

E/CN.16/2001/Misc. 4
22 May 2001

ENGLISH ONLY

COMMISSION ON SCIENCE AND TECHNOLOGY
FOR DEVELOPMENT

Fifth session

Geneva, 28 May-1 June 2001

PARTNERSHIPS AND NETWORKING IN SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Paper prepared by the UNCTAD secretariat*

* The secretariat would like to acknowledge the contribution of Mr. Nicholas Vonortas, Director, Center for International Science and Technology Policy and Department of Economics of the George Washington University, to this paper.

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EXECUTIVE SUMMARY

In its resolution 1996/61, the Economic and Social Council requested the secretariat of the Commission on Science and Technology for Development (CSTD) to identify and analyse best practices in partnerships and networking in order to inventory opportunities in the area of international science and technology. This report has been prepared pursuant to that request.

The confluence of important developments in the international economic environment during the past couple of decades has turned inter-firm cooperation into an important mechanism of business interaction and for accessing markets and technology around the world. Particularly in high- and medium-tech industries, the private sector has increasingly used various kinds of cooperative agreements, such as joint ventures, joint research and development (R&D), technology exchange agreements, co-production, direct minority investments and sourcing relationships, to advance core strategic objectives. Called partnerships or alliances in this document, such agreements 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 parties. When R&D is a focus of the partnership, universities and other research institutes may also participate.

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. Available evidence, however, shows that although developing country firms have increased their participation significantly, partnerships are still overwhelmingly concentrated in developed countries. It also shows that a rather small group of developing countries and emerging economies have benefited disproportionately more than others. The primary beneficiaries have tended to be a few newly industrializing countries (NICs) and countries in transition with significant capabilities and domestic markets. Expectations for widespread opportunities for developing countries leading to economic convergence thus seem not to have materialized.

Although indicative, such evidence should be interpreted carefully. Not only are the underlying data subject to significant biases, but also the nature of recorded partnerships has been changing dramatically. Rather than equity-based, the vast majority of partnerships during the past couple of decades have been contractual agreements, catering to the pressing need for strategic flexibility in high-tech sectors. An argument could be made that now contractual agreements can work in favour of developing country firms as they require less commitment and get closer to informal kinds of cooperation. In addition, as reflected in the examples of partnering strategy in this report, one can find numerous cases of firms operating in developing countries and emerging markets that have succeeded in raising their technological capabilities and business competitiveness significantly through extensive cross-border partnering and networking.

Analysts may, in fact, have overreached in trying to extrapolate from the experience of developed countries in forming expectations for developing countries. More specifically, they may have paid too much attention to formal forms of partnering – involving explicit contracting

among parties, with or without shared equity investment – and relatively inadequate attention to various forms of informal partnering among organizations and among individuals. Anecdotal evidence strongly indicates that informal partnering probably accounts for an overwhelming share of partnering activity in industry, involving extensively SMEs in proximate geographical areas.

Formal and informal partnering should be seen as a continuum, where formal inter-firm cooperation, clustering and networking are perceived as alternative, and often complementary, modes of operation. The important message here is that the requirements of formal partnerships – including strategy formulation and significant partner contribution in tangible and/or intangible resources – may be placing the bar too high for the majority of (mainly small) firms in most developing countries. That leaves a whole spectrum of other cooperative interactions for these economic agents to pursue. 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. The *World Investment Report 2001* explores the benefits of linkages between large and small firms as well as public-private sector programmes to promote them. This paper is devoted to partnering and networking in general.

There is a whole set of policy options regarding inter-firm cooperation available to Governments. In addition, the policies that a Government should choose will depend on the country's development stage, internal technological capabilities, and specific business environment and structure. Unsurprisingly, one size does not fit all.

For firms that do graduate to formal partnerships, the report provides a road map to harnessing the potential of partnerships to promote technological capabilities and economic competitiveness. Key lessons for success include the following:

- Clearly understand the strategic objectives of the firm;
- Clearly determine the firm's needs from the partnership;
- Negotiate a suitable agreement;
- Treat the partnership agreement as a "living" document;
- Understand that the comparative advantages of partners at the outset of the agreement may change over time;
- Be aware that technology transfer is one of the most sensitive and contentious issues. Create clear provisions for a framework of technology use in the partnership;
- Partnership agreements must contain sound provisions for dispute resolution and, in the event of irreconcilable differences, the exit mechanism to be employed in terminating the partnership;
- Monitor and review the partnership throughout its lifetime.

For these firms, policymakers and international organizations have important roles to play in terms of spreading the message of partnership opportunities, on the one hand, and creating a supportive environment, on the other.

I. INTRODUCTION

Since the first half of the 1980s, when the first data were put together to map the sudden burst of inter-firm cooperation, it has been established beyond a doubt that partnerships have become a very important mechanism of business interaction and market and technology access around the world. A proliferating literature in economics, business and policy has tried to identify and interpret the important features of cooperation among firms, universities, and other public and private organizations.¹

In high- and medium-tech industries, the private sector has increasingly used various kinds of cooperative agreements – such as joint ventures, joint research and development (R&D), 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 are referred to here as partnerships (alliances). They involve mutual dependence and shared decision-making between two or more independent firms. When R&D is a focus of the partnership, universities and other research institutes may also participate.

A set of developments in the international economic environment has underlined the explosion of business partnerships since the late 1970s. Four changes in particular seem to be key.

1. **Globalization.** Transnational companies have pushed relentlessly into new product and geographical markets.
2. **Technological change.** The pace of technological advance has accelerated significantly, partly as a result of increasing competition through globalization and the spread of information technologies. In addition to being an outcome of competitive pressures, however, technology is an enabler of globalization. Technological capabilities have diffused around the world more widely than ever before.
3. **The notion of “core competency”.** Increasing international competition and the faster pace of technological advance have robbed firms of their ability to be self-sufficient. The popular concept currently is to do internally what a company does best and outsource the rest through partnerships.

¹ For recent literature reviews see Caloghirou (2000), Gomes-Casseres (1996), Hagedoorn, Link and Vonortas (2000), Vonortas, (1997 and 2000), and the proceedings of a workshop on strategic business partnership indicators held on 13 October 2000 in Washington, DC, with sponsorship from the United States National Science Foundation.

4. **Economic liberalization and privatization.** This process has led to unprecedented international flows of capital and financial resources. Cross-border mergers and acquisitions and other kinds of foreign direct investment have achieved all-time records (\$1.2 trillion in 2000). Developing countries have managed to increase their share of the intake (but the distribution among them is highly skewed).

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, 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 escape.

The available literature on business partnerships and networking has tended to concentrate on developed countries for a simple reason: their firms have dominated world partnering records, at least as currently accounted for.² This is no surprise given that the same firms also dominate international trade and investment. For the same reason, while firms from developing countries have become increasingly visible in world partnerships, the distribution still heavily favours newly industrializing countries (NICs) and a few countries in transition (Vonortas and Safioleas, 1997).

A series of recent publications by UNCTAD offer interesting viewpoints on partnering and networking for national capacity building in developing countries (UNCTAD, 1999a, 1999b, 2000a, 2000b). UNCTAD (2000a) in particular very appropriately emphasizes the continuum of partnerships, networking and clustering. Reporting the outcomes of several intergovernmental and other expert group meetings in the late 1990s, these publications refer to a wide variety of experiences that the interested reader would find useful and should definitely consult.³

This paper contributes to the applied side of this discussion. Its primary purpose is to describe how the potential of partnerships can be harnessed to support technological prowess, economic competitiveness and national capacity building. As such, the paper takes a closer look at what it means to have a partnership and how to enter it, manage it and terminate it. The discussion is complemented with several cases of partnerships and partnership strategies that

² This is not to say that references to partnerships in developing countries and countries in transition are missing altogether: see, e.g. Freeman and Hagedoorn (1994), Lee and Beamish (1995), Rondinelli and Black (2000), Si and Bruton (1999), and Vonortas (1998). It should be mentioned that various factors related to data collection bias available databases on alliances against smaller firms and developing countries.

³ Another type of literature, perhaps equally interesting, deals with research networks as an organizational mechanism for linking scientists and institutions within and across countries (Engelhard and Box, 1999). The topic is beyond the scope of this paper.

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 will refer to a few examples of public policy that promote networking.

The paper is divided into five sections. The next (second) section defines and classifies partnerships. It focuses on research and technology partnerships (RTPs), which concentrate primarily on the generation, exchange, adaptation and exploitation of new technology. Such partnerships are of primary interest for national capacity building. The third section reveals global partnership trends during the past couple of decades. It also illustrates the RTP activity of firms from developing countries and economies in transition. The fourth section focuses on best practice: it discusses factors and dynamics leading to successful partnering. The fifth section sets out examples of partnerships and partnership strategies of developing country firms. Finally, the sixth section concludes with lessons learned and a suggestion for linking partnerships into the broader net of formal and informal cooperation featuring in the literature on clusters and networks.

2. DEFINITIONS

The term “strategic alliance” (strategic partnership) was introduced in the 1980s to describe the multitude of forms of agreements between firms, universities and research institutes that analysts had started to observe. Strategic partnerships refer to agreements whereby two or more partners share the commitment to reach a common goal by pooling their resources and by coordinating their activities.

Partnerships denote some degree of strategic and operational coordination and may involve equity investment. They can occur vertically across the value chain, from the provision of raw materials and other factors of production, through research, design, production and assembly of parts, components and systems, to product/service distribution and servicing. Or, they can occur horizontally, involving competitors at the same level of the value chain. Partners may be based in one or more countries, in the latter case creating an international partnership.

It should be stressed that a first major distinction is between formal and informal partnerships. Very little is known about informal partnerships, apart from anecdotal evidence that (a) many firms informally partner with one another in short-term business endeavours, and that (b) informal partnerships may account for the vast majority of all partnerships. Informal partnerships are unfortunately almost impossible to track down systematically; they fall more in the realm of clusters and networks, to which we will return in the concluding section. The main discussion in this paper relates to formal partnerships.

Among formal partnerships, a narrower set can be characterized as innovation-based, focusing primarily on the generation, exchange, adaptation and exploitation of technical advances. Called research and technology partnerships (RTPs), these arrangements are of primary concern to both developed and developing countries as a result of the expected direct contribution to national capacity building.

There are various ways to classify partnerships in general and research and technology partnerships in particular. One way, proposed by John Hagedoorn, is on the basis of different levels of organizational interdependence between partners. The major categories include:

- *Joint ventures*, including the creation of a separate organizational entity to promote the common economic interests of two or more parent companies. Profits/losses are usually shared on the basis of the equity exposure of the parent companies. Joint ventures may involve any function, including R&D, production, marketing and sales.
- *Joint R&D pacts and joint development agreements*, including contractual relationships to undertake jointly funded R&D or jointly work on the development of new products or processes.
- *Customer-supplier relationships*, including co-production contracts and co-makeship relations that regulate long-term contracts between independent, vertically related companies. R&D contracts, where a company subcontracts another to carry out a specific R&D project, are also included in this category.
- *Second-sourcing*, including agreements that regulate technology transfer through product specifications. Mutual second-sourcing involves transfer of technical specifications between two or more companies for different products.
- *Licensing*, including agreements that provide unilateral technology access in return for a fee. Cross-licensing usually involves swapping of packages of patents.

The first category includes equity agreements; the remaining four categories are contractual agreements. RTPs in any category can be either national or international.

One can already observe certain desirable partnership characteristics in relation to national capacity building. First, RTPs are preferable to partnerships with no technological content. Second, a gradual progression from simpler, close-to-market RTPs (e.g. one-way licensing) towards more involved, higher value-added RTPs should be desirable. Third, moving gradually in the direction of RTPs with higher levels of organizational interdependence and more critical roles for developing country partners should also be desirable.

3. 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. This section draws on very recent surveys and on original data to piece together the current view of the recorded international partnering activity and its evolution during the past few decades. The first part discusses trends in international partnering during the 1990s. The second part discusses global trends in RTPs specifically during

the past several decades. The third part looks closer at RTPs involving partners from developing countries and economies in transition.

3.1 International partnerships⁴

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 foreign direct investment 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 R&D 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 members of the Organization for Economic Co-operation and Development (OECD) were involved in more than 92 per cent of world partnerships during the 1990s. Firms from the United States, Japan, the United Kingdom, Canada and Germany were the most active.

North American firms, most of them United States-based firms, were involved in approximately two thirds of world partnerships in the 1990s, with Asian and European firms involved in one third and more than one fourth respectively. More than half the partnerships involving North American firms were confined to North America; an additional 20 per cent were with Asian partners and a further 16 per cent were with European partners. Organizations from Japan, the United Kingdom, Canada, Germany and China accounted for three fifths of the international partnerships of United States based firms. During the decade, United States firms decreased their partnerships with Asian firms, kept stable the number of partnerships with European firms, and dramatically increased the number of partnerships with Canadian and Australian firms. North American firms were the most preferred partners for both Asian and European enterprises.

The last decade witnessed a large increase in contractual and service sector international partnerships. Close to three fifths of the cross-border partnerships of United States firms during the 1990s were contractual. Partnerships involving manufacturing firms accounted for 48 per

⁴ This part draws on Kang and Sakai (2000). It is based primarily on partnership data of Thompson Financial Securities.

cent of total United States partnerships during that decade. Services represented 43 per cent. Service sectors have increased their participation dramatically. Starting with 18 per cent of United States cross-border partnerships in 1990, service firms ended the decade holding 67 per cent of the total. In almost a mirror image, the share of manufacturing firms in United States cross-border partnerships fell from 63 per cent in 1990 to 27 per cent in 1999.

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. Firms motives for partnering differ among sectors. In information and communication industries a major driving force towards international alliances seems to be the effort to develop new global product and system standards. In pharmaceuticals, cost reduction and speed to market seem to be major drivers of the international partnering activity. In the automotive sector, securing sufficient financial resources to develop state-of-the-art technologies for environmentally friendly vehicles, achieving economies of scale in production and accessing markets appear to be the major drivers. Finally, in the airline industry, cost savings through investment in common systems of reservations, ticketing and client services appear to be the main driving force for international partnering.

3.2 Research and technology partnerships⁵

A major development in the past couple of 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 R&D 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 developments appear to be more significant in capital- and R&D-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.

During the 1960s, newly established RTPs recorded in the MERIT-CATI database did not exceed ten per year. By the early 1970s, the number had risen to about 30; it had jumped to about 150 at the end of the decade. Sharp increases were recorded during the 1980s, reaching about 500 deals at the end of the decade. A short respite in the first couple of years in the 1990s was followed by yet another increase in new RTP announcements, reaching a peak of around 700 in 1995. Annual announcements of RTPs fell back to about 500 in the second half of the past decade.

The share of equity-based RTPs in the total has followed the reverse course. From almost 100 per cent in the mid-1960s, it fell to about 70 per cent in the 1970s, about 40 per cent in the

⁵ This part draws on Hagedoorn (2000) and Hagedoorn, Link and Vonortas (2000). It is based on partnership data from the MERIT-CATI database.

1980s, 20 per cent in the early 1990s and 10 per cent in 1998. In other words, the growth of RTPs has reflected an overwhelming increase in the numbers of contractual partnerships.

RTPs have gradually developed a dominant position in high-tech sectors since the early 1980s. During the 1960s, the share of high-tech sectors (IT, pharmaceuticals, aerospace and defence) was only between 20 and 40 per cent of the total, compared with about half for medium-tech sectors (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-tech and 40 per cent for medium-tech. Since then, the share of high-tech sectors in newly announced RTPs has reached 80 per cent while that of medium-tech sectors has dropped to about 20 per cent of the total. By the late 1990s, information technology's share had reached about half of total recorded RTPs and the share of pharmaceuticals had reached approximately 30 per cent, whereas the share of the third high-tech sector (aerospace and defense) had dropped to 5 per cent of the total.

A number of important developments have been identified. First, contractual RTPs have become prevalent. Second, high-tech sectors strongly prefer contractual RTPs, relative to medium- and low-tech sectors. Third, the share of international RTPs has edged downward in the last 10-15 years, while the share of intra-North America RTPs has increased (particularly in IT and pharmaceuticals). Cross-border partnerships currently account for approximately half of the total recorded RTPs. Fourth, United States predominance in RTPs is recent. The importance of the intra-North American RTPs is a relatively recent phenomenon: during the 1990s, the share of intra-North American RTPs jumped from less than 25 per cent to 41 per cent of the total. At the same time, the share of intra-European RTPs dropped from about 27 per cent in the 1970s, to 19 per cent in the 1980s and 11 per cent in the 1990s. The share of European-North American RTPs rose to about 25 per cent of the total during the 1990s.

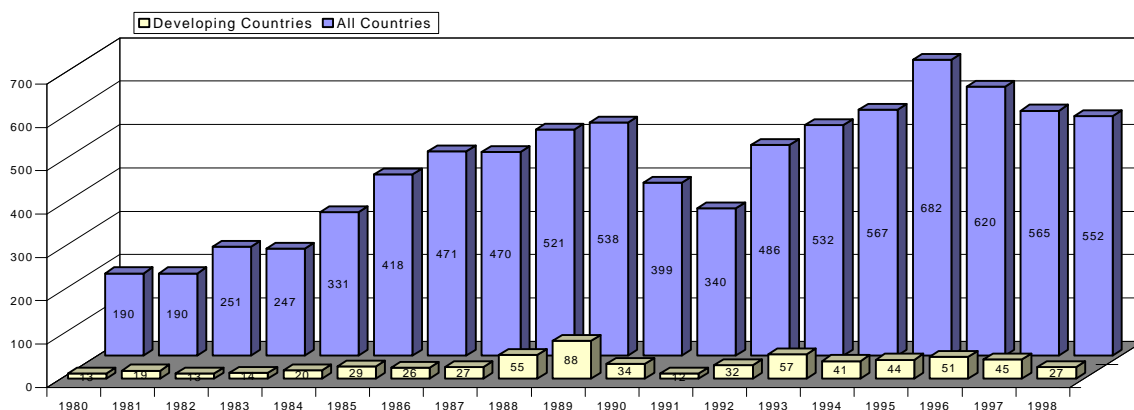
3.3. RTPs for developing countries and economies in transition

This section differentiates between RTPs partnerships with at least one partner from a developing country and/or an economy in transition and the rest.⁶ The evolution of new RTP announcements during the past two decades (1980-1998) is shown in figure 1. Starting from a rather small base, developing countries have managed to increase this kind of technology- and R&D-intensive partnerships. The increase has not been very rapid, possibly reflecting the fact that technological and R&D capabilities develop only slowly. The share of developing countries in all types of partnerships is higher than their share in RTPs shown here.

Figures 2a and 2b graph the same time series in two separate sets while differentiating between equity and non-equity (contractual) agreements. The overall relative increase in the importance of contractual RTPs has carried over to developing countries more recently. Equity arrangements had clearly dominated developing country RTPs until the mid-to-late 1980s.

⁶ Historical data from the MERIT-CATI database are used for comparison. In this paper, Israel, Mexico and the Republic of Korea are included in the group of developing countries.

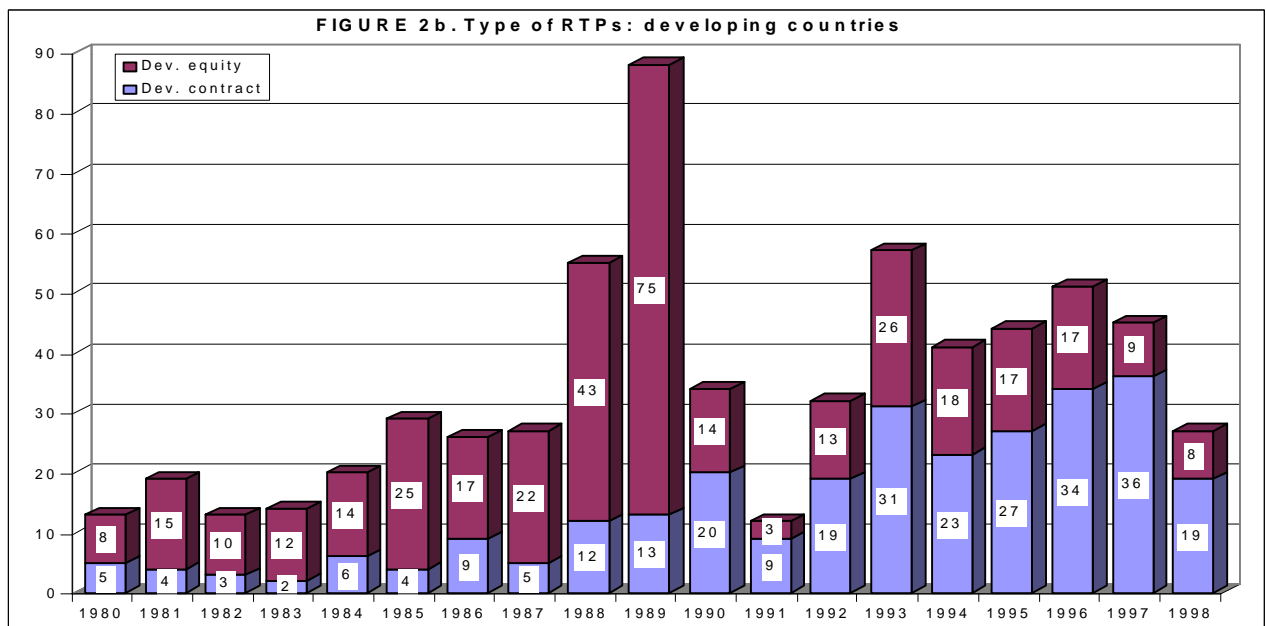
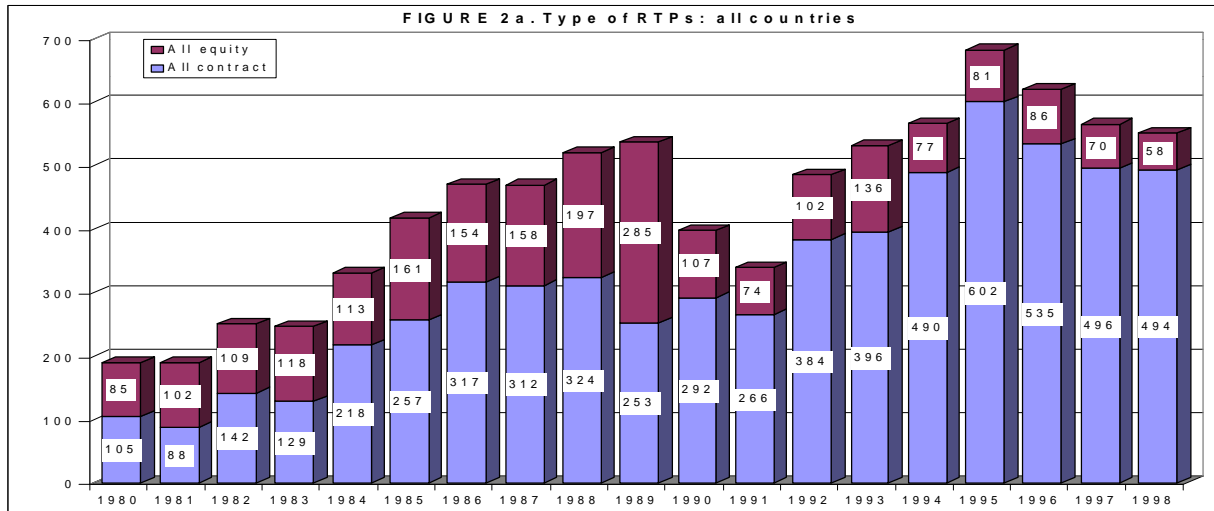
FIGURE 1: Research and technology partnership announcements

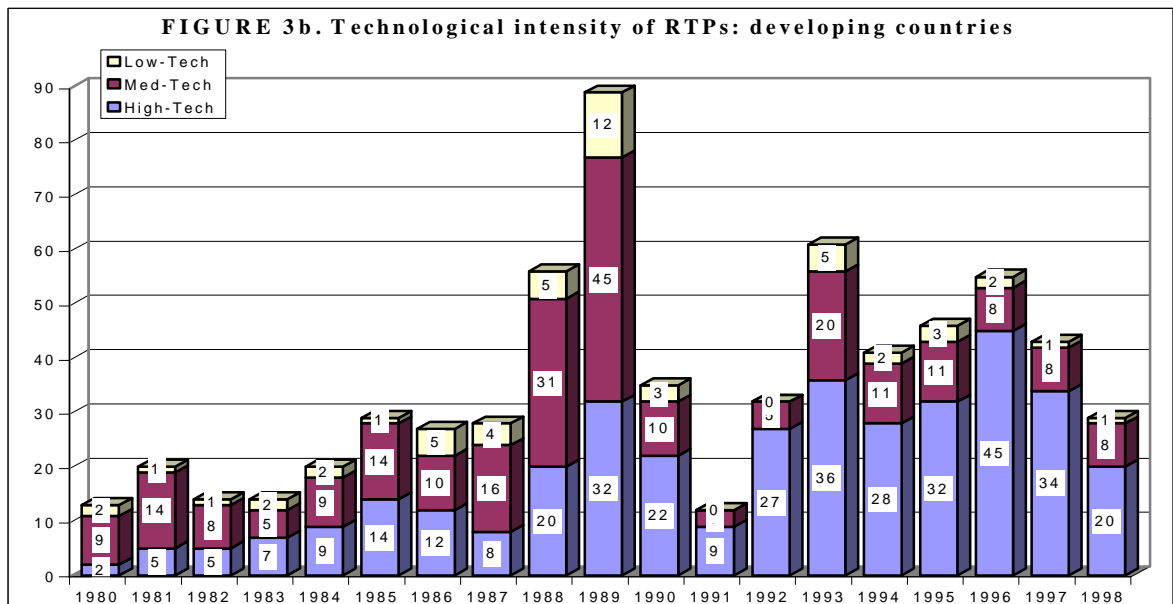
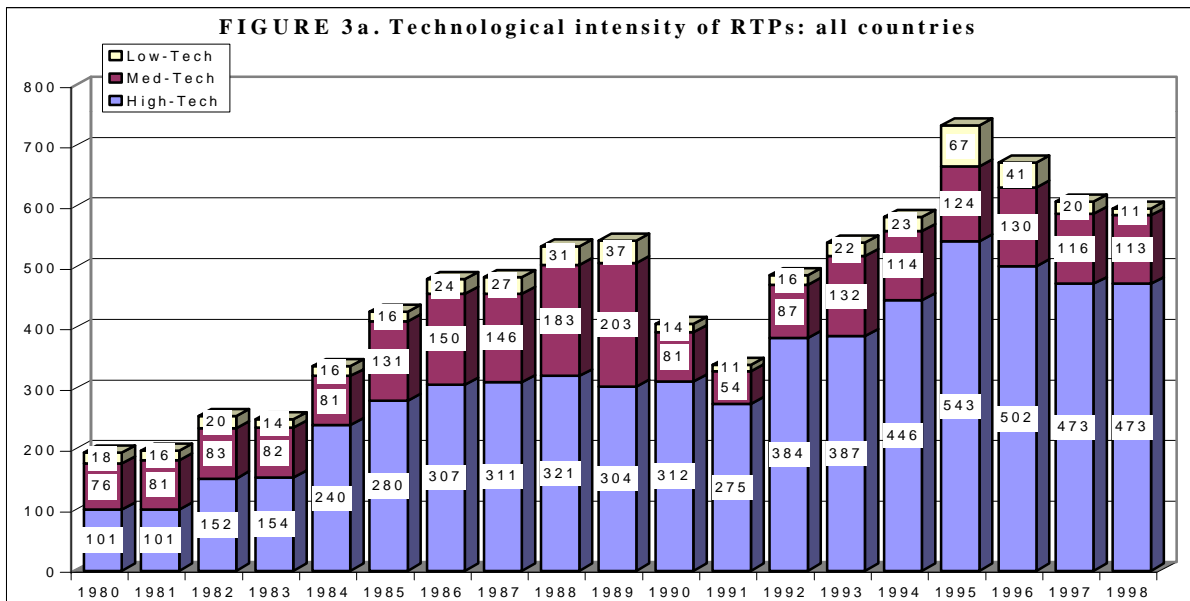


Figures 3a and 3b break down the data into high-tech, medium-tech and low-tech. Again, a time lag is indicated. Whereas high-tech has dominated RTPs around the world since the early 1980s, it has started dominating developing country RTPs only since the early 1990s. Medium-tech was prominent in the 1980s but has since kept a lower profile.

The distribution of recorded RTPs between individual countries or territories is very skewed, reflecting the industrial and technological sophistication of a country/territory (figure 4). Figure 5, which focuses on the six most active economies, also indicates a relationship between general business expectations and the number of recorded RTPs. The two periods of investor “exuberance” with the Russian Federation are clearly visible, as is the general drop in Asian RTPs during the time of financial crisis later in the 1990s.

Finally, tables 1 and 2 list the most active companies in the two data sets. As expected, large transnational corporations dominate both sets. However, the difference in the number of recorded agreements indicates the opportunities ahead for developing countries and economies in transition.





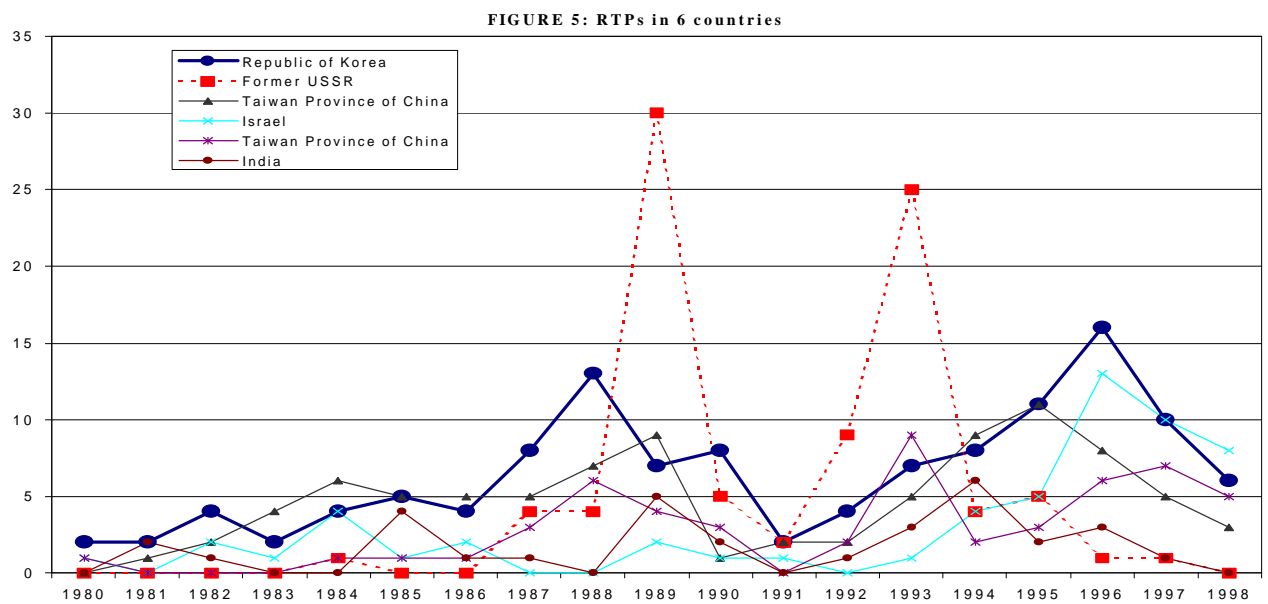
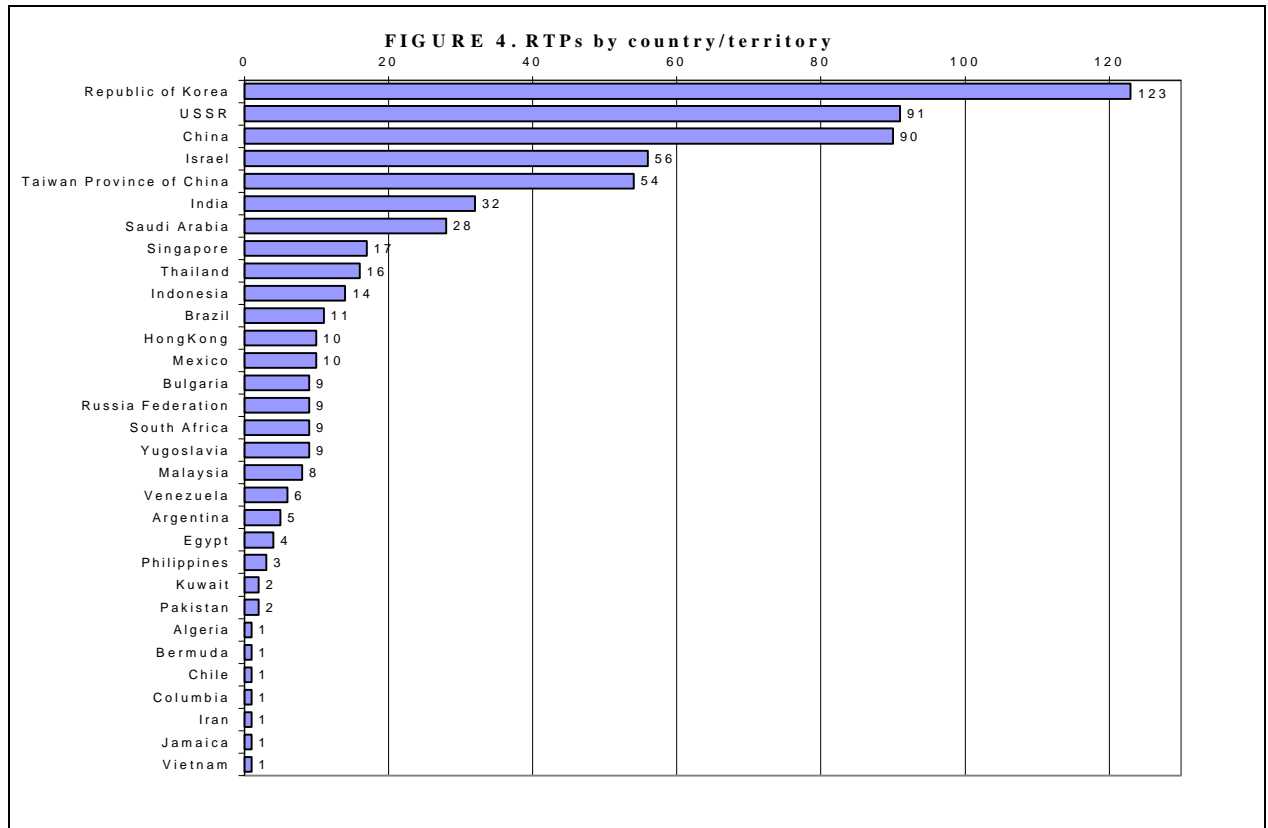


TABLE 1: 25 Most RTP- active firms in the world

Firm	Country	No. of partnerships
Int. Business Machines Corp. (IBM)	United States	316
Siemens A.G.	Germany	244
Philips Gloeilampenfabrieken N.V.	Netherlands	208
Mitsubishi Corp	Japan	202
Hewlett-Packard Co.	United States	196
Sumitomo Corp	Japan	186
Dai-Ichi Kangyo Bank (DKB) Group	Japan	167
General Motors Corp.	United States	166
Compaq Computer Corp.	United States	155
American Telephone & Telegraph Co.	United States	153
Toshiba Corp.	Japan	149
General Electric Co. (GE)	United States	140
Thomson S.A.	France	137
Daimler-Benz A.G.	Germany	133
Microsoft Corp.	United States	133
Sun Microsystems	United States	132
Motorola Inc.	United States	126
Du Pont de Nemours	United States	117
Hitachi Ltd.	Japan	115
Intel Corp.	United States	114
Hoechst A.G.	Germany	112
Mitsui Group	Japan	98
Rhône-Poulenc	France	98
Texas Instruments Inc.	United States	91
Dow Chemical Co.	United States	89

TABLE 2: 25 Most RTP-active firms in developing countries

Firm	Country	No. of partnerships
Samsung Co.Ltd.	Republic of Korea	27
Hyundai Corp.	Republic of Korea	18
Lucky Group Ltd.	Republic of Korea	16
Saudi Basic Industries Corp.(SABIC)	Saudi Arabia	16
Daewoo Corp.	Republic of Korea	12
Samsung Electronics Co	Republic of Korea	12
China Petrochemical (Sinopec)	China	7
Israel Aircraft Industries LTD	Israel	6
Acer Corp.	Taiwan Province of China	5
Kia Motors Corp.	Republic of Korea	5
Ministry of Oil Ref.& Petroch.Ind.	Former USSR	5
Orckit Communication	Israel	5
Temasek Holdings PTE LTD	Singapore	5
Amati Communications Corp	Israel	4
CATIC China Aerotech Imp/Exp Corp	China	4
Israel Military Industries IMI	Israel	4
Macronix International Co	Taiwan Province of China	4
Mikoyan Design Buro	Former USSR	4
NPO Energia	Former USSR	4
Beijing Jeep Corp.	China	3
China Aerospace Corp.	China	3
Daewoo Motor Co.Ltd.	Republic of Korea	3
Denel	South Africa	3
ECI Telecom	Israel	3
Embraer	Brazil	3
Golden Hope Plantations Berhad	Malaysia	3
Israel Aerospace Industries	Israel	3
Klimov Corp	Former USSR	3
Koor Industries	Israel	3
Kumho Petrochemical Co.	Republic of Korea	3
LG Chemical Co	Republic of Korea	3
LG Electronics	Republic of Korea	3
LG Semicon Co Ltd	Republic of Korea	3
Oriental Chemical Industry Co.Ltd.	Republic of Korea	3
Pertamina	Indonesia	3
Russian Space Agency	Former USSR	3
Taiwan Aerospace	Taiwan Province of China	3

4. A PRACTICAL GUIDE TO PARTNERSHIPS

Partnerships can significantly expand opportunities for companies interested in accessing markets and technologies, and for Governments interested in indigenous capacity building and economic growth. However, benefits do not flow automatically, nor do partners necessarily gain in equal proportions. There is indeed a great deal of learning associated with setting up and managing successful partnerships and room for policies to facilitate them. This section distils lessons from past experience to draw up a practical generic guide to negotiating and managing successful partnerships. It focuses mostly on partnerships with technological content and is addressed to companies with little or no prior experience of formal partnering.

This material is intended to address both industry strategists and policymakers.⁷ A better understanding of the basic building blocks of successful partnership is crucial to efficiently choosing maximum-impact policies for inter-firm cooperation.

For firms that get involved in formal partnerships, the following are some key lessons for success:

- Clearly understand the strategic objectives of the firm;
- Clearly determine the firm's needs from the partnership;
- Negotiate a suitable agreement;
- Treat the partnership agreement as a "living" document;
- Understand that the comparative advantages of partners at the outset of the agreement may change over time;
- Be aware that technology transfer is one of the most sensitive and contentious issues. Create clear provisions for a framework of technology use in the partnership;
- Partnership agreements must contain sound provisions for dispute resolution and, in the event of irreconcilable differences, the exit mechanism to be employed in terminating the partnership;
- Monitor and review the partnership throughout its lifetime.

4.1 Partnership opportunities and dangers

Consideration of a business partnership must always start with a careful examination of the *strategic challenges* confronting the firm in question. Management must consider:

- Where does the firm want to go in the future? What are its strategic objectives?
- What are the necessary projected steps – organizational, technological, finance, marketing, and so forth – to achieve the strategic objectives?
- To what extent do the required resources and capabilities exist internally?

⁷ The section draws on related work by Nicholas Vonortas on analytical tools and instructional material for industry executives regarding international business partnerships. The part on negotiations also draws on Miller et al. (1995).

The more *tactical challenges* for management considering a specific task include:

- What is the exact activity the firm is currently interested in and why can it not be economically carried out in-house? Why choose a partnership instead of an arm's-length exchange or a merger/acquisition to carry out this activity?
- How is a partnership expected to assist in accessing the resources and capabilities that the firm does not already possess?
- What kind of partners is the firm interested in? How to identify and select these partner(s)?
- How to successfully negotiate the partnership? Since partnerships involve both give and take, what are the specific assets that the firm will bring to the negotiating table? How much control can it afford to give away?
- How to manage the partnership and learn from it?
- How to set clear objectives for the partnership?
- How to evaluate partnership performance?
- When and how to dissolve the partnership?

Regardless of strategic goals, inter-firm collaboration always implies a *trade-off* between greater access (markets, finance, resources, capabilities), on the one hand, and less control of strategic decision-making, day-to-day management, and technological and other kinds of proprietary knowledge, on the other. From the point of view of the firm, the most frequently advocated *benefits of partnerships* over single company operations include:

- Access markets; create new product markets;
- Share costs of large investments;
- Share risk, reduce uncertainty;
- Access complementary resources and skills of partners, such as complementary technologies, people and finance; exploit research and technological synergies;
- Accelerate return on investments through a more rapid diffusion of assets;
- Deploy resources efficiently to create economies of scale, specialization and/or rationalization;
- Increase strategic flexibility through the optimal exploitation of new investment options;
- Unbundle the firm's portfolio of intangible assets, and selectively transfer components of this portfolio;
- Co-opt competition;
- Achieve legal and political advantages in host countries.

More broadly, partnerships have such virtues as flexibility, speed and economy. They can be put together in little time and be folded up just as quickly. They can involve little paperwork.

Partnerships also entail costs. The most important *cost of collaboration* for a partner is the partial loss of control over strategic decisions, over technology use and over market position.

The danger is that decreased control can invite opportunistic behaviour by one or more partners, resulting in the involuntary loss of important assets, particularly intangible assets such as technological and other types of knowledge.

Other potential *drawbacks of partnering* include:

- Increased transaction costs due to (a) increased management needs, (b) diversion of management attention, (c) employee coaching into the agreement, and (d) decisions and responsibilities that are subject to negotiation;
- Lack of compatibility of the collaborative activity with core firm interests, e.g. locking the firm into a product/service standard that may not be in its best interest.

It should be stressed that partners often join the same partnership for different reasons. Moreover, these reasons can shift over time, implying the same for the perceived benefits and costs of collaboration. The motivation to enter into a joint relationship must, then, not only be strong but also regularly re-examined during the lifetime of the partnership.

4.2 Partner choice

The ideal match of partners maximizes collaboration benefits and minimizes costs. As a rule, complementary needs, assets and/or capabilities among partners are prerequisites for maximizing benefits. Complementarities may, for example, be reflected in:

- Expertise in different, but commercially linked, technologies;
- Strength in different, but commercially linked, markets;
- Specialization in separate parts of the value chain.

Generally speaking, successful partnerships link firms such that one is weak where the other is strong. Successful partnerships do not link firms trying to make a strength out of their combined weaknesses. Such a combination can only create an even greater weakness.

The trade-off of linking complementary organizations may be higher transaction costs for running the partnership. The chance of disagreements between partners on market strategy, technology designs, decision-making process and so on increases. Disagreements will raise costs and reduce the effectiveness of the partnership. There may thus be reason for firms to search for like-minded partners, with similar management perspectives. Everything else being constant, common goals and strategies will result in fewer conflicts and lower costs of managing collaboration.

A particular type of conflict in cross-border alliances may occur when a transnational corporation (TNC) with a global strategy forms a partnership with a local partner pursuing more narrowly defined domestic or regional goals. Global strategies frequently require the TNC to incur costs in one country in return for profits in another. The specific partnership runs the danger of being treated as one of the TNC's subsidiaries. Local partners could be expected to

bear costs for which they receive no gains. Since the relationship in a partnership is dynamic and can shift over time, this may become a problem even though it was not one at the beginning of the partnership.

4.3 Partnership negotiation

Negotiation is one of the most important aspects of partnerships. Depending on the objectives, experience and complexity of the deal, partnership negotiation can be a difficult process. Reported negotiation length varies from a few weeks up to two years. A number of issues are extremely important and tend to dominate the negotiation phase:

- Control of the partnership, including its equity structure and veto power over various aspects in managing the partnership (appointment of key personnel, dividend policy, technology use, export markets, quality standards, supply sources, etc.);
- Conditions surrounding technology transfer. After control, this is the most frequently mentioned item in partnership contracts, indicating its importance to both sides;
- Dispute resolution in the partnership;
- Terms of partnership termination.

Fairly common *negotiation problems* include:

- Valuation of the assets brought by each partner to the partnership;
- Transparency – quality of data for evaluation;
- Conflict resolution procedures among partners – explicit rules and/or rules based on trust relationships;
- Allocation of management responsibility and degree of management independence;
- Changes in ownership shares as partnership matures;
- Exit policy;
- Dividend policy;
- Measurement of performance.

Fairly common *relationship problems* include:

- **International strategy-related problems.** The TNC treats the partnership as a subsidiary attempting to fit it to its global strategy. While the TNC optimizes benefits from its global network, the local partner, which depends much more on the specific partnership, has a different optimization objective.
 - (i) *Export rights.* Exporting sometimes represents a fundamental difference between industrial and developing country partners. A TNC typically will not want to allow the partnership to freely export products to markets that

may already be served from other manufacturing points in its system. For the TNC, the partnership is of course just a piece of a more complex global web. The developing country partner will probably be of a different opinion, as it will view exports as a natural avenue of expansion. The problem is that exports are often directed through the TNC partner which essentially controls external sales.

- (ii) *Tax issues.* The optimization process undertaken by the TNC will cover its worldwide tax burden. If the partnership exports products through the TNC system, transfer prices will play major big role in achieving the TNC goal of global tax burden minimization. Such a strategy may not necessarily be in the interest of the local partner.
 - (iii) *Dividend and investment policies.* The TNC may have global investment programmes that involve the transfer of funds from one region to another. This will affect its preference for dividends over reinvestment in the partnership, and vice versa. Again, the local partner may have different views.
 - (iv) *Partner size differences.* When these are significant—as is often the case with cross-border partnerships involving developing country partners — there may be difficulties during the high-growth phase of the partnership as the local partner may have difficulties coming up with the necessary funds for the expansion. Size differences also seem to have operational implications that can cause problems (e.g. the larger firm not taking the partnership seriously enough).
- **Ownership and control problems.** The following problems seem to arise repeatedly during the lifetime of a partnership:
 - (i) *Ownership problems.* Long-term strategic partnerships may need operational management with considerable independence from either partner. Problems may well be the result of changes during the lifetime of the partnership. A possible change involves change in management in one of the partners that affects this firm’s attitude towards the specific partnership.
 - (ii) *Control problems.* These are related to ownership, but are distinct in some ways. They refer to disputes over changes in product lines as time goes by, raw material sourcing, technology utilization, continuous provision of the partnership with state-of-the-art technology from the TNC, and so forth.
 - **Cultural problems.** These involve both the social cultural backgrounds of companies based in different countries and the corporate culture that characterizes each company. Both types of cultures condition how people view their environment and how they interpret issues. Complaints concerning arrogance, business practice, corruption, the use of “relational contracting”, and so on are frequent.

- **Problems related to dynamic changes in the relationship.** The changing environment within which the partnership operates alters partner relationships in ways that can sometimes cause stress.
 - (i) *Experience in a partnership results in learning.* Learning can modify how one views the contributions of the partner. Learning happens from either side, of course – the foreign firm may understand the developing country market better and the local partner may improve significantly its capabilities. Learning boosts self-confidence and raises expectations for partner contribution. The result sometimes is dissatisfaction.
 - (ii) *Unforeseen changes in circumstances render parts of the agreement obsolete.* Making the necessary modifications may be difficult, even if all sides agree. One example is changing circumstances in the markets of the basic customer (which may be one of the partners).

5. AN INVENTORY OF OPPORTUNITIES⁸

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 (increasingly referring to semi-skilled or skilled labour). While foreign market entry may also be the ultimate objective of developing country firms, their primary concern is to access resources and enhance their capabilities related to finance, technology, marketing and general international networking.

Partnerships may, for example, help a foreign firm overcome various difficulties in entering a developing country market, including:

- Satisfying government restrictions requiring a link with a local firm;
- Cost and risk sharing;
- Lack of country familiarity (local product market characteristics, distribution channels, labour conditions, management style in the local environment, legal system and government regulations, local customs);
- Lack of contacts within the Government;
- Use of existing facilities.

Partnering with local actors may also facilitate tapping relatively cheap, semi-skilled or skilled labour and other high-tech assets that exist in regions of East and South-East Asia, the Indian subcontinent, Latin America and the Caribbean, and Eastern Europe.

⁸ This section draws on Vonortas and Safioleas (1995) and Lee and Vonortas (forthcoming). The cases of Intrakom and Petrobras draw on Caloghirou, Constantelou and Karounos (2000) and Furtado and Gomes de Freitas (2000).

On the other hand, an increasing number of developing country firms attempt to position themselves as international competitors. Partnerships are seen by such firms as a mechanism to overcome a number of difficulties, including:

- Lack of brand names;
- Lack of specialized resources – e.g. access to well-developed systems of clinical studies for new medicines;
- Relatively small domestic market; access to export markets;
- Oligopolistic situations in domestic markets, nurturing large conglomerates threatening to stifle smaller, entrepreneurial firms;
- Low R&D budgets;
- Marketing inexperience outside the domestic market, particularly in industrialized country markets;
- Perception of low quality for developing country products;
- Lack of adequate finance.

The remainder of this section concentrates on information technology, considering the potential role of partnerships in building indigenous capacity building in developing countries, and looks at several company examples.

5.1 Information technology

Ever since modern computing was introduced in the early 1960s, electronics have been one of the most dynamic and technologically fast-progressing industrial sectors. The first decade was the era of centralized computing based on mainframes, expensive to produce and maintain. A small group of firms in a small group of countries (primarily the United States) dominated the international market. An important break came in the early 1970s when Intel introduced the first microprocessor which enabled the spread of minicomputers. The subsequent opening of the personal computing market by Apple in 1978 (capitalizing on the ideas of Xerox researchers at Palo Alto) created a wholly new horizon. Smaller machines with less complicated circuitry made possible the entry of a plethora of newcomers based in industrialized countries but, increasingly in the 1980s, in developing countries as well. It was, however, the advent of the recent information revolution – based on the convergence of computing and telecommunications that enabled the process and electronic transmission of texts, numbers, images and sounds – that really opened the field to new entrants, including many from developing countries (Bresnahan and Greenstein, 1999; Hobday, 1995).

A significant number of developing country firms have been able to enter various segments of the international IT markets owing to the important opportunities for worldwide sourcing of IT products (both hardware and software) made possible by technological advance. Rapid technological change in both products and manufacturing processes, shifting market requirements, and the continuing redistribution of cost factors for various IT products in favour of knowledge-intensive elements are changing 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 NICs 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, while small, their minicomputer producers do 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. The experiences of Asian NICs are useful examples to consider, although they should be appropriately modified to reflect the idiosyncrasies of each country.

In order to develop a competitive electronics industry, developing countries must succeed in a number of strategic goals, including: 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. Eight critical factors for building a modern electronics industry were listed by Miller (1993, p. 24):

- “government policies and strategies that support electronics sector growth and competitiveness;
- education and training programmes to build up the base of human resources;
- national industrial and quality assurance infrastructure to support enterprises;
- export marketing, distribution, and sourcing networks to support the emerging electronics industry;
- economies of scale, with cost, quality, and productivity levels meeting international benchmark levels;
- foreign strategic alliances to achieve effective technology transfer and engender sufficient foreign development investments;
- enhanced shop floor management; and
- flexibility in the public and private sector institutions, to adapt to changes in markets and technologies”.

While partnerships (alliances) appear as a distinct critical factor, they can undoubtedly influence a number of the other factors on this list. For example, 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 be almost certainly 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 to the next technology generation.

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. Partnerships are thus a vehicle for alleviating constraints directly related to the third, fourth, fifth and eighth of Miller's critical factors listed above. Indirectly, they both influence and depend on all the rest.

5.2 Partnership strategy examples

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-megabits DRAMs and 64-megabit DRAMs. Sensing its extensive exposure to the highly cyclical industry of computer semiconductors, Samsung also made it a priority around the same time to diversify into application-specific integrated circuits (ASICs), multimedia products, liquid crystal displays (LCDs) and telecommunications gear.

The transition from DRAM producer to a broad-based technology giant is rather difficult. As Samsung lacks the know-how to develop its own cutting-edge technology in most of these areas, it has 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 LCDs. Over the years, Samsung has also acquired equity positions in several companies such as LUX, a Japanese CAD/CAM producer, 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 R&D to enable it to adopt foreign technology for video-signal processing and 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.

LG Electronics Inc.

In the 1990s, LG Electronics, a unit of the group formerly called Lucky-Goldstar, managed to reverse a sharp performance decline in its core industries of electrical appliances and consumer electronics. In addition to regaining its number one position for colour TVs, refrigerators and washing machines in the Republic of Korea market, the company has managed to establish itself in memory chips, LCD screens and high-speed CD-ROMs. In these technologies, the group has invested significant R&D funds and has had to compete against sophisticated competitors from Japan, the United States and Europe.

LG Electronics has relied on partnerships for success in high-technology fields. It has, for example, entered into agreements with companies such as Zenith Electronics for high-definition television and multimedia technology, GE Appliances for white goods, Oracle to develop video-on-demand set-top boxes, Hitachi for DRAM chips and IBM for operating software. In partnerships, LG Electronics is trying to move beyond being merely a source of cheap production to becoming a full technology partner.

Acer

Acer is the largest manufacturer of personal computers in Taiwan Province of China. Compared with the conglomerates 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 makers 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 hurt the company's efforts to penetrate global markets. As part of a strategy to raise 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.

Acer and Canon formed in the mid-1990s 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, United States and ultimately the 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

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 to look overseas. Its most visible success abroad was securing the contract to automate the European stock exchange, winning over 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 Swissair to carry out its 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. Ambitious investment plans of the group 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 such as China, Japan and Australia.

Creative Technology sees itself alongside Microsoft and Intel as a "defining influence" in the personal computer business, and claims activity 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 part of all these deals.

United Microelectronics Corporation (UMC)

UMC is the second largest IC manufacturing firm in Taiwan Province of China, tracing Taiwan Semiconductor Manufacturing Corp. (TSMC). UMC's major business items in the mid-1990s included semiconductor devices and related components such as hybrid circuits, IC cards and circuit modules microcomputers, microprocessors and peripheral devices, as well as related subsystems such as contact image sensors (CIS) and liquid crystal displays (LCDs). Semiconductor memory devices and related systems for data acquisition, transmission and telecommunication systems were also included in UMC's catalogue.

At that time, the company underwent a radical strategic change and implemented a new alliance strategy. These changes were the company's reaction to several developments, including (a) Intel's expansion into the PC peripheral business in 1995, (b) the shortening of product life cycles of central processing unit (CPU) and computer products; and (c) the growing worldwide demand for foundry services. First, its CPU, microcomputer products and communication product divisions were spun off to become three independent companies registered in the United States. Second, UMC transformed itself to become a pure IC manufacturing company by spinning off several other divisions (e.g. IC design and chipsets). It also radically restructured into the UMC Group to include a number of previous spun-off but closely associated firms plus three investment companies. Third, UMC recognized the potential for rapid growth in the foundry business and an opportunity to continue its leadership by aggressively seeking joint ventures with United States firms, such as Cirrus Logic, Alliance, S3, Xilinx, OAK, ATI, OPTI, Lattice, Trident, ISSI and ESS. By the late 1990s it had established three new foundry companies in the Hsinchu Industrial Park, namely the United Semiconductor Corp. (USC), the United Integrated Circuits Corp. (UICC) and the United Silicon Inc. (USI).

UMC's strategic transformation from a diversified product-oriented company into a professional foundry service firm through cross-border partnerships and spin-offs has increased the operational scale of the newly formed group and increased sales. The separation of design and manufacturing functions has enabled the members of the UMC Group to specialize in key value-added areas. In order to accumulate the large amount of capital required for expansion and specialization, UMC aggressively sought partners specialized in either upstream or downstream activities willing to contribute financial resources and market access in exchange for a guaranteed right to manufacturing capacity. Overall, this alliance strategy enabled UMC to expand the scale and scope of its operations.

Intrakom

Developing local industrial capabilities in telecommunications equipment manufacturing was first considered as a serious policy option by the Greek Government in the late 1970s. In the mid-1980s, telecommunications equipment was chosen as a strategic sector that could benefit from the procurement of the government-owned telephone monopoly (OTE). The policy objective was to increase domestic value-added and learning potential associated with the production of digital switching systems. It was pursued largely through the involvement of an indigenous firm, Intrakom, in close collaboration with the Swedish company Ericsson, in the long-term investment project of OTE.

The award of the first procurement contract for digital switches to Intrakom marked a shift in the company's strategy into more technology-intensive activities. Soon after the award, the company entered into a licence agreement with Ericsson for the transfer of production and assembly know-how for the AXE-10 digital switch. Simultaneously, Ericsson acquired an 11 per cent stake in Intrakom.

The initial agreement between Ericsson and Intrakom provided for all parts of the AXE-10 switch to be imported as ready-made kits and for Intrakom to undertake the final assembly locally. This provision was later relaxed, however, and Intrakom fairly soon started to look in the domestic and foreign markets for raw materials of the same quality and standards as those provided by Ericsson. The raw materials were then compiled into kits by local engineers according to Ericsson's specifications and quality standards and were ready for use in the final assembly. By the late 1990s, about 80 per cent of AXE-10 components were reportedly manufactured in Greece. Owing to extensive software customization for use in the public network, it is estimated that about 70 per cent of the total value-added of the product is domestic. Software has become a critical area of interest to the company, given its importance in modern digital switching systems. Software exports to Ericsson Sweden are the most significant export activity of Intrakom.

The continuing and evolving relationship with Ericsson and the continuing success in winning a succession of supply contracts for OTE since the late 1980s laid the foundations of Intrakom's accelerated growth. Intrakom's strategic focus in establishing a long-term cooperative agreement with a leading foreign telecommunications equipment producer has proved very beneficial in terms of acquiring new knowledge from technology transfer and in terms of accessing new geographical and product markets.

Furthermore, the close relationship between OTE and Intrakom has been mutually beneficial to the companies' expansion into neighbouring countries. Expecting to benefit from technology procurement contracts, Intrakom has both followed and led OTE in entering these markets. By mid-1997, it had already formed nine joint ventures in Romania, the Russian Federation, the Republic of Moldova, Bulgaria and Albania. The majority of these projects involved the manufacturing and maintenance of systems well known to the company, similar to those procured by OTE (e.g. AXE-10 digital switches, transmission equipment, public cardphone networks, rural radio link systems).

The company is increasing its R&D intensity, emphasizing the design and pilot production of new products in the areas of telematics and tele-informatics. In-house R&D still primarily focuses on the adaptation of advanced technologies from external sources and the design of new wireless and wireline products and services. In addition to the licence agreement with Ericsson, the company has set up licence agreements with a number of international vendors, including Marconi, Alcatel and GNC. It has also been a frequent participant in collaborative R&D programmes funded by the European Commission.

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 under constant evolution owing to the need to produce oil and gas at increasing water 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 organization 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 are indicative, listed below, 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 respective 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 avenues to the problem simultaneously helped Petrobras spread its bets. Working with others helped spread the bets even more widely. Overall, the company managed to learn extensively and to make significant steps in a relatively short period to become a major international innovator in the area of deep sea oil production.

6. CONCLUSION

The proliferation of partnerships during the past couple of 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.

The evidence is, however, still concentrated in certain geographical areas and sectors. This has been interpreted to imply that the expectations of widespread catch-up opportunities through partnerships have not yet materialized (Freeman and Hagedoorn, 1994). It is argued elsewhere that such an interpretation misses two points. First, partnerships alone cannot be expected to put developing economies on a par with industrialized economies. They are but one of many factors enabling firms to enhance competitiveness and enjoy rapid rates of economic growth. Second, intensive international inter-firm cooperation is a relatively new phenomenon where, with few exceptions, developing countries have made their presence felt only very recently. In other words, it is simply too early to tell (Vonortas, 1998).

It is also possible that policy analysts have tried to extrapolate too much from the experience of developed countries, in the process missing important signals. In an early section of this paper, partnerships were classified by first drawing a dichotomy between formal and informal partnerships. There is little systematic information on the latter. Even so, available anecdotal evidence 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 involves especially small and medium sized enterprises (SMEs) in proximate geographical areas.

In fact, various terms have been developed to capture aspects of more informal modes of interaction. They are often referred to as clusters, districts or networks. Each term means something different, but they also share considerable common ground: the willingness and ability to interact closely with the surrounding environment, with peers, with buyers and suppliers – by and large on an informal basis. An expanding literature has, in the past few years,

tried to amass evidence of such interaction and of policies that promote it in developed and developing countries.⁹

Formal and informal partnering should be seen as a continuum, not unlike the way in which enterprise cooperation, clustering and networking are portrayed next to each other in UNCTAD (2000a, volume I). Then, the question is no longer whether partnering helps developing country firms to grow competitive, but rather which kind of partnering may be more appropriate – or more prevalent – at different stages of development and in different sectors.

As shown in this paper, available 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 NICs, a few countries with economies in transition with significant industrial capabilities, and a few 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, it would be difficult to attribute everything to bias.¹⁰ Simply put, formal partnerships do not seem to reach most developing country firms. Not until now, at least.

Earlier sections of this paper have also shown that formal partnerships require strategy formulation and partner contribution, whether in financial resources, intangible assets, market familiarity, market access, etc. Frequently, the required level of strategy sophistication and other resource commitment is considerable. It is thus quite possible that these requirements raise the bar too high for the majority of (mainly small and unsophisticated) firms in the majority of developing countries. Hence, one could argue, the relatively slow trickling down of partnering to the majority of firms in developing countries and thus the need for government strategies and policy interventions.

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's first creating an enabling business environment for partnering which includes not only the usual macro-economic 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

⁹ See, for example, Casas and Luna (1997), Casas, de Gortari and Santos (2000), Humphrey and Schmitz (1995), Levitsky (1996), Perez-Adelman (2000), and Vonortas (2000)

¹⁰ Available data sources are subject to serious biases owing to data collection procedures. They tend to discriminate against small firms, non-English-speaking countries and less developed countries. They may thus be underestimating ongoing activity in the developing world, particularly lesser developed countries.

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.

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).

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