Indeed, the preseed and initial seed financing stages present great policy challenges in all countries. Difficulties such as the lack of institutionalized markets may also impede the placements of initial public offerings on the stock market. After the initial public offering, new technology-based firms may encounter further obstacles in raising second and subsequent tranches of finance. When such firms wish to grow significantly, they sometimes have to mortgage the company to exploit the opportunities afforded by rapid early growth in demand (see figure 3.2).

To reduce these constraints and induce venture capitalists to finance projects that transform the research outputs from universities or public labs into commercial success, industrialized countries have improved stock market regulations and intensified support for venture capital by allocating larger budgets to venture capital, especially for SMEs and technology-based start-ups, by providing tax incentives to nonresident investors, and by forming partnerships with private venture capitalists.

Figure 3.2 Financing Cycle for New Technology-Based Firms



Source: Cardullo 1999.
Note: IPO = initial public offering.

Examples of Policy Measures

Most countries have various schemes for new firms and SMEs, including general guarantee schemes, matching of investments made by small business investment companies with public loans, seed capital schemes, or schemes that enhance equity.[8] Public venture capital can reveal lucrative investment opportunities to potential suppliers, and many industrialized countries have had positive experience with public venture capital programs.

Public Venture Capital Funds. Several European and Asian countries, for example, have established public venture capital funds. In Germany, the Kreditanstalt für Wiederaufbau and Tbg have such programs. Combined with the Länder (state) programs, this arrangement ensures a relatively even regional spread of funds. By contrast, funds in the United Kingdom are heavily concentrated around London.

Experience with venture capital programs provides helpful lessons (OECD 2006c):

- Public venture capital programs work only when interaction with the private venture capital market is strong.
- Venture capital is effective only for a very narrow range of new technologies. Hence, a "balanced portfolio" spread across many sectors may not succeed.
- Successful private funds are both flexible and active. They are involved with the inevitable shifts in direction and personnel associated with fast-moving companies. Public funds require the same involvement.
- Public funds have to be ruthless in jettisoning underperforming companies. Performance has to be judged according to the criteria of private venture funds.
- Public venture capital funds can be used to demonstrate to financial institutions the presence of a potential market.
- Public funds should be more "patient" than private funds in performing their role.
- The experience of OECD countries is inconclusive as to whether public venture capital funds supplement or lead the provision of venture capital. Such funds are generally young, and assisted firms have had insufficient time to grow.

Financial Support to Innovative SMEs. In the United Kingdom, capital investment grants are provided in the form of financial support to encourage sustainable development and job creation in most disadvantaged areas. Other measures include export credit guarantees (that is, government-backed guarantees, insurance, and reinsurance against the risk of nonpayment) to help exporters secure overseas contracts. To provide enterprises with the skills and

expertise to secure private sector funding, governments offer a combination of specialist information and expertise.

In central Europe, Nordic countries such as Sweden, southern European countries, Japan, and Korea, the financing and incentive structures of the national innovation system have been geared primarily toward stimulating productivity improvements and growth in large manufacturing groups. Incentives for starting firms and generating growth of SMEs have been weak. These countries are not particularly well equipped with public preseed financing mechanisms.

The financial environment for supporting innovation is a great barrier in many emerging economies. In China, for example, when regional actors speak of venture capital, that funding usually comes from public sources. For small firms, access to bank loans is repeatedly cited as a major barrier for investment in innovation and overall development. Nevertheless, Shanghai reports an active private venture capital community for the biotechnology industry, for example. Weaknesses in the financial environment also help explain the lesser economic impact of certain innovation investments.

In the countries of the Middle East and North Africa, if private equity fund-raising is limited (see table 3.1), individuals with high net worth can provide a base for venture capital finance, thereby acting as a substitute for institutional investors or bank finance. In addition, private equity and venture capital firms based in Europe and United States may seek opportunities to invest abroad and put money into emerging markets. Since risk capital can involve equity participation, private equity and venture capital are also well suited to Islamic models of finance (which prohibit interest) as exemplified by the success of the Bahrain-based venture capital bank launched in 2005.[9]

Countries such as Egypt, Israel, Jordan, and Morocco have introduced public guarantee instruments in cooperation with the banking sector to meet the borrowing requirements of young firms. But these efforts are not sufficient to meet the region's entrepreneurship financing needs, especially since start-ups require funding for the period during which they do not generate enough

Table 3.1 Private Equity Fund-Raising in Emerging Markets, 2003–05

US$ millions

Region	2003	2004	2005
Africa and the Middle East	350	545	962
Asia[a]	2,200	2,800	15,446
Central and Eastern Europe[b]	406	1,777	2,711
Latin America	400	1,020	2,067
Total	3,356	6,142	21,186

Source: OECD 2006b.

a. Excluding Australia, Japan, and New Zealand.

b. Including the Russian Federation.

revenue to cover expenses. Despite its recent growth, private equity and venture capital are still at an early stage of development in this part of the world. Unlike their U.S. and European counterparts, Middle Eastern and North African countries have yet to develop strong venture capital markets or associations of private equity and venture capital. The establishment of the Gulf Venture Capital Association, however, is a step in that direction.

The Gulf Venture Capital Association was formed to disseminate knowledge about venture capital and best practices in the region through conferences, technology forums, and workshops. It is not clear how countries in the Middle East and North Africa outside the Gulf will be involved in these activities, however. The association will have to face the diversity of financing requirements and differences in the state of development of venture capital industries in the region (OECD 2006b).

Business Angels

So-called angel investment is an important source of informal equity capital. Angel investors often provide critical know-how as well as capital. Studies suggest that in countries such as the Netherlands and the United States, this source of investment may be significantly larger than the formal venture capital market. Evidence from the United Kingdom suggests that informal investors in small firms would make additional investments if presented with suitable proposals. Under these circumstances, public policy can help develop a supply of relevant information. For example, an initiative has been launched in the United States to create an Angel Capital Electronic Network.

The importance of business angel networks is recognized everywhere, but their strength is quite variable. For example, there are 10 times more in the United Kingdom and 100 times more in the United States than in France. Some networks are financed by the public sector, such as Austria's Federal Ministry of Economic Affairs and Labor, and some by membership fees and donations. And while Austria's i2 network is one of the oldest in continental Europe, according to some evaluations, the number of transactions in this network has not reached critical mass.

Bridging Institutions: Clusters and Networks

In the past two decades, clusters (or local productive systems) have developed in all market economies. They have become an increasingly efficient mode of organization, combining the advantages of competition and cooperation in groups of firms located in a relatively limited physical space. Clusters provide a favorable environment for innovation and technology diffusion. In this context, firms benefit from economic advantages that can be translated into productivity gains and growth opportunities: a larger market for workers with specialized skills, more rapid information flows and

knowledge diffusion, and trust between contractual parties, which favors cooperation and specialization. In Italy, for example, both employment growth and productivity are higher in clusters than elsewhere. Firms that are part of industrial districts tend to have rates of return to investment and equity that are 2 percent and 4 percent, respectively, higher than those of isolated firms. They are also more innovative.

Clustering has not only increased in industrialized countries but has also diffused widely in emerging and less developed countries and regions. Often quoted are the metalworking and textile industries in the Punjab, the cotton knitwear industry of Tiruppur, the diamond industry of Surat, and the software and electronics cluster of Bangalore (India); the footwear clusters in Agra in Uttar Pradesh (India; see also box 3.6), in the Sinos Valley (Brazil), and in Trujillo (Peru); the shoe clusters in Leon and Guadalajara (Mexico); the textile cluster in Daegu (Korea); and the sports goods and surgical equipment

Box 3.6 SME Clusters in India

India's small-scale industry sector accounts for 40 percent of the country's industrial output and 35 percent of its direct exports. It has achieved significant milestones for India's industrial development. Within that sector, clusters—which have been in existence for decades and sometimes even for centuries—play an important role. According to a UNIDO (United Nations Industrial Development Organization) survey of Indian small-scale industry clusters undertaken in the late 1990s, India has 350 such clusters and approximately 2,000 rural and artisan-based clusters. It is estimated that these clusters account for 60 percent of India's manufacturing exports. Among the larger clusters are the following five:

- Panipat, which accounts for 75 percent of the blankets produced in the country
- Tiruppur, which is responsible for 80 percent of the country's cotton hosiery exports
- Agra, with 800 registered and 6,000 unregistered small-scale units, which makes approximately 150,000 pairs of shoes per day with a daily production value of US$1.3 million and exports worth US$60 million per year
- Ludhiana, known as the Manchester of India, which accounts for 95 percent of the country's woolen knitwear, 85 percent of its sewing machines, and 60 percent of its bicycles and bicycle parts
- Bangalore, which is a world-famous software cluster and deserves special mention.

Despite such achievements, the majority of the Indian small-scale industrial clusters have significant constraints: technological obsolescence, relatively poor product quality, information deficiencies, poor market links, and inadequate management systems. Moreover, with the Indian economy on the path of liberalization, all these clusters (even the best-performing ones) increasingly feel competitive pressures from international markets.

Source: UNIDO 2002.

clusters in Sialkot, the cutlery industry in Wazirabad, and the electrical fan industry in Gujrat (Pakistan). In African clusters, the interfirm division of labor and institutional support tend to be less developed in the metalworking, furniture making, garment, and other clusters in Kenya, Tanzania, and Zimbabwe. Most of these clusters are "low road to competitiveness" clusters (they compete on the basis of low prices, cheap materials, and numerical labor flexibility), but some concentrations of firms also exhibit elements of the "high road" such as innovation, quality, and functional flexibility.

Governments now realize the importance of these clusters, both as a significant share of the economy and as a main driver of innovation performance.[10] Experience in industrialized countries also shows that specialization and cooperation among SMEs can be efficiently promoted through public institutions. Directing policy toward groups of firms lowers transaction cost and facilitates learning. Through collective measures rather than subsidies to individual firms, policies can promote investment in both physical capital and in intangibles (forums for exchange, cluster animation). Groups of local actors with good knowledge of local needs and capacities can provide services. Such initiatives can involve strengthening clusters' demand for technological services and improving the work of intermediaries, linking participating firms with international firms within parks, and enhancing cooperative links, for example, through brokering and related programs.

Improving Access to Know-how and International Markets

Individual SMEs rarely have the resources or connections to take advantage of the global wealth of product and process ideas. One way for them to overcome this barrier is to pool resources and act together. Joint participation in international trade fairs, for example, can allow them not only to sell but also to learn through direct contact with potential customers. Trade fairs were important for the development of Brazil's Sinos Valley shoe cluster, for example. Joint action in the early 1960s led to the institution of a regular trade fair, which attracted buyers from all over the country. Subsequently, groups of producers went to trade fairs in the United States and Europe. Organized by local business associations and subsidized by the government, these groups played a vital role in connecting existing clusters with international buyers and provided a driving force for improving their products. Joint participation in trade fairs was also critical for ceramic producers from the Philippines, who launched themselves internationally in the 1980s. External support allowed them to exhibit a range of products at European fairs.

Technology Institutes and Collective Associations. Another possibility is to rely on a local technology institute, funded by government or foreign donors. Cluster development institutions can encourage firms to take certain kinds of collective action, such as cooperating to acquire new competencies while

remaining competitors in other product markets.[11] In Taiwan, China, small firms have been encouraged to cooperate on R&D, with technological guidance provided by a public laboratory. The Ministry of Economic Affairs and trade associations play an important role in this context.

Collaborative institutions, councils, or associations that represent a cluster provide it with a sense of identity and with mechanisms for obtaining contracts and grants. They can combine participating firms' demand for specific types of services (see box 3.7).

They can also organize an advocacy function for clusters and express their interests. They encourage the definition of common standards, rules, and norms that stimulate competition or increase efficiency and set agendas for growth. In addition, they can organize training and the transfer of tacit knowledge among participants in an industrial section. Their role can be important in developing countries (see box 3.8).

Clusters. Policy measures in industrialized countries usually include programs to stimulate cluster development. For example, recent development initiatives in New Zealand through the New Zealand Trade and Enterprise aim to foster growth and innovation in existing clusters. Over 40 cluster development initiatives are underway in biotechnology, optics, pharmaceuticals, organics, software, film, and wool. The Cluster Development Program provides a grant (of up to NZD 50,000), which must be matched by the applicant. A cluster facilitator can thus be engaged to help develop the cluster more rapidly.

Box 3.7 The Role of Trade Associations in Italy

In Italy, the main trade associations representing small firms identify cooperation opportunities, suggest ways in which firms can link complementary skills, create contacts among potential partner firms, and motivate firms to cooperate and mediate critical phases in the establishment of a network.

In Bologna, one of the three major trade associations, the CNA (Confederazione Nazionale Artiglianato) has about 17,000 member firms, 41 local offices, and 500 employees. The CNA prepares 22,000 pay packets every month for 5,000 firms. It keeps the books of 10,000 firms, prepares the income tax declarations for most of its members, and organizes 80 training courses a year on subjects ranging from management and business administration to computing and foreign languages.

In the 1950s, the CNA established a large assessment and guarantee consortium in Bologna, which today has 7,500 member firms and guarantees some US$12 million in loans. So far, it has promoted 41 other consortia dealing with production and joint buying and selling, which now have 8,000 member firms and 42 industrial parks in which 1,030 small firms are located.

Source: OECD 2001.

Box 3.8 Sector Associations in Senegal and Cameroon

In Senegal, textile activities (such as tailoring and dressmaking) are well organized in the informal sector. In 1995, the National Federation of Clothing Professionals was started at the initiative of the clothing sector. The federation has some 10,000 members (including small garment workshops as well as small and medium enterprises) and performs critical activities: research into new commercial channels for national and international markets, creation of a savings and credit union to finance members' production activities, and training of workers in the skills required to produce modern wearing apparel, including those necessary for international subcontracting. In 1999, the Training and Professional Development Centre was established under the federation. It employs 18 part-time instructors and can oversee some 130 trainees. The trainees are workers from small and medium enterprises and apprentices. The center provides both preemployment education, which can last up to 12 months, and skills upgrading sessions that last just a few days. The center is registered with the government and provides its own certificates.[1]

The Groupement Interprofessionnel des Artisans, Cameroon, is an association of over 100 informal sector enterprises in different economic sectors (woodworking, leather products, textiles, and metalworking). The group has been active in the organization of training sessions for its members, regulation of apprenticeships, and production of a newsletter. It has introduced an examination for apprentices (from member workshops), for which it organizes a committee of five members: one from the Ministry of Industrial Development and Commerce, two expatriates from donor agencies, and two local master crafts people. The graduates are presented with a joint certificate from the Groupement Interprofessionnel des Artisans and the Ministry of Industrial Development and Commerce.[2]

Sources: 1. Johanson and Adams 2004. 2. Haan and Serriere 2002.

Similar mechanisms exist in emerging countries like Mexico, where state governments have developed ways to assist firms in clusters. For example, in Tamaulipas the government helps its 13 clusters by supplying facilitators. In the electronics and telecommunication clusters, the main task of the facilitator is to identify firms' needs and help build capabilities to meet them (for example, by creating a skills profile to transmit to universities so that they develop the appropriate curriculum). In addition, the Regional Maquiladora Association initiates information sharing and has several committees (human resources, finance, and technology, among others) that can provide expertise. It is expected that firms in the telecommunication cluster will share design practices in the future.

Given that tacit knowledge, which is essential to innovation, is not easy to communicate and its attainment necessitates practice, learning and interaction are widely understood to be basic inputs in technological innovation. Innovation in a firm increasingly requires active acquisition and exploitation of

knowledge from other firms and public research organizations. Geographical proximity among learners thus becomes important and demonstrates the advantage of clusters.

Science Parks. Science parks are much used to encourage these agglomeration processes. Because they have not always lived up to expectations, more cautious attitudes now prevail. Revamped and better-organized parks and better-designed technopoles, however, are still expected to create spillover effects. Cross-fertilization and value added are intangibles and difficult to create, maintain, and evaluate. While companies and universities may be close together, for example, cultural barriers may still be difficult to overcome. In addition, particularly in high-technology industries, the technology required may be available only in very few places so that links tend to be global rather than local.

In both emerging and developed economies, many parks seek foreign investment through preferential tax policies and various support services. The proximity of suppliers and subcontractors often facilitates the implantation of these international firms.[12] Foreign investors are assumed to produce significant spillovers to the local business sector, and these are assumed to be faster and stronger when the firms are located in the same facility and involved in organized networking, as is often the case in science parks.

Several mechanisms in Turkey aim to attract FDI to encourage local firms to generate knowledge and thereby increase Istanbul's innovation capacity and the country's economic internationalization. Those mechanisms involve creative forms of joint ventures, acquisition of foreign technology licenses, and turnkey projects. Technology parks, which provide an environment for catalyzing strategic alliances, offer a suitable environment for technological start-ups. After an incubation phase, the firms can be relocated in technoparks, which house a more mature group of firms.[13]

In China, an important objective is to replicate the success of "clusters" in industrialized countries by promoting industrial and science parks, albeit on a larger scale and involving a complex set of overlapping structures. China's science parks have evolved over time from focusing on high-technology manufacturing exports to including entities that support endogenous innovation.[14] Firms that locate in a science park hope that this placement will help leverage government support, among the other benefits of participation such as preferential tax policies. The number of actors and the degree of government control are in any case greater than what would be found in industrialized countries.

China has also provincial and local initiatives for such parks, in addition to those designated as national parks, although in view of their proliferation, they are now prohibited from offering certain tax incentives. It has been estimated that there are approximately 12,300 "clusters" across China.

It has also been estimated that there are approximately 6,741 development zones (presumably also a form of park) (Sigurdson 2004). There are, for example, 120 regional high-technology zones in addition to the national ones, although they do not benefit from the same degree of tax exemption as the national zones.

Supporting Innovation in Networks

Unlike clusters, which do not require membership in an association or a collective entity, firm networks work in cooperation, though not necessarily in the same place or linked by some type of agreements. In "hard" networks, small groups of companies come together to achieve shared objectives through formal agreements. "Soft" networks are larger groups with more flexible internal relationships. In most industrialized countries, programs are limited to hard networks. In the United States, however, soft networks predominate because they are easier to form, involve less risk, and seek short-term results. Examples include hosiery companies in western North Carolina, metalworking in Arkansas, and the Berkshire Plastic Networks in western Massachusetts.

An important policy strategy to stimulate networks was the 1989 initiative of the Danish government, which launched a scheme for training and mobilizing brokers to create networks (see box 3.9). While the program was temporary, it served as a prototype for replication in Australia, Canada, France, New Zealand, Norway, Portugal, Spain, the United Kingdom, and the United States.

Box 3.9 Denmark's Network Program: Brokers and Scouts

Denmark's Network Program, implemented in the early 1990s, offered monetary incentives to promote cooperation among groups of at least three independent firms that committed themselves contractually to a long-term relationship. Grants were provided for three phases of network creation: feasibility studies to evaluate the potential for cooperation, planning grants to prepare an action plan or budget for a network, and start-up grants for operating costs in the first year. Eligible activities included R&D, production, joint marketing, and problem solving.

- *Network brokers:* The network broker was the key to the program and served as an external facilitator or systems integrator for network functions. In some instances, brokers were consultants expecting to earn a living in this way, but most already worked for agencies that served SMEs. Because the idea of working with groups of firms was uncommon, Denmark designed a training and certification program.
- *Network multipliers:* These people were very familiar with the companies and able to detect and assess opportunities for collaboration that could be passed on to brokers. Sometimes referred to as "scouts," they included staff members

continued

Box 3.9 continued

of chambers of commerce, trade associations, banks, accounting firms, law offices, trade centers, technical colleges, and technology extension services that serve SMEs.

- *Incentives for rural networks:* Denmark offered sequenced incentives to compensate small firms for some of the costs of participating in activities with uncertain returns. The Danish program was based on the U.S. Small Business Innovation Research program, with a small 100 percent concept grant (up to US$10,000), larger planning grant (up to US$50,000) and still larger implementation grant (up to US$500,000).
- *Information campaign:* Denmark also distributed information widely through the media, brochures, and newsletters on the potential value of networks and funding opportunities. The distribution venues ranged from conferences to pubs.

While not formally assessed, the Danish Network Program, which terminated in 1993 after three years of operation, was considered a success on a number of grounds: (a) 5,000 enterprises were involved in forming networks out of a target group of 10,000–12,000; (b) the idea, and often the practice as well, has disseminated widely, and networking has become a natural option to consider in the face of new business challenges; and (c) in the interim survey, 75 percent of participating enterprises felt that networking was raising their ability to compete, and 90 percent of respondents expected that they would continue the practice of networking beyond the subsidy period.

Source: Rosenfeld 2005.

In the United States, network programs are state based and modest. They are not viewed as subsidies but as incentives to change attitudes toward cooperation. They are designed for a finite period of time. In recent years, the importance of a network environment has become clear. Overlaps with cluster policies have been emphasized, and networking programs have been included in cluster initiatives, with goals such as creating skills alliances, technical assistance (in MEP programs), building social capital, and fighting poverty. Networks have become "the conventional wisdom of business practices as a result of exhortation to cooperate" by managers, business schools leaders, and policy makers (Rosenfeld 2001).

The Danish model has also been followed in a number of emerging countries. For example in Chile, SERCOTEC introduced an initiative to encourage networking between groups of firms and to provide a focus for channeling support to small firms. It established a series of subprojects, each involving three stages: *preparation*, in which officials work to identify firms in a particular locality, diagnose their problems, and establish the credibility of SERCOTEC; *consolidation*, in which a manager is appointed to coordinate the network, act as an interface with various government and marketing agencies, facilitate the

take-up of training and other support services, and develop better interfirm relations; and *independence*, when, after three years, participating firms are expected to take on responsibility for the manager's salary. The idea is that the participants in the network benefit enough that private initiatives will sustain it. Although the program is small, results have been encouraging. Most participating firms succeeded in gaining access to new domestic or international markets. The majority of networks also showed the capacity to be self-sustaining. Government officials have been sufficiently encouraged to develop a new initiative designed specifically for exporting firms.

Networking is increasingly understood in a wider sense, that is, in the context of productive chains that include small firms, large companies, and multinationals.[15] This shift of emphasis is mirrored in the new innovation policies increasingly implemented in industrialized counties (see box 3.10). In Italy, in the wake of the new law on transfer of technology and innovation, which emphasizes the transfer of power from the national to regional governments, regional agencies such as ERVET (Territorial Development Agency of the Emilia Romagna Region) have refocused their strategies from subsidizing services to sectoral districts toward focusing on territorial approaches, productive chains, promotion of public-private partnerships, and investment funds (Dall'Olio 2007). This new trend

Box 3.10 Networking Programs: The International Experience

Governments concerned about economic development have frequently encouraged large local employers to engage SMEs more actively in value chains. Supplier development programs involving SMEs in industrialized countries reflect the increasing recognition that the delivery of a final product or service to the customer involves the linking of often numerous suppliers in a "value chain." SMEs rarely initiate value chains or deliver the final products and services.

Incentives for creating value chains can stem from adversity. The United Kingdom's Accelerate program was implemented in the West Midlands, which suffered from a continuous decline in the automotive sector dominated by a large company (MG Rover). Many local suppliers in the region were dependent on this firm. The Accelerate program encouraged local SMEs to use their wide range of skills, diversify their customer portfolio, and improve their modes of production and organization. This goal was achieved through the provision of subsidized consultants who worked closely with firms. Over seven years, Accelerate worked with more than 1,000 companies and safeguarded more than 16,000 jobs.

A recent review of SMEs in global value chains concludes that they are likely to grow in importance. It argues that in addition to facilitating SME financing, protecting intellectual property, and helping SMEs comply with international standards, governments seeking to increase the role played by SMEs should seek to raise awareness of the roles SMEs can play in this respect.

Source: OECD 2006d.

is replicated in many lower-income countries. In Mexico, for example, the objective is clearly to encourage the creation of centers to initiate production, to strengthen integrators (hubs for infrastructure investment projects), and to trigger new supply chains through the cofinancing of projects and the national program of suppliers. In 2006, the federal government of Mexico devoted almost half its assistance to SMEs to these networking programs.

Conclusions

In most countries, support to innovators has become an important policy task. This support is ensured by various institutions that provide specific and relevant services for entrepreneurs and firms. In industrialized countries, the business services infrastructure has been in place for several decades and has considerably improved its offer, with a focus on professional, mature, and highly segmented services. At the same time, while technical centers formerly tended to link with traditional and medium-technology firms, more high-technology ventures have sought sources of expertise in universities or leading public laboratories. Nevertheless, low-technology and incremental innovation continue to account for a considerable share of GDP and employment in all industrialized countries. They remain a basic factor in the innovative performance of countries.

Delivering business services through networks is acknowledged as a very efficient way to maximize their contribution to regional development and innovation. Cooperation is obviously favored by geographical proximity, institutional coordination, and physical opportunities (shared space and facilities), but international communication and cooperation substantially broaden the scope of possible links. At present, these are only partially exploited. To be sustained, the networking trend needs active encouragement from public policies.

In developing countries, support institutions have often copied those of industrialized countries. The spectrum of performance is extremely wide, not only between countries but also within them. Many of these institutions do not function effectively and tend to be of poor quality, with inadequate equipment and a poorly remunerated staff. They also often exacerbate the initial pitfalls of their model. First, they overemphasize the supply side and are often out of touch with industry needs; in particular, they pay insufficient attention to the need to enhance firms' absorptive capacity. Second, unrealistic strategies that place an exaggerated emphasis on leading-edge technologies are commonplace.

To increase policy efficiency, many industrialized countries tend to put the firm at the center of their strategies. Policies are then designed to support small firms and start-ups. In the wake of these policies, comprehensive sets of public initiatives and support are being implemented to cover the life cycle of

new products, from design to internationalization. In this context, incubators play a major role in the survival rate of young companies. In developing and especially emerging economies, incubators have also proliferated. The concept is not well established, however, and policies to encourage their professionalization are not easy to design.

The lack of finance available for the early stages of the innovation process has been underlined not only by business circles but also by policy makers. Industrialized countries have improved stock market regulations and intensified support for venture capital through supplementary budget allocations in favor of venture capital, especially for SMEs or technology-based start-ups or the formation of partnerships with private venture capitalists. In continental Europe, the absence of an efficient secondary financial market explains part of the lag in venture capital and business creation vis-à-vis the United States. In most developing countries, these financial markets are embryonic.

Finally, governments everywhere are more aware of the need to support clusters and networks because of their innovative potential, their collective efficiency, and their increasing share in business activities. Physical proximity and a shared "regional culture" (shared practices, attitudes, expectations, norms, and values) that facilitate the flow and sharing of tacit and other forms of proprietary knowledge are the cornerstones of clusters. In industrialized countries, the most popular initiatives for enhancing productivity and capabilities for innovation include the funding of facilitators, efforts to stimulate spillovers, and greater effort to strengthen productive chains.

As a last remark, some countries are clearly concerned about the proliferation of innovation support measures and the need for rationalization and simplification. Not all innovation schemes are cost-effective, and they may be confusing for business. The United Kingdom considers it necessary to merge and simplify these schemes and to expand the number and role of one-stop shops. Most countries are now taking a systems approach that emphasizes the need to optimize the combination of supports and implement structural reform. This approach may be useful as well to many developing countries.

Notes

1. Although these data are relatively old (see Bellini 1998), they probably stand as minimums.

2. The regional investment contract simplifies procedures and helps advance the installation of start-ups and develop new investment projects in the region. It addresses all types of companies that manage operations in the production of goods and services, R&D, and innovation. It gives priority to highly innovative sectors such as new sources of energy.

3. Brazil is the Latin American country with the highest number of quality certification approvals (about 3,000) and one of the world's leaders in the relative increase in approvals.

4. The idea is to ensure early revenue and a route to market for firms that face barriers for their early development.

5. A pilot scheme for grants for investigating an innovative idea also helps U.K. SMEs obtain practical advice when exploring ideas for innovative products, services, and processes by covering 75 percent of the cost of outside experts.

6. The business support services typically provided by incubator management include business planning, advice on accessing capital, marketing, identification of suitable business partners, and general strategic advice. Other business support services—such as specialist legal services, accounting, and market research—tend to be provided by external providers with which the incubator management has established relations. Business incubator managers are often experienced former businesspersons and play an essential role in supporting and nurturing early-stage businesses. Case study evidence and survey work suggest that incubators can help address the traditional market failure in the provision of business support services to small businesses. Larger private sector business support organizations and management consultancies often do not deal with SMEs.

7. As a consequence, from 2000 to 2004 the number of incubators more than tripled from 131 to 464, and the number of firms rose from 7,693 to 33,213.

8. This includes a scheme such as Austria's High Tech Double Equity program.

9. This bank is the first Sharia-compliant venture capital bank in the region. It focuses on SMEs and uses a rigorous system to ensure Sharia certification of investments (see OECD 2006b).

10. Clusters account for a significant and growing share of industries and services in a wide variety of sectors. In Italy, for example, output of the industrial districts account for more than 40 percent of manufacturing production and more than half of industry exports. In the Netherlands, they represent 30 percent of output, and in Norway they employ 22 percent of the workforce. According to Porter (1999), high-technology clusters account for only 8 percent of employment and 2.5 percent of total U.S. employment. The most populated clusters in the United States include business services, financial services, tourism, education and knowledge, distribution, construction, and logistics.

11. A more detailed discussion of policy measures for cluster promotion is to be found in chapter 10, which discusses building innovative sites.

12. In the case of proximity, they tend to form some type of hub-and-spoke clusters.

13. Turkey has 17 technological incubators, which provide the infrastructure for technological start-ups.

14. The Zhongguancun Science Park in Beijing, approved in 1988, is one of the first examples. In this science park, there are 71 institutions of higher education with 300,000 students, including Peking and Tsinghua universities, 213 research institutes, 65 multinational firms, and 54 multinational R&D centers as well as other intermediaries. The Shenzhen High-Tech Industrial Park in the Guangdong province takes advantage of the Shenzhen Special Economic Zone, multiple incubators, and the Shenzhen Software Park, which serves as a base for the national Torch Plan Software Industry program.

15. While districts are characterized by flexible specialization and dense networks of local centers, productive chains integrate elements of productivity, knowledge, and social capital.

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