



G-77/HLCST/2002/3



**Partnerships and Networking in Science and Technology for
Development: Global Trends and Opportunities for Developing
Countries**

Report prepared by the UNCTAD Secretariat



**UNITED NATIONS CONFERENCE ON TRADE
AND DEVELOPMENT**

**Partnerships and Networking in Science and
Technology for Development: Global Trends and
Opportunities for Developing Countries**

South-South High-level Conference on Science and Technology

Dubai, United Arab Emirates
27-30 October 2002

Prepared by the UNCTAD Secretariat

I. Introduction

The confluence of important developments in the international economic environment during the last two decades has turned inter-firm cooperation into an important mechanism of business interaction and for accessing markets and technology around the world. In high- and medium-technology industries, the private sector has increasingly used various kinds of cooperative agreements – such as joint-ventures, joint research and development, technology exchange agreements, direct minority investments and sourcing relationships – to advance core strategic objectives. Such inter-firm relationships fall short of complete mergers but are deeper and steadier than arm's length market exchanges. They involve mutual dependence and shared decision-making between two or more independent firms. When RESEARCH AND DEVELOPMENT is a focus of the partnership, universities and other research institutes may also participate.

Such developments have changed the nature of international business interactions that have supported the development of a score of developing countries since the mid-twentieth century. Traditional mechanisms of technology transfer, including licensing, the acquisition of capital goods and the transfer of complete technology packages through foreign direct investment (FDI), are being supplemented by many new semi-formal and formal mechanisms for gaining access to technologies and markets. These new mechanisms entail the formation of dense webs of inter-organizational networks that provide the private sector with the necessary flexibility to achieve multiple objectives in the face of intense international competition. The result has been an increasing interdependence on a global scale that few firms interested in long-term survival and growth can ignore.

The proliferation of inter-firm partnerships has raised expectations of new opportunities for developing countries through faster access to markets and technologies and greater learning possibilities. The United Nations Conference on Trade and Development (UNCTAD) has held several intergovernmental and other expert group meetings since the late 1990s that focus on partnering and networking for national capacity building in developing countries. This paper reports some of the important findings that have emerged from these meetings. It describes global partnering trends, and examines several cases of partnerships and partnership strategies that have helped developing country firms to upgrade, learn, and enhance their international reach and competitiveness. In addition to examples of individual firms and partnerships, the paper refers to a few pilot projects, examples of policy measures and programmes that promote partnerships and networking.

II. Global partnering trends

Extensive analytical work in economics and business management has confirmed a dramatic growth in partnerships during the past couple of decades. Even though the relevant data

sources are dispersed and frequently incompatible, the emerging picture is convincingly one of a widespread phenomenon on a global scale.

A. International partnerships

Recorded new partnerships around the world increased more than sixfold during the past decade, from just over 1,000 during 1989 to about 7,000 in 1999. Even though increasing fast in absolute terms, cross-border partnerships lost ground overall, dropping from approximately 86 per cent to 63 per cent of the total number of recorded partnerships worldwide. The peak was reached in the middle of the decade (approximately 9,000 new reported partnerships in 1995), but numbers have fluctuated significantly. Overall, there were many more recorded partnerships in the 1990s than in the 1980s. Fluctuations aside, quite a sizeable increase in partnerships has taken place during the past 30 to 40 years, with the numbers exploding during the second half of that period, and especially the most recent decade. Importantly, recent trends in partnership “flows” resemble trends in FDI and cross-border mergers and acquisitions in terms of density and destination.

More than half of the recorded partnerships in the 1990s were classified as contractual agreements, such as co-production and co-marketing agreements, joint RESEARCH AND DEVELOPMENT agreements, and technology sharing. The later part of the decade witnessed a significant increase in service sector partnerships, such as business services.

Firms from countries that are members of the Organisation for Economic Co-operation and Development (OECD) were involved in more than 92 per cent of world partnerships during the 1990s.

The past decade witnessed a large increase in contractual and service sector international partnerships. Sectors registering large numbers of partnerships include pharmaceuticals, chemicals, electronic equipment, computers, telecommunications, and financial and business services. Service sectors took an increasing share of the total as the decade progressed.

B. Research and technology partnerships (RTPs)

A major development in the past two decades has been that equity-based RTPs (traditional joint ventures) have gradually become less popular relative to contractual agreements. Non-equity, contractual forms of RTPs such as joint RESEARCH AND DEVELOPMENT pacts and joint development agreements have provided the main mechanism for inter-firm collaboration.

Firms enter RTPs for both cost-reduction and other strategic reasons. Cost reductions, e.g. sharing of costs and risks of a technological development, appear to be more significant in capital- and RESEARCH AND DEVELOPMENT-intensive sectors such as telecommunication

hardware. Strategic considerations become important when firms use partnerships to enter new product areas, especially ones with high technological and market risk.

RTPs have gradually developed a dominant position in high-technology industries since the early 1980s. During the 1960s, the share of high-technology industries (information technology, pharmaceuticals, aerospace and defence) was only between 20 and 40 per cent of the total, compared with about 50 percent for medium-technology industries (instrumentation and medical equipment, automotive, consumer electronics, chemicals). These shares slowly evolved in opposite directions during the 1970s, reaching 35-50 per cent for high-technology and 40 per cent for medium-technology industries. Since then, the share of high-technology industries in newly announced RTPs has reached 80 per cent while that of medium-technology industries has dropped to about 20 per cent of the total. By the late 1990s, information technology's share had reached about 50 percent of total recorded RTPs and the share of pharmaceuticals had reached approximately 30 per cent, whereas the share of the third high-technology industry (aerospace and defence) had dropped to 5 per cent of the total.

III. Partnership strategies for developing countries and economies in transition

It should not be surprising to observe significant differences in overall objectives between firms from developed and developing countries in international partnerships that link the two. Although it is difficult to generalize, firms from developed countries seek primarily to become familiar with and enter foreign markets, and to access competitively priced resources (the latter increasingly referring to semi-skilled or skilled labour). While foreign market entry may also be the ultimate objective of developing country firms, whose primary concern is to access resources and enhance their capabilities related to finance, technology, marketing and general international networking.

A. Information technology

A significant number of developing country firms have been able to enter various segments of the international information technology (IT) markets owing to the important opportunities for worldwide sourcing of IT products (both hardware and software) made possible by technological advances. Rapid technological change in both products and manufacturing processes, changing market requirements, and the continuing redistribution of cost factors for various IT products in favour of knowledge-intensive elements are altering the patterns of worldwide sourcing. They present developing countries with new opportunities to upgrade their industries and effectively compete in the international markets. These opportunities are opening up to more than a handful of East Asian newly industrializing countries which, starting in the 1960s with simple activities such as transistor radio assembly, have managed to break into significant segments of the IT markets. For example, firms from the Republic of Korea are at the cutting edge in terms of dynamic random access memories (DRAMs) technology and are driving hard into application-specific integrated circuits and liquid-crystal display screens; Singapore is the world's leader in the production of hard disk drives; Indian firms have carved out a significant niche for computer software and, although small, their minicomputer producers have impressive technological capabilities; and firms from Taiwan Province of China are very competitive in personal computer parts production, computer assembly and telecommunications

equipment. Numerous other developing countries are currently putting in place or upgrading their IT infrastructures and making a serious attempt to jump-start their indigenous electronics industries.

In order to develop a competitive electronics industry, developing countries must succeed in a number of strategic goals, which include shortening the cycle from technology development or acquisition to production and efficient distribution; achieving internationally competitive prices; maintaining high quality standards; and being responsive to, or even anticipating, market requirements.

Many developing countries usually lack the necessary breadth and depth of domestic industrial structure to sustain all the vertical activities involved in the production of IT products. Industries related to and supporting the nascent segments of electronics will almost certainly be missing. This obliges producers to depend on foreign sources not only for technology but also for intermediate components and production equipment. More often than not, home demand will be unable to absorb production to a level that provides domestic producers with the necessary economies of scale. Home demand may also turn out to be relatively unsophisticated, thus depriving domestic producers of the discipline imposed by the strict market requirements for advanced product characteristics and quality. Finally, if they rely only on arm's-length technology acquisitions (e.g. licensing), developing country firms will be able to obtain technology only for certain activities. Rather than state-of-the-art, these technologies will tend to be mature enough to have multiple sources and relate to well-understood processes. They will therefore not contribute sufficiently to accumulating experience and creating highly specialized human resources in order for developing countries to adopt the next generation of technology.

International strategic partnerships can provide multiple (and more reliable) sources for components and production equipment, enable the acquisition of advanced technologies, open doors to international financial resources, provide access to larger and more sophisticated markets, and raise quality requirements.

B. Partnership strategy examples

Several company examples are examined to see the potential role of partnerships in indigenous capacity-building in developing countries.

Samsung Electronics

Samsung Electronics, a unit of the Samsung group, gained a prominent position in the mid-1990s as the world's largest DRAM producer with its 4-megabit chip. Its success continued with the subsequent generations of 16-megabit DRAMs and 64-megabit DRAMs. Sensing its extensive exposure to the highly cyclical computer semiconductors industry, Samsung also made it a priority around the same time to diversify into application-specific integrated circuits (ASICs), multimedia products, liquid-crystal displays and telecommunications gear.

The transition from DRAM producer to a broad-based technology giant was rather difficult. As Samsung lacked the know-how to develop its own cutting-edge technology in most

of these areas, it relied on strategic alliances with United States and Japanese companies. It entered into agreements with General Instrument Corp. for the development and sale of digital televisions, AT&T for handwriting-recognition personal computers, and Fujitsu Ltd. to share technology in liquid-crystal displays. Over the years, Samsung has also acquired equity positions in several companies, such as LUX, a Japanese CAD/CAM producer, and Array, a United States company, to provide a better understanding of the United States desktop computer market, and AST Research, the American personal computer manufacturer. Samsung's challenge in telecommunications and in the next generation of information and video technology was addressed through heavy investment in RESEARCH AND DEVELOPMENT to enable it to adopt foreign technology for video-signal processing and through several deals with United States companies.

Partnerships have played a significant role in Samsung's recent development; its partners have included some of the biggest company names in the American, European and Japanese IT industries. The company continues to utilize such agreements to acquire technology, collaborate in the production of new technology, and enter new markets.

Acer

Acer is the largest manufacturer of personal computers in Taiwan, Province of China. Compared with the conglomerates mentioned above, Acer and its other Taiwanese counterparts are significantly smaller. However, the relatively small size of Taiwanese firms has not significantly disadvantaged them in competition with American, Japanese or Republic of Korea giants. In fact, Acer claims that its relatively small size produces real benefits: a generally solid infrastructure, low overheads and an inherently tight network of local suppliers.

Acer makes and sells PC-compatible machines under its own name, as well as being an original equipment manufacturing (OEM) supplier to major PC manufacturers worldwide. One of the company's short-term aims is to offer one-stop shopping to computer OEMs, from design work to creating complete computer systems.

On several occasions, Acer's management has revealed that the perception of "low quality, low price" that the "made-in-Taiwan" label still carries has undermined the company's efforts to penetrate global markets. As part of a strategy to increase international awareness of the Acer brand name, partnerships have been formed with companies such as Texas Instruments (TI) (its joint DRAM venture with TI has been the most visible) and Germany's Daimler-Benz (now Daimler-Chrysler). Acer has also allied itself with well-known integrated circuit (IC) partners such as Advanced Micro Devices (VLSI devices for PCs), Intel (licence technology to upgrade PCs), Motorola and National Semiconductor.

In the mid-1990s Acer and Canon formed a partnership to develop and produce low-priced notebook PCs equipped with built-in printers. This reflected Canon's strategic plans to enter the European, American and, ultimately, Asian markets for PCs. Acer's low-cost manufacturing expertise is to be combined with Canon's proprietary Bubble Jet super-compact printing technology.

Partnerships have also been useful in furthering Acer's ambitious plans for entering other developing country markets. For its expansion to India, it formed a joint manufacturing venture for computers with Wipro, one of India's largest IT groups. Wipro Acer Ltd. was established in Bangalore to manufacture and market Acer products under a Wipro-Acer brand name.

Tata

The Tata Group is India's largest conglomerate, with a presence in virtually every line of business, from cosmetics, computers and cement, to textiles, tea and trucks, and from fertilizers to hotels, construction, power generation and consulting (software, engineering). Tata is also well entrenched in the IT industry with successful joint ventures in the 1990s with IBM, Unisys and Honeywell. Tata Consultancy Services (TCS), which was formed three decades ago, is India's largest software export house.

Since domestic demand is not adequate, TCS was forced early on to look overseas. Its most visible success abroad was in securing the contract to automate the European stock exchange, in the face of stiff international competition. TCS is positioned as a provider of both quality and low-price services, and is closely following the Japanese experience with software factories. The company has successfully exploited India's low-cost labour and abundance of technically trained or skilled manpower to become a major player in computer software. It has set up offices overseas in order to come closer to customers. It has carried out work for large financial companies such as the Prudential and JP Morgan.

In addition, TCS has set up joint-ventures with various Western partners, such as one with now defunct Swissair to carry out ticketing and accounting work in India, and with Canada's Northern Telecom to develop software for telecommunications applications. The Tata Group also has operations in Singapore's engineering and IT industries. Its ambitious investment plans have included a joint venture with Singapore Airlines to operate an airline in India, and a stake in Bangalore's IT park by a consortium of Singapore companies led by Singapore Technologies Industrial Corporation.

Creative Technology

Based in Singapore, Creative Technology Ltd. is a leading supplier of multimedia products for personal computers and the developer of Sound Blaster, the industry's recognized standard for superior PC sound. The company develops, manufactures and markets a family of high-quality, affordable audio boards, video cards, desktop video communications tools, multimedia kits and productivity software. Founded only 20 years ago, Creative Technology already has several subsidiaries in North America and subsidiaries and associates in Europe, and countries including China, Japan and Australia.

Creative Technology sees itself alongside Microsoft and Intel as a "defining influence" in the PC business, and is active in various electronics areas, including audio, CD-ROM drives, signal processing technologies, speech technologies, video, video-conferencing, three-dimensional graphics, pointing devices, wireless networking and high-speed networking.

Creative Technology's strategy significantly depends on a series of partnerships with key players in the multimedia field. Partners have included the American software company Asymetrix (multimedia software), Singapore Telecom Equipment AST Research, 3DO, IBM, Digital Equipment Corporation and Microsoft. Technology licensing, exchange or co-development has been a part of all these deals.

Petrobras

The global oil industry's efforts to discover increasingly effective methods for discovering and extracting hydrocarbons in deep offshore areas have been greatly affected by the advent of new technologies such as IT and new materials. This has generated a growing number of agreements between large companies and between large companies and their suppliers that have seemed to help bring down innovation costs. The development could offer opportunities to developing country companies with good technological bases to acquire a place on the technological frontier, formerly controlled by a select group of leading developed country firms.

Offshore technology is in constant evolution owing to the need to produce oil and gas at increasing offshore depths. Several years ago, Petrobras faced the challenge of developing the Campos Basin and producing oil offshore in increasingly deep waters. Joining the club of firms with investments in subsea boosting systems meant a change in strategy. Petrobras was now required to stop relying exclusively on external technology and to try to transform itself into an organisation able to conceive its own technological solutions.

Petrobras decided to throw its lot in with no fewer than three different concepts, each with a range of different competing technologies, and pursue all of them through a series of international partnerships. Different kinds of agreements were reached for different technologies according to their stage of development. Three technology examples listed below, are indicative, from the least developed technology to the most well developed technology at the time:

- ◆ subsea multiphase flow pumping system (SBMS);
- ◆ subsea separation system (SSS);
- ◆ electrical submersible pumps in subsea wells (ESPS).

Petrobras has since collaborated with a series of foreign engineering and oil companies in these projects. They have included: Weir Pumps, Borneman, Westinghouse, Leistriz, AMOCO, Chevron, Oryx and Hardyoil in SBMS; Unicamp (Brazilian University), Boet, Agip, BP, Conoco, Elf, Mobil, Shell and Statoil in SSS; and Tronic, Reda-Lasalle, Pirelli do Brasil, Sade-Vigesa, Cooper, Siemens and Cameron.

Willingness to enter the select group of international innovators in subsea boosting technology forced Petrobras to activate strategy and considerable resources. Collaboration was used extensively as a mechanism to decrease costs, share risks, learn and leapfrog. Importantly, however, each of the three alternative technological systems represented a different cooperative strategy, depending on the particular stage of development. Petrobras took more upfront positions in the better developed technology (ESPS), where it led the consortia. It took a more diversified approach in the middle technology (SSS). It played more conservatively (even though

actively) in the least well developed technology (SBMS). Pursuing three technological approaches to the problem simultaneously helped Petrobras hedge its bets. Working with others helped hedge the bets even more widely. Overall, the company managed to learn extensively and to take significant steps forward in a relatively short period to become a major international innovator in the area of deep sea oil production.

IV Pilot projects, policy measures and programmes that promote networking

Inter-firm partnership can potentially contribute to the more effective integration of developing countries' firms into the world economy. Firms in least developed countries in particular do not have the funds, trained human resources or infrastructure to pursue a technology-based innovation process completely on their own. Experiences of newly industrializing developing country firms could reveal some of the dynamics that make partnerships work. From these experiences it might be possible to develop mechanisms to transfer "best practice" in partnering activity and diffuse mechanisms that could provide the backing for inter-firm partnerships.

For partnership agreements to be successful, there needs to be a variety of supportive measures by Governments and business communities. In recent periods a number of national and international incentive schemes have been put into operation in developed countries, with some of them especially directed to developing countries and transitional economies. North-South inter-firm cooperation thus becomes part of a three-way partnership in which Northern Governments and international organizations play a critical supportive role.

There are a number of pilot projects, mechanisms and programmes addressing issues such as financing of the various phases of technology transfer, creating awareness, finding partners, launching specific transfer processes and encouraging RESEARCH AND DEVELOPMENT institutions to transfer technology. For example, the United States Agency for International Development (USAID) supported a five-year University-Industry Linkages and Economic Development Programme. This was designed to ensure collaboration between Northwestern University in the United States and the Autonomous University of Yucatan in Mexico, focusing on linkages between each university and each local productive sector. Its objectives were to develop joint research capabilities as well as an academic programme in technology and organizational performance, and to extend extension programmes of the Mexican university to assist local manufacturers.

The Technology Partnership Initiative (TPI), a British programme funded by the Official Development Assistance (ODA), promotes inter-firm cooperation in the area of environmental technology. It promotes technology cooperation between British and developing country firms in the area of environmentally sound technologies (ESTs). The TPI's main aim is to promote direct access by developing countries' businesses and newly industrialising economies to information about ESTs available in the United Kingdom, and about the companies that produce them.

The TPI has established a number of criteria for promoting partnerships. The technologies involved have to be affordable; they have to be appropriate to the needs of a wide

range of industrialising developing countries; and they have to enable businesses operating in developing countries to grow in accordance with sustainable development principles. The TPI mainly works as an information clearing-house, but also carries out more direct activities such as training seminars.

Partnerlink Programme, a Finnish programme promoting inter-firm linkages between Finnish and foreign companies concentrates mostly on contacts with other advanced industrialized countries; more recently, it initiated linkages with China. The programme is aimed at commercializing Finnish innovations in international markets and assisting, in particular, innovative SMEs and the business service organizations that aid them (including consultants, technology centres, development companies, chambers of commerce and industry associations). Each project has to secure at least one strategic alliance agreement between Finnish and foreign companies. The programme promotes the internationalization of SMEs and business service organizations; the latter are to become part of a functioning international contact and expert network. The Partnerlink Programme is made up of individual projects involving European countries, the United States, China, the Republic of Korea and Australia. Each project involves several companies and one or more business service organizations, the role of the latter being to seek potential foreign cooperation partners for Finnish companies in collaboration with foreign service organizations, and to participate in relevant negotiations. Client companies are sought out among technology-intensive firms, and use is made of Finnish industrial attachés and commercial counsellors and secretaries based in foreign countries.

Some of these initiatives such as the TPI primarily target newly industrializing countries. Can the new inter-firm alliances be further extended to include a larger number of enterprises in developing countries, including least developed countries (LDCs) and economies in transition?

A number of United Nations organizations have aimed at supporting inter-firm cooperation, e.g. the United Nations Organisation for Industrial Development (UNIDO), which organizes programmes and events such as techmarts, investmarts and intechmarts, and has prepared tools to assist in the partnership process. UNCTAD has also been contributing to examining the potential of inter-firm cooperation, both in North-South and South-South contexts. Examples of this work include two workshops, held in Geneva in 1995 and in Helsinki in 1996, on various aspects relating to technology partnerships; and the first Subregional Workshop on Asia-Africa Trade, held in Zimbabwe in November 1997, which provided opportunities for entrepreneurs from different regions to meet and to network among themselves. The UNCTAD Asia-Africa Cooperation project included workshop and study tours in Indonesia and Thailand in November 1996, and thus provided, for example, the possibility for a fashion designer from Ghana to establish a quality design network with South-East Asian companies. A number of inter-firm linkages have also been initiated through the UNCTAD EMPRETEC programme, including enterprise networking between Asia and Africa, with a particular emphasis on small-and-medium-sized enterprises (SMEs). SMEs can also find partners for joint-ventures and other types of inter-firm cooperation through the electronic trading opportunities system of the UNCTAD Global Trade Point Network (GTPNet).

Similarly, a Yale University initiative, in collaboration with the United Nations Development Programme (UNDP), supports the creation of public-private partnerships to tackle

water, sewage and energy problems in urban environments. The project emphasizes eco-efficiency, stakeholder participation and replicability. It uses ODA to leverage private sector investments by creating joint-ventures, while building an effective enabling environment with solid supporting mechanisms at the same time.

In addition to assistance from bilateral sources and UN agencies, regional bodies have supported partnering activity. The European Union, for example, plays a dynamic role in supporting partnerships concerning technology, production and marketing and promoting technology transfer and trade for SME development at various levels. Various specific programmes backed by the European Union function within the framework of ECIP (European Community Investment Partnership), which has as its main objectives to encourage investment by European firms in Asia (through the ASIA-INVEST Programme), in Latin America (through AL-INVEST) and in the Mediterranean countries (through MED-INVEST). The ECIP programmes operate via a network of financial institutions and mainly facilitate four critical stages of business investment: (i) project identification and the search for potential partners, working through chambers of commerce, trade associations and public institutions providing support to enterprises; (ii) preparation prior to the setting-up of a partnership, e.g. partner search; (iii) financing of capital requirements; and (iv) development of human resources, training and management assistance. Also supporting inter-firm partnerships, the Trade and Technology Information Promotion System (TIPS) operates a computerized technology support company for various regional programmes throughout the world, with the assistance of the European Union.

Support to inter-firm partnerships has also been provided by the European Union through the Centre for the Development of Industry (CDI). The latter is an EUACP (European Union-Africa, Caribbean and Pacific) joint institution financed by the European Development Fund under Lomé Convention provisions.

The Organisation of American States, within the framework of the Partnership for Development of the Americas, focuses among other things on science and technology cooperation, and provides support to the improvement of scientific partnerships and technological ventures in the region. In addition, it pursues new partnerships in the field of sustainable development, including the facilitation of information exchange on environmentally sound technologies. In Asia, and parallel to a process which is market-led and where the main actors are networks of firms and corporations regionalizing production, a more formal institutional process led by Governments is drawing together agents from public and private sectors into enhanced regional economic cooperation projects. Organizations such as the Association of South-East Asian Nations (ASEAN), the East-Asian Economic Caucus (EAEC)-ASEAN plus Japan, the Asia Europe Meeting (ASEM) and the Asia-Pacific Cooperation grouping (APEC) have established diverse forums for promoting new forms of cooperative ventures, including those among firms.

Since 1992, when it opened its doors in eight Latin American countries, the Programa Bolivar -- backed by the Inter-American Development Bank -- has been promoting international partnerships with businesses in Latin America and the Caribbean. It has been operating a mechanism in different countries to bring together two or more parties in doing business: buyers and sellers, innovators and financiers, promoters of ideas and those offering practical

applications. In every case the programme operates transnationally, as it is seen as instrumental in allowing small and medium-sized companies to go international and achieve competitiveness.

V. Conclusion

The proliferation of partnerships during the two decades has raised expectations of accelerated growth through faster access to markets and technologies and greater learning possibilities. There is evidence that inter-firm partnership can be extremely useful in assisting developing countries in their efforts to catch up. Partnerships can speed up the process of establishing competitive indigenous industries. They can also play a major role in mobilizing the necessary resources and technological expertise to upgrade lagging infrastructure.

As shown in this paper, data on formal partnerships show that the vast majority of them involve participants from developed countries. An increasing number, but still a minority, of cases involve participants from a few countries in the upper echelon of newly industrializing countries, some countries with economies in transition with significant industrial capabilities, and some developing countries with large domestic markets and/or relatively low-priced resources (increasingly semi-skilled and skilled human resources). While part of this skewed distribution undoubtedly reflects data collection bias, formal partnerships do not seem to reach most developing country firms. Not until now, at least.

There are a number of policy options for Governments wishing to increase partnering and hence the competitiveness of firms. However, all the options are dependent on the Government first creating an enabling business environment for partnering which includes not only the usual macroeconomic stability, and legal and regulatory framework, but also the physical and social infrastructure in terms of communication, transportation and, more importantly, education and training for building industrial and technological capabilities. Once the Government has provided for such an enabling environment, it can pursue various options via public/private sector partnerships. The options include specialized skill development, provision of business development services to SMEs to make them partnership-ready, and foreign direct investment strategies which target TNCs interested in partnering and identification of SMEs with high potential for such arrangements. This, however, will reach only a certain elite group of local firms. For the majority of SMEs, other options are needed to end their isolation and put them on the road to technological upgrading and competitiveness.

However, available anecdotal evidence also strongly indicates that informal partnering probably accounts for an overwhelming share of partnering activity in industry. It involves firms and other organizations across the board, but it especially involves SMEs in proximate geographical areas. It seems quite probable that informal partnering through networks and clusters is an alternative way for many relatively disadvantaged developing country firms to become stronger and more competitive, and to meet the minimum prerequisites in terms of capabilities in order to graduate to formal partnerships. Governments would be wise to consider addressing most developing country SME problems related to size and competitive position through networks (often more vertical, supplier/buyer relationships) and clusters (often regional, more horizontal, agglomerations). It seems quite probable that more informal partnering through linkages, networks and clusters is a way for many firms in developing countries to increase their

sophistication and become stronger and more competitive, thus gradually preparing for more formal partnerships.