7. Technology and Innovation

Firms are central players in the process of structural transformation—that is, the process through which an economy engaged in the production of traditional, low-productivity goods and services moves to producing a more diverse set of modern, high-productivity goods and services.[42] After all, it is in firms where production takes place and decisions are made to modify production processes, improve product quality, produce a new product, and apply new marketing methods and tap new markets. These decisions are deeply interconnected with issues of technological capability and the incentives to invest in innovative effort.

In this section, we begin by describing the different ways Asian enterprises are innovating, taking a broad view of what constitutes innovation, as seen in Box 7.1. Noting that many SMEs are especially likely to be characterized by the use of traditional technologies, limited technical skills, and lack of information about markets and technology, we then discuss different ways governments have tried to help SMEs move from engagement in traditional, low productivity activities to more modern and higher productivity ones, and conclude with two promising approaches.

Box 7.1 **Types of Innovation**

OECD (2005) defines four sub-components of innovation:

1. Product innovation: this involves the introduction of a good or service that is new or substantially improved.
2. Process innovation: the introduction of a new or significantly improved production or delivery method.
3. Marketing innovation: the implementation of a new marketing method involving significant changes in product design or packaging, product promotion, or pricing.
4. Organizational innovation: the creation or alteration of business practices, workplace organization, or external relations.

Source: OECD (2005).

7.1 Innovation Across Enterprises in Developing Asia

While expenditures on research and development (R&D) and patenting activities provide useful information on firms' efforts at innovation in industrialized countries, they do much less so on firms in developing countries. This does not mean firms in developing countries do not innovate. Even if we leave aside enterprises in the newly industrialized economies of Korea, Singapore, and Taipei,China, R&D by large corporations in some lower income Asian countries are certainly on the rise, especially in sectors such as pharmaceuticals, machinery, and transportation equipment. However, for the most part, they do not innovate in the same way that firms in industrialized countries do. Crucially, developing country firms are not pushing the frontiers of technology outwards or making original inventions. Rather, their innovations lie in introducing new products and processes nationally or even sub-nationally.

Innovating is not a trivial exercise for these enterprises. A key lesson from case studies in developing countries is the difficulty firms face to adopt what are standard technologies in the industrialized countries (Lall 1987, Amsden 1989, Evenson and Westphal 1995). These show that the standard assumption used in many economic models, whereby enterprises have full information on technical alternatives (or more formally, that alternative production functions are common knowledge among firms) is a strong one. Box 7.2, based on Lall (2001), describes some important features of technology and technological learning in developing countries.

Box 7.2 **Technological Learning in Developing Countries**

On the basis of many firm level studies carried out by scholars (including himself), Lall provides a useful discussion of important features of technology and technological learning in developing countries, including:

1. Firms do not have full information on technical alternatives. They often function with imperfect knowledge of the technologies they are using.
2. Firms have to make conscious and significant efforts to understand the technologies they are using (the "know-how"). Even more effort is required to understand the "know-why". Moreover, there is no uniform, predictable learning curve for a given technology.
3. The learning process is highly specific to the technology and industry in question. For example, some technologies may be more embodied in equipment. Others may have greater tacit elements.
4. Technological learning involves more than formal research and development. In fact, for many developing country enterprises, building technological capabilities at the level of the shop floor, maintenance of machinery, inventory control, and other things, are more relevant capabilities.
5. The process of technological learning is ridden with externalities and interlinkages. It is driven by links with suppliers of inputs or capital goods, competitors, customers, consultants, and technology suppliers. Interactions with firms in unrelated industries, technology institutes, extension services, universities, business associations, and training institutions are also important.

Source: Lall (2001) pg.14–16.

42 For a detailed discussion of structural transformation, conceptual as well as empirical, and key issues in the Asian context, see ADB (2007).

With these conceptual issues in mind, we now turn to an examination of how enterprises in Asia innovate, whether firm size affects the propensity to innovate, and whether exporters are more inclined to innovate than non-exporters, using the WBES dataset. Because the WBES dataset does not currently include microenterprises and unregistered enterprises across the range of developing Asian countries covered, the discussion here is based on small, medium, and large enterprises in the formal sector. Box 7.3 looks at innovation (or the lack of it) in microenterprises and small informal sector enterprises.

Table 7.1, using the WBES database, describes the proportion of developing Asian manufacturing enterprises that undertook different forms of innovation. Consistent with the findings of Ayyagari, Demirgüç-Kunt and

Table 7.1 **Asian Enterprises that Undertook Innovation (%)**

	East and Southeast Asia			South Asia		
	Small	Medium	Large	Small	Medium	Large
Developed a major new product line	32.4%	45.6%	56.9%	36.2%	49.3%	60.8%
Upgraded an existing product line	53.4%	63.3%	72.2%	58.3%	70.9%	75.4%
Inrtroduced new technology that has substantially changed the way that the main product is produced	27.0%	41.3%	54.3%	12.9%	25.9%	37.3%

Notes: East and Southeast Asia includes Cambodia, People's Republic of China, Indonesia, Republic of Korea, Lao PDR, Malaysia, Philippines, Thailand, and Viet Nam; South Asia includes: Bangladesh, India, Pakistan, and Sri Lanka.
Source: Authors' estimates using World Bank Enterprise Survey database.

Box 7.3 **Innovation in Micro and Small Enterprises**

Hard data on innovation in microenterprises and enterprises in the informal sector more generally are hard to come by. Nevertheless, existing data seem to confirm the casual observation that the vast majority of these enterprises are not very active in upgrading technology and innovating. For example, according to results from the third census of "Small-scale Industry" undertaken in India over 2001–02, 85% of registered, or formal, enterprises did not take any initiative to upgrade technology (NCEUS 2009). Unregistered enterprises (that is, belonging to the informal sector) can be expected to show even less technological dynamism. The scale at which these enterprises operate and the costs associated with adopting new production technologies give us some sense of the challenge an informal sector entrepreneur faces to upgrade production technology. NCEUS 2007 (quoted in NCEUS 2009) points out that the average investment in plant and machinery of an enterprise, as reported by the third census data, is around Rs147,000. It estimates that for an enterprise set up about 10 years ago at a cost of Rs200,000, the cost of upgrading its production process can often be around Rs1,000,000 or more. Difficulties in obtaining finance would be enough to dissuade even the more enterprising entrepreneur from upgrading his technology.

A more in-depth look at innovation in microenterprises comes from the recent work of de Mel, McKenzie, and Woodruff (2009) based on a survey of around 2,865 micro-, small-, and medium-sized enterprises from Sri Lanka. Of these, 43% had no employees other than the owner, while 34% had between one and four workers; 33% of the enterprises belong to the manufacturing sector, while 35% were involved in retail; and only 2% of firms exported and only one-third were legally registered.

Box Table 7.3.1 describes the incidence of innovation across firm size over a three-year period; as can be seen, this increases steadily. Thus while around a quarter of enterprises without any workers undertook at least one of four types of innovation (that is, a product, process, marketing, or organizational innovation), almost 59% of enterprises with 25 workers or more did so. Marketing innovation was the most common type, followed by product, organizational, and process innovation, generally in that order. Not surprisingly, the product innovations rarely involved the introduction of a product new to Sri Lanka. This is especially so for the smaller enterprises. For example, only 1.7% of the product innovations reported by enterprises without any workers turn out to involve a product that is new for Sri Lanka. This can be contrasted with almost 29% for the largest category of enterprises (25 workers or more).

Box Table 7.3.1 **Incidence of Innovation and Whether Firm Introduced New Product in Sri Lanka (%)**

	Number of workers (excluding owner)					
Type of Innovation	0	1–4	5–9	10–24	25+	All
Any Innovation	25.5	38.3	43.5	48.0	58.5	34.9
Product	13.4	19.5	19.0	26.9	35.2	18.0
Process	3.0	7.7	8.6	12.9	18.3	6.6
Marketing	18.8	29.3	34.9	32.8	49.3	26.6
Organizational	4.0	9.9	18.7	22.8	38.0	10.6
Introduced new products to Sri Lanka	1.7	12.5	3.7	16.7	28.6	11.1

Source: de Mel, McKenzie, and Woodruff (2009)

The de Mel, McKenzie, and Woodruff (2009) study also examined the role played by the characteristics of the entrepreneur in undertaking innovative activities. Using a variety of approaches, they measure various aspects of ability and personality—attitude toward risk seeking, optimism, willingness to juggle tasks, and tenacity. Ability is measured using not only information on educational attainment, but also through digit span recalls and scores on Raven progressive nonverbal reasoning tests.[1]

Controlling for firm characteristics (including firm size), the authors find higher-ability entrepreneurs to be more likely to innovate. Additionally, more optimistic entrepreneurs are also more likely to introduce some type of innovation. A particularly interesting aspect of the results is that entrepreneur characteristics have a larger effect on the probability of innovating, the smaller the enterprise.

1 In a digit span recall test a respondent is shown numbers on a card (for example, a four-digit number) and asked to repeat it after a given time (for example 10 seconds). The Raven progressive nonverbal reasoning test involves pattern recognition. de Mel, McKenzie, and Woodruff (2009) note that the digit span recall test is a proxy for short-term cognitive processing power whereas the Raven test is more a measure of abstract logical thinking.

Source: National Commission for Enterprises in the Unorganised Sector (2009); de Mel, McKenzie, and Woodruff (2009).

Maksimovic (2007) using a larger set of countries, large enterprises in Asia are more innovative than SMEs. More than half of the surveyed large firms either developed or upgraded a new product line or introduced new technology that changed the way their products were produced.

That large enterprises undertake innovative activities more often is not surprising. For example, at least since Schumpeter (1947), it has been argued that a positive relationship exists between size and innovative activities.[43] There are several reasons for this. First, the usual difficulties faced by smaller firms in accessing finance are exacerbated when it comes to investing in risky projects (which innovative activities essentially are). Second, larger enterprises have a greater volume of output over which to spread the fixed costs of such investments. Finally, it is quite likely there are scale economies in innovative activities.

At the same time, while SMEs generally are at a disadvantage when it comes to innovation relative to larger firms, it is useful to distinguish more dynamic SMEs from the others. SMEs which are connected to international markets presumably may innovate more since the pressure to develop higher quality products and to streamline costs is more intense. As Lall (2001) puts it, "[f]acing world competition is an effective stimulus to building technological capabilities, and close contact with export markets is an excellent, partly free, source of technological information". Figure 7.1 shows us that there is some variation in innovation between exporting and non-exporting SMEs, and that the difference is more pronounced for South Asia, a region with more protected domestic markets.

There are several ways in which enterprises acquire new technology to improve production and marketing, as seen in Table 7.2.

The most important source of technological innovation, for SMEs as well as large firms, comes from new machinery or equipment. Also of considerable importance are those innovations developed or adapted within the establishment, especially in South Asia, where about one fifth of surveyed small firms report this as an important source (though as Box 7.3 has pointed out, these innovations may be relatively minor when viewed not from the perspective of the enterprise but more broadly).

Enterprises innovate either to lower production costs or to create demand for their products. At the same time, the pressure to innovate likewise stems from the interlinkage and spillover from suppliers of inputs or capital goods, competitors, the government, customers, consultants and other technology suppliers. The relative importance of these different influences varies by firm size. Table 7.3 shows that domestic competition drives a third of East and Southeast Asian enterprises to reduce production costs.[44] The influence is strongest for SMEs: 45% of SMEs report domestic competition as a main influence in cost reduction compared to 29% for large enterprises. Large enterprises, on the other hand, due to their greater ability to integrate with international markets and the closer similarity of their products to international products and specifications, also report foreign competition as a major influence. Apart from competition from firms, customers also provide sufficient motivation for enterprises to be more efficient, especially in small enterprises. More than one-third of small enterprises say their customers compel them to lower production costs.

Table 7.2 **Most Important Sources of Technological Innovation for Asia (% of enterprises)**

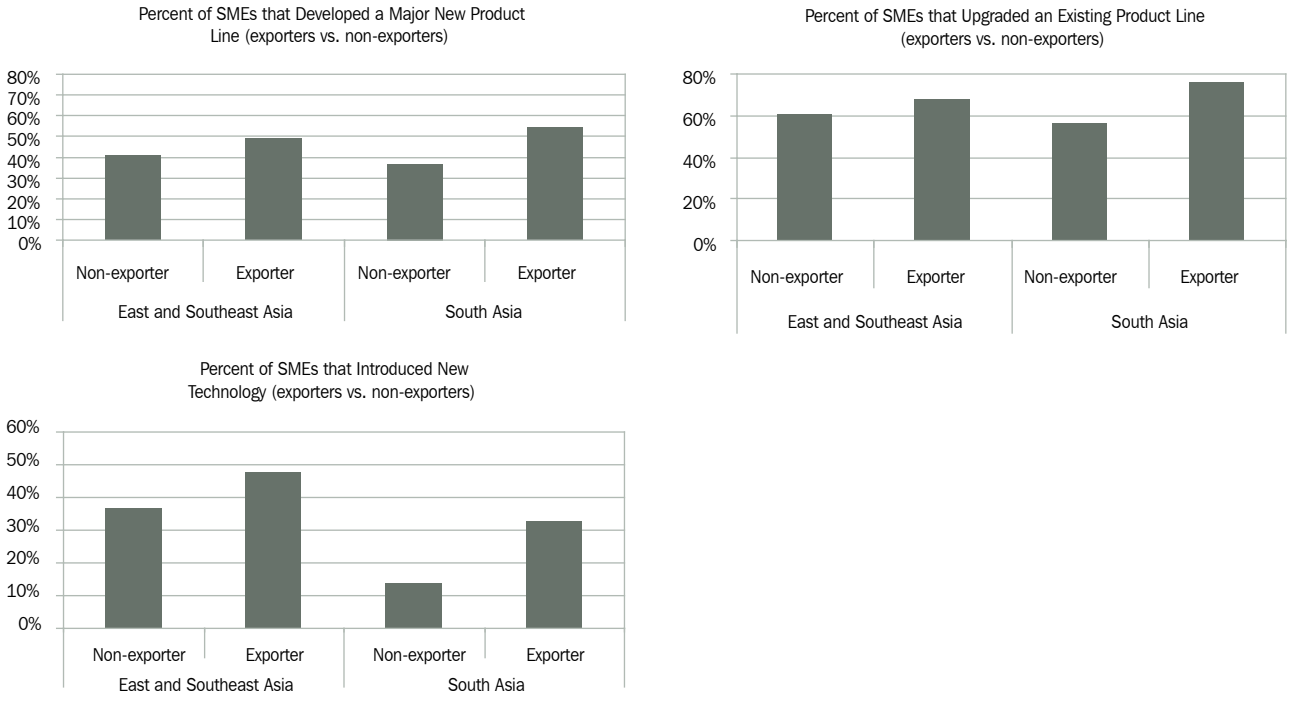
	East and Southeast Asia				South Asia			
	Small	Medium	Large	All	Small	Medium	Large	All
Embodied in new machinery or equipment	48	49	46	47	26	36	50	36
By hiring key personnel	11	8	8	9	13	15	14	14
Licensing or turnkey operations from international sources	1	2	3	2	2	2	2	2
Licensing or turnkey operations from domestic sources	1	1	1	1	5	3	1	3
Developed or adapted within the establishment locally	13	11	9	11	21	15	7	15
Transferred from parent company	2	6	12	7	2	2	3	2
Developed in cooperation with client firms	11	11	11	11	13	14	11	13
Developed with equipment or machinery supplier	6	7	7	7	1	3	4	3
From a business or industry association	2	3	2	2	5	1	2	3
Trade fairs and/or study tours	2	1	0	1	8	7	4	7
Consultants	2	1	1	1	3	2	2	3
From universities, public institutions	0	1	0	0	0	0	0	0

Notes: East and Southeast Asia includes Cambodia, People's Republic of China, Indonesia, Republic of Korea, Lao PDR, Malaysia, Philippines, Thailand, and Viet Nam; South Asia includes: Bangladesh, India, Pakistan, and Sri Lanka.
Source: Authors' estimates using World Bank Enterprise Survey database.

43 There are other views, of course. See, for example, the work of Audretsch discussed in Box 3.4 in Section 3.

44 Data pertaining to this issue were not available for South Asian countries.

Figure 7.1 **Innovation in Exporting and Non-Exporting SMEs**



Notes: East and Southeast Asia includes Cambodia, People's Republic of China, Indonesia, Republic of Korea, Lao PDR, Malaysia, Philippines, Thailand, and Viet Nam; South Asia includes: Bangladesh, India, Pakistan, and Sri Lanka.
Source: Authors' estimates using World Bank Enterprise Survey (WBES) database.

Table 7.3 **Main Influence to Reduce Production Cost (% enterprises answering yes)**

East and Southeast Asia				
	Small	**Medium**	**Large**	**All**
Domestic competitors	45	45	29	37
Foreign competitors	9	17	31	21
Customers	36	24	21	26
Shareholders	3	4	6	5
Creditors	1	4	3	3
Government or government agencies	6	6	10	8

Notes: East and Southeast Asia includes Cambodia, People's Republic of China, Indonesia, Republic of Korea, Lao PDR, Malaysia, Philippines, Thailand, and Viet Nam.
Source: Authors' estimates using World Bank Enterprise Survey (WBES) database.

Table 7.4 **Main Influence to Develop New Products (% enterprises answering yes)**

East and Southeast Asia				
	Small	**Medium**	**Large**	**All**
Domestic competitors	41	44	22	33
Foreign competitors	7	18	31	21
Customers	47	32	39	40
Shareholders	1	4	5	4
Creditors	2	2	2	2
Government or government agencies	1	0	2	1

Notes: East and Southeast Asia includes Cambodia, People's Republic of China, Indonesia, Republic of Korea, Lao PDR, Malaysia, Philippines, Thailand, and Viet Nam.
Source: Authors' estimates using World Bank Enterprise Survey (WBES) database.

Customers also exert heavy influence on enterprises to develop new products (Table 7.4). Demand from markets and customers is an integral part of building innovative capacity for several reasons: (i) the sophistication of buyers, the development of marketing channels and the competition it generates influence product development, quality management, and marketing skills; and (ii) the size and extent of the market induces the proliferation of activities that can be undertaken. Larger markets mean that the opportunity to develop scale-intensive enterprises is greater and these enterprises can possess the resources to make innovation possible (Lall 2001).

In closing, it is worth noting that regulations can play an important role, positive and negative, in influencing the incentives to adopt new technologies. This can be seen in Box 7.4, which describes an assessment of the Indian apparel industry and the complex mix of factors that appear to have dampened the incentives to adopt process innovations.

Box 7.4 **Choice of Production Methods, Scale, and Regulations in the Apparel Industry in India**

With relatively low capital and skill requirements, apparel is an industry well-suited to the early stages of industrialization. The manufacturing process used in apparel can be broken down into five sequential steps: (i) garment design; (ii) production planning; (iii) preassembly; (iv) assembly; and (v) finishing.

There are two principal methods employed for undertaking these steps in so far as the production of more typical apparel products is concerned (that is, outside the production of high-value added, high fashion products). The "make through" method relies on one operator who understands all of the processes involved in manufacturing to undertake all five steps. This is the standard method used by tailors in India. The assembly line is diametrically opposite, relying intensively on the division of labor. Each individual worker focuses on a narrowly defined task. It allows for a dramatic increase in labor productivity and quality of finished products, especially when operators work with specialized machinery. Significantly, the assembly-line method requires a much lower level of skills among operators than the make through method.[1] However, what it does require is excellent organizational ability among supervisors and at higher levels.[2]

Benchmarking exercises reveal very large gaps in the productivity of Indian apparel producers relative to international standards. McKinsey's case study attributes almost 60% of the differential in productivity between Indian and US producers to the very large reliance in India on the make through method, with one master tailor and 3–4 workers working on a similar number of sewing machines at its base. In contrast, apparel factories in the People's Republic of China and Sri Lanka often have hundreds and thousands of employees working with specialized machinery. One example of such machinery is a spreading machine—a machine that spreads cloth flat and evenly. In contrast, manual spreading of cloth can result in stretching of the fabric and ultimately contributes to distortions in the size of the final fabric.

But at the scale at which Indian tailors operate, there's simply no incentive for them to adopt the specialized machinery. How then do tailors survive despite their obvious disadvantages on the productivity front? First, tailors are able to compete on the basis of their low fixed costs, virtually zero inventory costs (typically consumers provide the fabric) and their low wages. Second, a host of regulations prevent competition from assembly-line manufacturers, especially large-scale ones. These regulations have encompassed not only the reservations for small-scale industry that have until recently prevented large-scale producers from serving the domestic market,[3] but also high import duties on specialized textile machinery, and obstacles to large-size retail stores (where margins are typically lower as compared to small traditional stores). In addition, land zoning codes and certain elements of India's labor regulations are widely believed to have created disadvantages for large-scale production.

1 See Braverman (1998) for a detailed discussion of the de-skilling associated with assembly-line methods of production. While the division of labor at the heart of assembly-line methods of production is usually discussed in terms of improved efficiency in production, Braverman argues that the popularity of the division of labor is on account of its adverse effects on the bargaining power of workers.

2 A third method, common in developed countries, is the modular approach to production. This consists of grouping various tasks and assigning them to a module—that is, a team of 5–30 persons. The workers are trained in the different tasks and can therefore move across them. This method requires considerable cross-training across tasks and is used for producing high value added, high fashion products.

3 The McKinsey case study points out that reservations for small-scale industry imply that firms are encouraged to operate with fixed assets below $200,000. A basic 500 machine factory—the minimum size required to function effectively—requires a minimum investment of $700,000.

Source: McKinsey Global Institute (2001); National Manufacturing Competitiveness Council (2009).

7.2 Assisting SMEs with Technology and Learning

Limited technological capability and lack of information on markets and products are important constraints on SME dynamism. In addition to their attempts at improving SMEs access to finance, it is not surprising to find that governments have put in place a variety of programs and services to help SMEs improve their knowledge about and access to promising technologies, production methods, and markets (including export markets). As seen in Table 7.5, a snapshot of some of the programs put in place in Asian developing countries, governments have done this by subsidizing and often providing a variety of technology extension services, training to workers and entrepreneurs, and testing facilities and tool rooms and hosting trade fairs and the like to give enterprises access to new markets and buyers. In some cases, governments have also subsidized the development of low-cost production technologies for use by smaller enterprises. An example is a recent public-private partnership based effort in India to develop a shuttleless loom for smaller enterprises in the textile weaving industry.[45]

Box 7.5 outlines measures for SME support in Singapore as provided by SPRING Singapore, a

45 The textile industry has four main production processes: spinning, weaving, wet processing, and stitching. The weaving activity uses two main technologies for looms: shuttle looms and shuttleless looms. While shuttle looms are typically much cheaper, they are also more inefficient. Additionally, they produce relatively lower quality fabrics than shuttleless looms. To increase the penetration of shuttleless looms in the weaving activities of textile enterprises, the South India Textile Research Association (SITRA), one of the four textile research associations sponsored by the textile industry and supported by India's Ministry of Textiles has developed models of looms that are cheaper compared to imported shuttleless looms that achieve greater efficiency than the traditional looms. Imported shuttleless looms, although more efficient, definitely cost more than the SITRA looms—with brand new ones costing more than five times more. To encourage adoption of this technology, the SITRA loom is included in the list of looms that will be eligible under the Ministry of Textile's Technology Upgradation Funds Scheme whereby buyers of these looms are eligible for an upfront capital subsidy (Senthilkumar, Kadirvel, and Ramasamy 2002; Gurumurthy 2002).

Table 7.5 **Technology Programs, Extension Services and Training, and Business Links**

Technology Development and Transfer			
		Program	**Features**
South Asia	Bangladesh	Various government support on technology and capacity building	- Expert consultation meeting, technology development and transfer, assistance in meeting compliances (ISO certifications, etc.), technical support for issuing "Voluntary Product Certificates".
	India	National Manufacturing Competitiveness Programme	- Addresses the technology, marketing and skill upgrading needs of the sector, mainly in the public-private partnership mode.
			- Lean Manufacturing Technologies — systematically identifying and eliminating waste throughout the entire business cycle.
		Technology Mission	- Promoting new and appropriate technologies for SMEs, assessing present levels of technology and their forecasting, setting up technology information centres/data banks and an IT portal for information dissemination, carrying out detailed technology audits.
	Sri Lanka	Techology Improvement program	- New technical service centers (Vidatha) common service centers, as well as the science and technology centers have already setup at the very remote areas in the country.
Southeast Asia	Malaysia	Third Industrial Master Plan	- Introduction of technology foresight programmes to be implemented by Small and Medium Industries Development Corporation together with technology based institutions.
	Philippines	SME Development Plan 2003-2004	- Product clinics and advisory services for standards conformity, alternative uses of indigenous raw materials, training to sustain quality of raw material inputs, strengthening sharing of facilities.
	Singapore	Technology Innovation Programme	- One-stop centres offering technology consultancy and practical, downstream technology platforms.
		Local Enterprise Technical Assistance Scheme	- Provides up to 50% funding support to hire external experts to improve management and operations.
		Intellectual Property Management Programme	- Provides up to 50% funding support to manage intellectual property system more effectively for the development of new products, processes, ideas and business models.
	Thailand	Network for Promoting Innovation to Commercialization Project	- Various supports for upgrading technology.
East Asia	Korea, Republic of	Various policies on technology	- 380 billion won worth of technology iniatives on innovation and industry-academia research partnerships.
			- Reinforcement of industry-academia-research institute networks, commercialization of developed technology and establishment of digital infrastructure.
	PRC	The Outline of National Medium and Long-term Plan for Sci-Tech Development	- 500 technology incubators.
	Taipei,China	Heavenly Dragons 8-Steps Project	- Industry-academia links.
			- Information service portals, implementation of Information and Communications Technology, talent cultivation, accumulation of knowledge, online sales and supply chain management.

Table 7.5 continued on next page

Box 7.5 **SME Support for Technology in Singapore**

Established in 2002, SPRING Singapore has developed a comprehensive range of programs to help enterprises overcome barriers and advance. While assisting SMEs with access to finance is an important function of SPRING Singapore, the agency also helps enterprises enhance technological and marketing capabilities.

To do this, the agency has introduced a range of schemes to incentivize and facilitate development in areas such as branding, management systems, service standards, design, human resource, intellectual property, technology infrastructure, and productivity. The Local Enterprise Association Development program, for instance, is the result of an agreement between the government and 14 industry associations to commit over S$65 million for industry capability development projects. To build soft skills, SPRING Singapore partnered with local educational institutions to create the Management Development Program in 2007, aimed at sending leaders and managers of SMEs back to business school. Scholarship programs have also been launched to groom future business leaders. SPRING Singapore also acts a national standards and conformance body to help lower technical barriers to trade, provide quality assurance for products and services, and promote industry use of Singaporean and international standards.

Knowledge is another important driver of SME performance. Recognizing this, SPRING Singapore provides various information services such as publications and online portals. EnterpriseOne, for example, is a one-stop web platform where enterprises can obtain industry updates, research reports, workshops and access to business information resources. To supplement the website, key business chambers and associations were encouraged to establish Enterprise Development Centers in order to provide a network of business advisory and information services for enterprises.

To help enterprises expand overseas, International Enterprise (IE) Singapore was established to offer services to facilitate exporting, business capabilities development, finding overseas partners, and entering new markets. The agency works through a network of Overseas Centers, Honorary Business Representatives and Business Advisors in over 30 locations throughout the world. These representatives provide market intelligence and on-the-ground business facilitation services to Singaporean enterprises. IE Singapore also runs training programs and an advisory online portal to familiarize companies with potential international markers.

Source: Hank Lim, Singapore Institute of International Affairs.

Table 7.5 **Technology Programs, Extension Services and Training, and Business Links** *(continued)*

		Worker Training and Development		Entrepreneur Training and Development	
		Program	**Features**	**Program**	**Features**
South Asia	Bangladesh	Cluster based skill development program	- Provides training to upgrade skill in the following businesses: (a) bakery and confectionery food preparation and marketing (b) leather products production and marketing (c) bamboo products production and marketing (d) fashion design and dress making (e) ikebana (flower decoration) and others	Entrepreneurship development and management leadership	- Provides training to entrepreneurs in the following areas: (a) entrepreneurship development (b) new business creation (c) developing competitive business plan (d) market promotion and market development (e) preparation of project profile and project appraisals etc.
	India	Development institutes, regional testing centres, field testing stations, tool rooms, product-cum-process development centers	- Conduct long term, short term, trade/field specific and industry specific tailor-made courses as well as vocationals training programmes.	Package for promotion of SMEs	- Specialized training for 50,000 entrepreneurs.
Southeast Asia	Malaysia	Skills Upgrading Programme	- Tailor-made courses as well as vocationals training programmes for skills upgrading.	Technopreneur Management Support Scheme	- Provides technical advisory services in relation to standards and certification.
	Philippines	SME Development Plan 2003–2004	- Streamlining of training programs and standardizing fees and promotion; deployment of SME business counselors; review of academic curricula to promote entrepreneurship.	SME Development Plan 2004–2010	- SME counseling and advisory Program, IT appreciation and application courses, establishment of SME industry centers to provide extensive management capacity building services to SMEs.
	Thailand	Skill and Capacity Development	- Provides training courses arranged by governmental offices and network institutes, for example, the Department of Industrial Promotion, training institutes and universities.	Entrepreneur development programs	- Consulting services, workshops etc.
East Asia	Korea, Republic of	SME Training Center	- Provides low cost quality training services for SME employees. Trainings focus on production technology, IT/automation, quality assurance and digital technology.	Biz Start-up Policies and Services	- Business incubator and other start-up courses for entrepreneurs.
	China, People's Republic of	SME Galaxy Training Program	- Offers training on business administration, safe production, industrial policies, etc.	Various start-up services	- Entrepreneurship mentoring and training.
	Taipei,China	Various training programs	- Setting up northern, central, and southern SME research and training centers that combine the resources of schools and training institutes, management and consultant seed personnel training work to raise management capacity of owners and employees.	Various training programs	- Management courses that meet the needs of local industries.

Table 7.5 continued on next page

government agency entrusted to encourage innovations among enterprises and foster a competitive SME sector. Box 7.6 describes the network of technology support institutions that have kept SMEs in Taipei,China—where SMEs have an important role in a variety of manufacturing industries, including bicycles, machine tools, computer peripherals and even application-specific integrated circuits—among the world's leaders in the manufacture of high-tech products.

Rigorous evaluation of these government initiatives to help enterprises improve technological capabilities and adopt new technologies seems to be even rarer than evaluations of finance-related initiatives. Nevertheless, a reading of descriptive analysis and case studies—combined with an examination of aggregate performance indicators on growth of output, productivity, and exports (as well as the diversification into a greater range of products)—suggests strongly that government initiatives in the NIEs, especially Korea, Singapore, and Taipei,China, have been successful relative to similar initiatives elsewhere in the region (for example, in India).

A greater appreciation of the importance of adopting new technologies, breaking into new markets, and simply better design of assistance probably go a long way to explaining this. As has been noted in Section 4, from the late 1970s and especially 1980s, there was a gradual move in Korean industrial development policy towards supporting SMEs. At first glance, some of the measures bear some similarity to initiatives adopted in India to assist small enterprises. For example, Korea's 1975 Subcontracting Promotion Act disallowed large firms to expand production facilities for designated products while encouraging them to transfer their facilities to SMEs. However, rather than just stop there, an important part of the Korean policy was to ensure that SMEs had the incentives as well as the capabilities to produce the products efficiently. SME

Table 7.5 **Technology Programs, Extension Services and Training, and Business Links** *(continued)*

		Program	Features
Buyer-Seller/Market Linkages/Export Promotion Programs			
South Asia	India	Government Stores Purchase Programme	- (i) Issue of tender sets free of cost; (ii) exemption from payment of earnest money deposit; (iii) waiver of security deposit up to the monetary limit for which the unit is registered; and (iv) price preference up to 15% over the quotation of large-scale units.
		Export Promotion Programs	- (i) Products of SME exporters are displayed in international exhibitions and the expenditure incurred is reimbursed by the government; (ii) training for SMEs on latest packaging standards for exports, techniques, etc.
	Sri Lanka	Business Development Service Centre	- Enhance marketing opportunities for SMEs, promote business incubator and sells centers, conduct exhibitions, and trade fair programs, create link between development service providers that are, chambers of commerce, advertising organization, export development boards and SMEs associations.
Southeast Asia	Indonesia	Various promotional tools	- Development of promotion tools, trading board, exhibition.
	Philippines	Export assistance network	- Trade facilitation office serving existing and potential exporters, offering real and immediate services in export trade information dissemination, export procedures and documentation, buyer linkages etc.
		Establishment of Philippine trade centers	- Serves as permanent exhibit sites of the country's export products.
	Thailand	Board of Investment Unit for Industrial Linkage Development (BUILD)	- Organizes meetings and factory tours of registered suppliers and assemblers, organizes subcontracting exhibitions, and facilitating local suppliers to display their products and international exhibitions by providing financial support to potential suppliers.
		Office of Small and Medium Enterprise Promotion promotional programs	- Bilateral cooperation agreement to promote projects, such as, franchising, mulberry paper, handicraft, bio-diesel, and tourism.
	Singapore	Government Electronic Business (GeBIZ)	- Provides access to the procurement opportunities of 120 government agencies.
		Singapore Business Federation Global Sourcing Hub	- Online B2B business portal provides instant access to global opportunities: streamline and automate sourcing processes, and gain access to wider supplier and buyer communities.
		Export Technical Assistance Centre	- Helps to understand and comply with the standards and technical regulations for food and electrical/electronic exports.
East Asia	Korea, Republic of	Various promotion programs	- Trade missions to overseas exhibitions. - Dispatch SME employees to overseas markets to become trade professionals.
	PRC	Various export promotion programs	- Fund for SME International Market Development, China International SME Fair.
	Taipei,China	Various promotion and business linkage programs	- Integrate the resources of local governmental SME service centers, local chambers of commerce and other relevant agencies, honorary SME guidance personnel (enterprise service volunteers) to build up a comprehensive SME service mechanisms.

PRC = People's Republic of China
Source: Authors' compilation based on sources mentioned in the references.

Box 7.6 **SME Technology Support Institutions in Taipei,China**

Taipei,China has an impressive set of programs to support SMEs. In 1981, the government set up the Medium and Small Business Administration to support SME development and coordinate the several agencies that provided them assistance. Management and technology assistance was provided by the China Productivity Center (CPC), the Industrial Technology Research Institute (ITRI) and a number of industrial technology centers (for metal industry, textiles, biotechnology, food, and information). Financial assistance was provided by various agencies, including the Small and Medium Business Credit Guarantee Fund and the Small Business Integrated Assistance Center.

The Joint Services Center of the Ministry of Economic Affairs provides information on SME assistance. The government covers 50–70% of consultation fees for consultancy services for SMEs. The Medium and Small Business Administration has a fund for SME promotion of NT$10 billion. The "Center-Satellite Factory Promotion Program" of the Ministry of Economic Affairs integrates smaller factories around a principal one. This program involves vendor assistance and productivity raising efforts, and a rational sharing of tasks between participating enterprises. By 1989 there were 60 networks with 1,186 satellite factories in operation, mainly in electronics.

For providing research and development support, ITRI handles contract research work considered too risky for the private sector; the contracts have financial support from the government. The Institute for the Information Industry, complements ITRI's work on hardware by developing and introducing software technology. Taipei,China's Handicraft Promotion Center supports handicraft producers, particularly small ones with export potential. The Program for the Promotion of Technology Transfer maintains close contact with foreign corporations that have developed leading-edge technologies in order to facilitate the transfer of those technologies to Taipei,China.

The CPC is known for its efforts to promote automation to improve precision and quality; it sends out teams of engineers to visit plants throughout the country and demonstrate the best means of automation and solve relevant technical problems. Over the years the CPC has visited over 1,000 plants and made over 4,000 suggestions for improvement. It also carried out more than 500 research projects on improving production efficiency and linked enterprises to research centers to solve more complex technical problems.

Source: Lall (2001).

subcontractors were required to submit plans for facility modernization to the Ministry of Trade and Industry and, once these plans were approved, the SMEs could qualify for preferential long-term credit and technical assistance (Kim 2004). Put differently, this was not the blanket protection for the small enterprises provided in India.

Similarly, and as already noted earlier, a focus on exports seems to have ensured discipline in at least some of the assistance provided. Thus, when in 1983 the government developed a program to identify and assist 1,000 promising SMEs per year, the selection of the enterprises included as a criteria the potential for exports (Kim 2004). Finally, there was a concerted effort in fostering technology related partnerships between SMEs and universities and the private sector. One such program is the Industry/University/Research Institute Consortium for Technology Development, which created a matching fund system aimed at using the staff and research facilities of universities and research institutes.

Of course, it is unlikely that all of the government assistance in the NIEs was successful (or even equally successful). A serious, though largely qualitative study on the impact of government assistance programs for SMEs has been made by Kim and Nugent (1999) through a survey of 122 mostly exporting SMEs across four different subsectors in manufacturing, sheds useful light on this. Although data was not collected on the cost of different programs, the perceptions of enterprises on the usefulness of different assistance programs was obtained. The results suggest international trade fairs and access to information on technical and other standards in foreign markets were particularly useful for enterprises. In addition, networks of university professors and industrial consultants were important sources of technical support. Overall, the analysis suggests that assistance that met the following design principles and characteristics was deemed to be more useful by SMEs: a system for SMEs to provide feedback on the assistance (and a mechanism whereby that feedback would result in corrective actions); competent personnel in agencies providing assistance; and assistance that was not too general in nature.

Of course, quite apart from the direct assistance that governments provided to SMEs in the NIEs, an educated workforce has helped smaller enterprises make the transition to new activities and production methods relatively easily. For example, even while training in specific skills—for example, the capability to use a specific production technology—is best done outside the primary and secondary school system (for example, within individual enterprises through on-the-job training), broad-based access to general education has provided workers with the essential literacy and numeracy, along with the socialization valued in the modern workplace (by inculcating attitudes such as punctuality, for example), that seems to have made workers more *trainable*. At the same time, these economies have undertaken a range of training programs since the 1970s. For example, in 1976, Korea introduced the Basic Law for Vocational Training requiring private firms with 150 or more employees to conduct in-house training for a portion of its employees, or to pay a training levy equivalent to no less than 6% of its wage bill. This levy was used to promote vocational training via government-sponsored vocational training schools. Singapore, too, has been an early adopter of such programs. For example, the Vocational and Industrial Training Board, set up in 1979 and financed with a levy of 1% on wages, subsidized efforts to upgrade the skills and expertise of employees or retraining of retrenched workers.[46]

The various programs, very often working with the private sector, have delivered on providing a well-skilled workforce in these economies. SMEs have been the major beneficiaries since they lack the resources to carry out extensive training themselves. Indeed, the contrast with economies in South Asia is stark. As a recent study from India points out, export-oriented SME employers (and thus the dynamic SMEs policy should encourage)—in labor-intensive industries as diverse as apparel, leather, sports goods, and bicycles—view the lack of workers who have the skills to handle the specific machines these industries deal with as a major constraint on their operations (Das and Kalita 2009). While the skills can be acquired through on-the-job training, the enterprises feel unable to provide these on cost and time considerations. Moreover, the possibility that once trained, a worker could be easily hired by a competitor no doubt serves as an added disincentive. In this context, deficiencies in the system of vocational and technical education in India seem to be truly constraining. As a recent report points out, the system of providing technical education and training is extremely lopsided in that it is heavily biased against producing trained technicians (National Commission for Enterprises in the Unorganized Sector 2009). The report points out that in ideal circumstances, the ratio of college educated engineers to diploma engineers to technicians should be 1:3:15. However, the structure of technical education and training in India is such that it annually produces 400,000 college educated engineers, 250,000 diploma educated engineers, and only 600,000 formally trained technicians, for a ratio of just 1:0.6:1.5.

46 See Felipe and Hasan (2006) for more details on similar programs in the region.

7.3 Assisting SMEs through Links with Large Enterprises and Cluster-based Development

We end this section with a discussion of two approaches, which are receiving considerable attention in policy circles, for instilling technological dynamism in SMEs.

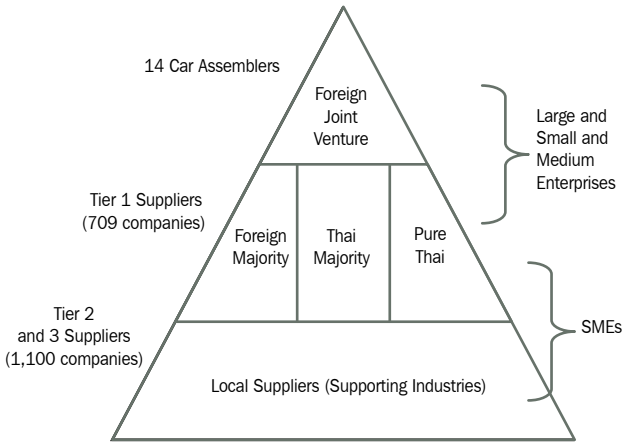
Fostering Links between SMEs and Large Enterprises

As noted above, size often confers a variety of advantages when it comes to the ability to adopt new technologies and seek out and enter new markets. For SMEs, establishing links with large enterprises through supplier and subcontracting relationships can represent an important way to derive the benefits of the superior access to markets and technology of larger enterprises.

SMEs generally fit into value chains as peripheral suppliers to one or more links in the chain, usually as second- or third-tier suppliers.[47] Their importance varies by country and industry. In Japan, SMEs have played an important role in supplying parts and components to large enterprises through long-term subcontracting relationships, especially in the machinery and automobile industries. Typically, the top tier consists of large enterprises, such as assemblers of electric appliances and automobiles and manufacturers of complete components. The second tier is occupied by medium and large enterprises that assemble components and supply these to large enterprises in the first tier. In turn, the enterprises in the second tier procure parts from the third tier—typically SMEs. Finally, tiny and small enterprises make up the fourth tier. In the case of Toyota, Uchikawa (2009) notes that while more than 30,000 enterprises have an indirect link with it, it has direct transactions with hundreds of enterprises.

Something very similar has happened in some countries in developing Asia. In the Thai automobile industry, for example, 700 first-tier suppliers and 1,100 second-tier suppliers have served a value chain with 14 car assemblers at the top (Figure 7.2).

Figure 7.2 **Structure of Subcontracting in the Thai Automobile Industry**



Source: Punyasavatsut (2008).

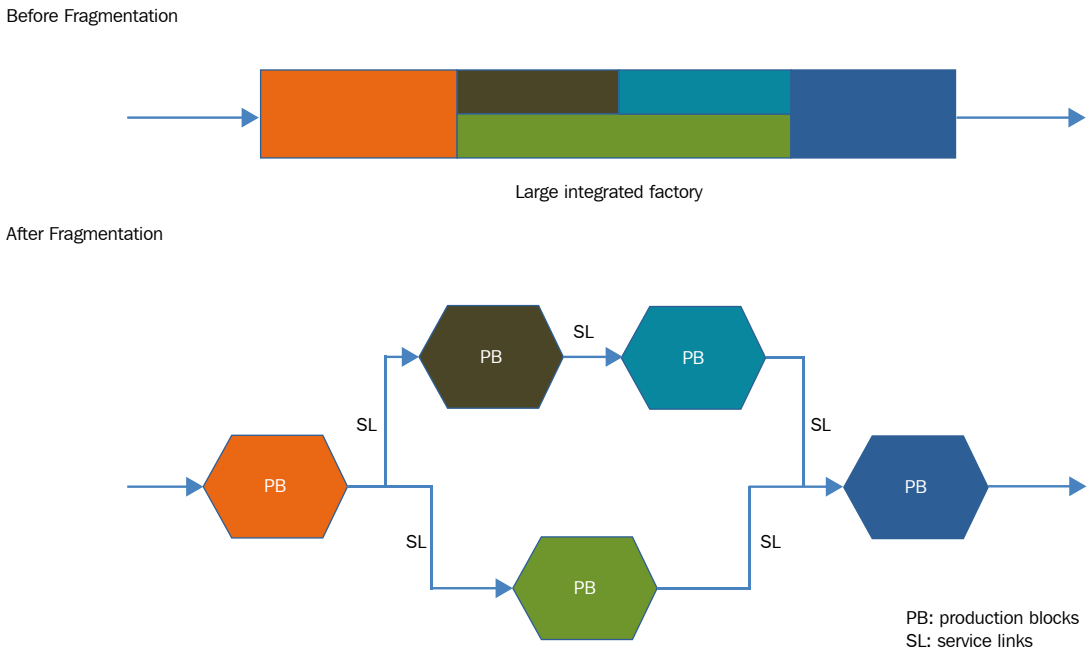
The scope for SME-large firm links has expanded in certain industries as a result of a process of *fragmentation* of production in some industrialized countries and the associated creation of global production and distribution networks. As illustrated by Figure 7.3, fragmentation has involved the parceling of some production processes that were carried out in large establishments to typically smaller enterprises in lower-income countries. This process gained momentum beginning in the 1990s in East and Southeast Asia.

Some fragmentation of production also seems to have happened locally (that is, large domestic enterprises developing their own value chains and interlinkages with SMEs through arm's length supplier or subcontracting relationships). In any case, the existence of supply links between small and large enterprises does not require a process of fragmentation. It can simply be the way production is structured from the outset. The exact scope of subcontracting or supplier relationships between small and large enterprises is very difficult to work out because of data issues. But in Thailand the Annual Industrial Survey reports subcontracting costs (including resale of finished goods) in business operations. Subcontracting cost shares among the top-ten manufacturing subsectors were around 18–49% of total production cost in 2006 (Punyasavatsut 2008). While it is not clear how much the subcontracting costs reflect sales by SMEs to large firms, they are by no means trivial and suggest the potential importance of fostering links between SMEs and large enterprises.

While it is widely believed that subcontracting has led to higher productivity and technological dynamism for the SMEs engaged in it—large enterprises have incentives to provide training and assistance to SMEs in upgrading their production capabilities, among other things—hard evidence is difficult to come by, even in Japan (Kimura 2002). Nevertheless, its prevalence in the industrial structures of Japan, and even Korea and Taipei,China,

47 A value chain refers to the integration of various organizations, resources, and knowledge streams involved in the creation and delivery of value to end customers. For any given industry, the value chain represents the different stages of processing of inputs to generate either intermediate or final output for sale to customers. Each stage involves the addition of value in the form of goods and or services.

Figure 7.3 **Fragmentation of Production**



Source: Kimura (2007).

three successful industrializers, has led analysts to argue in favor of measures to help SMEs engage in subcontracting relationships in production value chains. Outside Japan and the NIEs, Thailand, in particular, has taken major steps to help SMEs in this area (Box 7.7).

Help for SMEs to enter value chains must be preceded by a careful market analysis that examines the number and types of businesses involved in an existing value chain, the role SMEs play in that chain, and the barriers and constraints SMEs face in becoming part it. Only then can specific activities—such as the provision of subsidized training and technical assistance for potential SME subcontractors—be considered and designed.

Moreover, the interest and commitment of (typically larger) enterprises up the value chain to entering into relationships with smaller enterprises needs to be

Box 7.7 **Fostering Large Firm-Small Firm Links in Thailand**

Thailand has at least two major government agencies, the Bureau of Supporting Industries Development (BSID) and the Board of Investment (BOI) helping smaller firms establish links with larger firms. (The term "supporting industries" refers to a wide range of production activities that provide goods and services for other industries.) BSID activities have focused on industries such as auto parts, parts for electrical and electronic appliances and machinery, and mold and die and casting products. The BSID has provided technical assistance and training for enterprises in these industries, supported the design and development of prototype products (for example, electronic systems for heat treatment of steel), and promoted subcontracting through organization of the "Buyers Village" meant to bring representatives of different enterprises together.

The BOI, meanwhile, in 1992 established a special purpose agency, BUILD, to directly help build links between local parts suppliers and large assemblers, especially multinational corporations (not only located in Thailand, but also in other countries). Its main activities have included programs which bring together vendors and customers, for example, by organizing meetings and factory tours of registered suppliers and assemblers, organizing subcontracting exhibitions, and helping local suppliers to display their products at international exhibitions by providing financial support to potential suppliers. It has also supported a database of enterprises—ASEAN supporting industry database—that can enable manufacturers abroad to come up with short lists of enterprises that can serve as contractors for outsourcing activities. As of August 2007, 20,198 companies had listed in the database (13,534 of them suppliers in Thailand).

Among other agencies, the government has set up independent institutes (the Thailand Automotive Institute, Electrical and Electronics Institute, Food Institute, Textile Institute, and SME Development Institute) that provide testing facilities for parts and raw materials, and consultation and training facilities for enterprises.

Source: Punyasavatsut (2008).

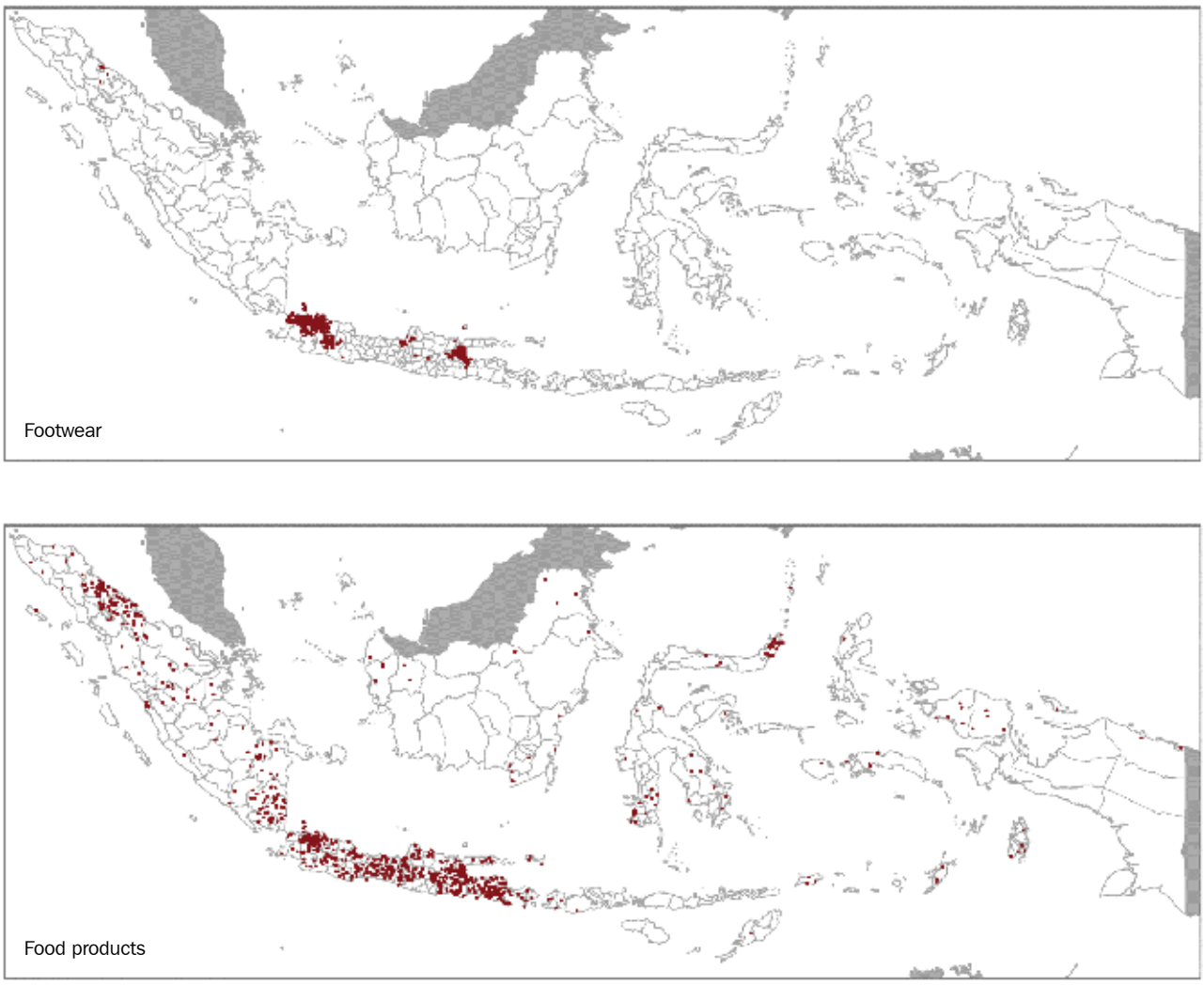
ascertained. For example, the long-run viability of subcontracting relationships once the subsidized inputs end (such as training for SME subcontractors) needs to be looked into. Similarly, there is a risk that large contracting companies may take advantage of their dominant position in the market to set unfair prices or to delay paying SMEs. State-driven measures are needed to control such practices and unfair competition.

Clusters

The term clusters is used to refer to a geographic and sectoral concentration of enterprises. The enterprises produce and sell a range of related or complementary products and, as a result, are faced with common challenges and opportunities (ADB 2006). Clusters are often also located close to equipment and raw material suppliers, independent component producers, and subcontractors and final goods producers. Suppliers of key business services are also present, as are buyers and their agents. Figure 7.4 gives some sense of the geographical and sectoral concentration of enterprises. The upper panel describes the location of formal manufacturers of footwear in Indonesia by district, while the lower panel is for food products. Quite clearly, while the production of formal footwear is very concentrated geographically, food production is much more widely dispersed.

Many analysts believe clusters hold considerable potential for instilling dynamism in small enterprises. Clusters can allow small firms to escape the straitjacket imposed by a lack of economies of scale and benefit from a variety of spillover benefits, including access to a wider pool of relatively specialized labor and opportunities

Figure 7.4 **Distribution of Manufacturing Employment in Footwear and Food Products, Indonesia, 1996**



Source: Deichmann et al (2005).

to learn about potentially profitable product lines and technologies. Indeed, a number of governments in the region are using assistance to clusters as a chief method to instill dynamism.

To gauge the potential, it is useful to examine what gives rise to clusters; the reasons vary. In Japan, based on a review of the history of 14 industrial clusters, Yamawaki (2002) notes several different factors that played key roles across different clusters. These include the catalytic role played by the emergence of a large enterprise (for example, the general machinery cluster that emerged around Komatsu Corporation, a large producer of construction machinery), the presence of public research in a standards testing facility (for example, the establishment of a public technology center in Hyogo in 1894) and the availability of a pool of workers (for example, the emergence of an apparel cluster in Gifu helped by an abundance of part-time female labor).

Based on a survey of small enterprises in various clusters, Yamawaki (2002) points out that for many small firms, being part of a cluster has helped them to specialize, to absorb new technologies, and facilitate their procurement of inputs. Additionally, the local government provision of public testing facilities and research and technology development centers to the cluster has also been helpful.

Being part of a cluster also seems to have helped SMEs in Indonesia. Berry, Rodriguez, and Sandee (2002) find that clustering, along with subcontracting relationships with foreign firms, has played an important role in helping many SMEs become successful exporters of furniture (rattan and wood) and garments by not only helping them establish links with foreign buyers, but also introducing them to a variety of process and product innovations. In contrast, small enterprises outside clusters have not been as successful in either entering export markets or diversifying their product lines.

Similarly, Zhejiang Province in the eastern coastal part of the PRC is considered to have one of the most vibrant SME industrial clusters in the PRC. Its growth was fueled by the clustering of SMEs in the area into specialized industrial zones (Lim 2009). Indeed, it is argued that many small towns in the PRC depend on township enterprises for their economic growth. Such enterprises are expected to generate more employment opportunities for the rural surplus labor force. A small town's development must be supported by its industry and such support can come from SME cluster enterprises in the secondary and tertiary industry.

Of course, the simple fact of clustering does not by itself suggest dynamism for its constituent enterprises. Table 7.6, drawn from Das (2008), shows some basic characteristics of different types of clusters in India. It is clear that the vast majority of clusters consist of microenterprises engaged in the production of traditional products, probably catering to low-income consumers. Average wage levels are low and the growth potential of these clusters is also deemed low.

Table 7.6 **Clusters in India**

	Microenterprise Clusters	Traditional Manufacturing Clusters	High-tech Clusters
Number of clusters	6,000	388	about 20
Average wage levels	Low	Medium	High
Growth rate (2002–07)	Negative or marginally positive	Positive (10–15%)	Positive (20–30%)

Source: Das (2008, pg. 87).

Indeed, it is probably the case that many enterprise agglomerations of SMEs represent embryonic clusters that lack dynamism. As noted in ADB (2006), information does not flow easily in these clusters and the various actors are not aware of their own ownership of the cluster. Not surprisingly, entrepreneurs in these underperforming clusters have limited "corporative" presence among local authorities and policymakers.

In contrast, well-developed clusters are those in which there is a close collaboration between firms, often based on a common social-cultural identity that facilitates trust. Crucially, this collaboration coexists with competition between firms. Additionally, the cluster should be well linked with local authorities and the policymaking apparatus.

Having business links with large enterprises in the form of sub-contracting and/or the presence of at least one firm as the leading or anchor firm and acting as the driving factor are also considered important for a well-developed cluster.

In Indonesia, for example, the metal industry clusters in Ceper (Central Java) and in Pasuruan (East Java) generally meet the above criteria and are considered successful industrial clusters for SMEs. By contrast, many other SME clusters in Indonesia are simply called clusters because they are located in the same location and do not successfully provide inter-firm cooperation to generate agglomeration and sub-subcontracting or other business links with large enterprises.

UNIDO provides some design principles for strengthening SME-focused cluster programs. Key elements of design include:

- Work with an existing cluster and network of SMEs. Trying to set up a cluster or network from scratch is unlikely to succeed.
- Concentrate interventions on groups of enterprises and not individual enterprises.
- Focus attention on strengthening institutions and developing instruments that facilitate an interface between enterprises and markets. The objective of better interface must be to help improve the access of enterprises to new markets, fashion trends, product development and technical know-how.
- Support institutions that can provide technical training, technology support, and market information.
- Support mechanisms by which enterprises can work with local levels of government.
- Encourage links with large firms.
- Ensure interventions do not crowd out private initiative

While it is still too early to say how recent initiatives at developing clusters along the above principles will work out, these principles do hold promise. Moreover, their success has implications not only for small firm dynamism, but also for urban development more generally. This point is highlighted in Box 7.8, which describes ADB's recent study on "City Cluster Economic Development in South Asia".

Box 7.8 **A Framework to Induce Functional Industry-Clusters**

By 2030, more than 55% of Asians will reside in urban areas. Towns and cities are sprawling into surrounding areas, forming agglomerated urban-regions, or clustered cities, calling for a development approach that accounts for both rural and urban development in a regional economic context.

The City Cluster Economic Development (CCED) initiative, started by the Asian Development Bank (ADB), attempts to do that. It combines the business cluster concept, discussed in this section, with urban development, and transforms the concept into a practice. It attempts to activate industrial-clusters by supporting their need for growth through research and development centers, vocational skills training, marketing (software infrastructure), as well as water supply, waste management, electricity, information technology, roads, transportation, and logistics (hardware infrastructure).

Research conducted for the CCED initiative measured and compared attributes of competitiveness for more than 30 cities/towns across each of three South Asian countries (India, Bangladesh, and Sri Lanka), identifying, mapping and analyzing sectoral and spatial changes in urban industry and economic activities. The three capital regions were further assessed for their strengths and weaknesses relating to key factors that drive urban development. Three competitive industries that have formed spatial clusters, but have yet to be activated as dynamic functional clusters, were identified:

Competitive Industry	Delhi, India	Dhaka, Bangladesh	Colombo, Sri Lanka
1	General metal engineering industry	Building construction materials industry	Apparel industry
2	Auto component industry	Tannery industry	Rubber industry
3	Ready-made garment industry	Food processing industry	IT industry

Source: Choe and Roberts (forthcoming).

Commonly, these industry clusters require several critical areas for support: research and development, skills training, knowledge sharing, building enabling environments, and improvement of basic urban infrastructure.

To help jump-start the industry-clusters, the CCED initiative calls for continued engagement with these selected industries, involving private sector participation.

The strengths of the approach used by the CCED initiative are that it:

- helps identify spatial clusters of industries that are competitive but still at a dormant stage or involve environmental improvements and waste management, such as the tannery industry in Dhaka;
- enables ADB to more strategically invest in critical infrastructure and capacity building needs to support sustainable local economic development;
- provides improved economic data on cities that will improve economic and financial planning of a country's development strategy;
- allows policy makers to make informed decisions on "where to invest first" and "what to invest in" so as to maximize its economic impact with limited resources.

Ultimately, the CCED initiative is intended to provide more job and income opportunities, covering not only urban areas but also the rural hinterland.